

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

EVONIK OPERATIONS GmbH
and EVONIK
CORPORATION,

Plaintiffs,

vs.

AIR PRODUCTS AND
CHEMICALS, INC., and
GREENLANE BIOGAS US
CORP.,

Defendants.

C. A. No.
1:22-cv-01543-JPM

The virtual video-recorded deposition of
GEOFFREY M. GEISE, Ph.D., called by the Defendants
for examination, pursuant to Notice and pursuant to
the Rules of Civil Procedure for the United States
District Courts, taken stenographically by Sandra L.
Rocca, CSR, RMR, RDR, CRR, via Zoom, on the 20th of
January, 2025, at the hour of 9:03 a.m.

Certification No. 084-003435, 1245
5104-4011-7213-5936

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GEOFFREY M. GEISE, Ph.D.

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EXAMINED BY

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Mr. Lane

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Geise

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09:03:12 1 VIDEOGRAPHER: We are now on the record for
09:03:13 2 the video deposition of Dr. Geoffrey Geise. The
09:03:17 3 time is 9:03 a.m., January 20th, 2025 in the matter
09:03:21 4 of Evonik Operations GmbH, et al., versus Air
09:03:29 5 Products and Chemicals Incorporated, et al., civil
09:03:32 6 action number 22-01543-JPM being held in the United
09:03:39 7 States District Court for the District of Delaware.

09:03:41 8 The court reporter is Sandra Rocca. The
09:03:43 9 videographer is Gus Phillips and both are
09:03:45 10 representatives of GregoryEdwards LLC.

09:03:47 11 Will counsel please state their appearances
09:03:50 12 for the record beginning with the Defendant.

09:03:52 13 MR. LANE: Yeah, John Lane for Fish &
09:03:55 14 Richardson for Defendant Air Products. With me
09:03:58 15 today is Ethan Kovar also from Fish & Richardson for
09:04:02 16 Air Products, Johanna Wilbert from Quarles & Brady
09:04:06 17 for Defendant Greenlane, and Dr. Benny Freeman, who
09:04:11 18 is Defendant's expert. And later today, it's
09:04:14 19 possible that Amy Trexler from Air Products might be
09:04:17 20 joining us.

09:04:19 21 MR. LIPPERT: Good morning. Nels Lippert,
09:04:24 22 Tarter Krinsky & Drogin for Plaintiff Evonik and
09:04:26 23 with me is Chandler Sturm from Tarter Krinsky also,
09:04:37 24 Philip Braginsky and Janet Linn.

25 ///

1 GEOFFREY M. GEISE, Ph.D.,
2 having been first duly sworn, was examined and
3 testified as follows:

4 CROSS EXAMINATION

5 BY MR. LANE:

09:04:53 6 Q Ready. All right. Good morning, Dr. Geise.
09:04:57 7 Nice to meet you. I can't hear you. Are you on
09:05:01 8 mute?

09:05:01 9 A Good morning.

09:05:02 10 Q There we go. Okay. How many times have you
09:05:05 11 had your deposition taken before?

09:05:07 12 A This is the second time.

09:05:09 13 Q Second time. When was the last -- the first
09:05:12 14 time?

09:05:12 15 A It was in February of 2020.

09:05:14 16 Q Okay. And a few formalities to get started.
09:05:22 17 If you need a break at any time, just let me know
09:05:24 18 and we'll take a break at the next convenient spot.
09:05:28 19 You understand that?

09:05:29 20 A (Indicating affirmatively.)

09:05:30 21 Q Okay. I'm having a hard time picking up
09:05:33 22 your audio. Is anybody else having a hard time?

09:05:37 23 CERTIFIED STENOGRAPHER: Yes.

09:05:41 24 A See if I can move my microphone a little bit
09:05:43 25 closer here.

09:05:44 1 Q That seems a little better. Do you
09:05:49 2 understand that there's a transcript and a video
09:05:52 3 being made of the deposition today?

09:05:53 4 A Yes, sir.

09:05:54 5 Q Okay. Do you understand that portions of
09:05:57 6 the transcript or the video from today's deposition
09:05:59 7 may be shown to the judge or jury in this case?

09:06:02 8 A Yes.

09:06:02 9 Q And it's important for the court reporter
09:06:07 10 that we try not to talk over each other because she
09:06:09 11 has to make an accurate transcript and if we both
09:06:13 12 talk at the same time, it's hard for her to do that.
09:06:16 13 Do you understand that?

09:06:16 14 A Understood.

09:06:17 15 Q I'll try my best, but I've done a lot of
09:06:19 16 these depositions, I don't think I've ever been to
09:06:22 17 one where it didn't happen, but we'll try.

09:06:25 18 You understand that Evonik's counsel might
09:06:27 19 object to some of my questions today, but even if
09:06:30 20 there's an objection, you go ahead and answer. Do
09:06:33 21 you understand that?

09:06:33 22 A Yes.

09:06:34 23 Q And you understand that you're under oath
09:06:37 24 today just like testifying in a courtroom under
09:06:40 25 penalties of perjury?

09:06:41 1 A Yes.

09:06:42 2 Q And you'll tell the truth today?

09:06:44 3 A That's correct.

09:06:46 4 Q The whole truth and nothing but the truth?

09:06:48 5 A Yes.

09:06:49 6 Q And because we're doing this virtually, I

09:06:53 7 need to ask you a few more questions. Where are you

09:06:56 8 today?

09:06:57 9 A I am located in my home office.

09:07:00 10 Q Is there anyone there at home with you

09:07:03 11 today?

09:07:03 12 A No other people. My dog is around

09:07:08 13 somewhere, but no other people.

09:07:09 14 Q And do you have any documents there with

09:07:14 15 you?

09:07:14 16 A Yes. I have --

09:07:15 17 Q Okay. What do you have?

09:07:16 18 A Sorry.

09:07:17 19 Q What documents do you have with you?

09:07:19 20 A So I have Exhibits 1 and 2 which are the

09:07:24 21 Ungerank patent, and the ex parte certificate. I

09:07:38 22 have my declaration or my initial declaration and my

09:07:42 23 rebuttal declaration and I also have Dr. Freeman's

09:07:45 24 initial declaration and his rebuttal declaration as

09:07:48 25 well.

09:07:49 1 Q And are those clean copies or do they have
09:07:52 2 any notes on them?

09:07:53 3 A They are clean copies with no notes.

09:07:55 4 Q Okay. Thank you. Any other notes or
09:07:59 5 documents there with you?

09:08:00 6 A No.

09:08:02 7 Q Okay. And what kind of device are you
09:08:05 8 using? Are you using your laptop?

09:08:08 9 A It's a -- it's a desktop computer, but...

09:08:11 10 Q Okay. Is that your work computer or is that
09:08:15 11 a home computer?

09:08:17 12 A It's personally owned.

09:08:18 13 Q And are you just using one monitor, one
09:08:23 14 external monitor?

09:08:24 15 A I do have two monitors connected.

09:08:26 16 Q Okay. Do you have your phone with you?

09:08:29 17 A It's in another room. It's not here in the
09:08:31 18 room with me.

09:08:33 19 Q Okay. And will you let me know if you start
09:08:36 20 using any other devices during the deposition today?

09:08:38 21 A I will let you know.

09:08:40 22 Q Okay, thanks. And the first time you had
09:08:45 23 your deposition taken, was that virtually or was
09:08:47 24 that in person?

09:08:47 25 A It was in person.

09:08:48 1 Q Okay. So if you have any issues with the
09:08:51 2 video or the technology today, just let us know and
09:08:55 3 we'll stop. Sometimes it freezes up or there's
09:08:58 4 issues with the exhibits, but we'll try to work
09:09:00 5 through them.

09:09:01 6 A few other formalities that I need to ask
09:09:04 7 you to get and ask pretty much in every deposition.

09:09:08 8 Have you ever been convicted of any felonies
09:09:09 9 or misdemeanors other than a traffic violation?

09:09:12 10 A No.

09:09:13 11 Q Are you feeling okay today?

09:09:14 12 A Yes.

09:09:15 13 Q You're not sick or taking any medication
09:09:18 14 that would affect your ability to give truthful and
09:09:20 15 complete answers in the deposition today?

09:09:22 16 A No.

09:09:23 17 Q Is there any reason you can't give truthful
09:09:26 18 and complete answers in the deposition today?

09:09:28 19 A There's no reason.

09:09:31 20 Q And will you let me know if that changes for
09:09:33 21 some reason?

09:09:34 22 A Yes.

09:09:34 23 Q Okay. And you understand that your
09:09:37 24 deposition today is in connection with litigation
09:09:40 25 between Evonik as the Plaintiff and the Defendants

09:09:46 1 Air Products and Greenlane?

09:09:47 2 A Yes.

09:09:48 3 Q In other words, you understand that Evonik
09:09:50 4 has sued Air Products and Greenlane?

09:09:52 5 A Yes.

09:09:53 6 Q You understand that specifically your
09:09:54 7 deposition is in connection with the claim
09:09:55 8 construction proceedings in the litigation?

09:09:58 9 A Yes.

09:09:59 10 Q And you submitted two declarations, right?
09:10:05 11 You talked about that a second ago.

09:10:07 12 A That's correct.

09:10:07 13 Q Okay. Can we put those up, Ethan? We'll
09:10:11 14 mark those as Exhibits 1 and 2.

09:10:11 15 (Geise Exhibit 1 marked for
09:10:15 16 identification.)

09:10:15 17 (Geise Exhibit 2 marked for
09:10:31 18 identification.)

09:10:31 19 BY MR. LANE:

09:10:32 20 Q Do you have those, Dr. Geise?

09:10:33 21 A Yes, I do.

09:10:34 22 Q And you signed these declarations on
09:10:38 23 January 3rd and January 15th, Exhibit 1 on the 3rd
09:10:42 24 and Exhibit 2 on the 15th, is that correct?

09:10:45 25 A Opening these up here. Yes, these do appear

09:11:01 1 to be the documents that I signed on those dates.

09:11:03 2 Q And when you signed your declarations, did
09:11:06 3 you believe everything stated in them was accurate?

09:11:08 4 A Yes.

09:11:08 5 Q Do you still believe today that all the
09:11:12 6 statements in your two declarations are accurate?

09:11:14 7 A Yes.

09:11:16 8 Q Let me see if I can add this exhibit. Can
09:11:32 9 you put up the LinkedIn? Sorry, my power cord just
09:11:39 10 fell out.

09:11:39 11 (Geise Exhibit 3 marked for
09:11:44 12 identification.)

09:11:44 13 BY MR. LANE:

09:11:56 14 Q All right. Dr. Geise, do you have that --
09:11:58 15 what's been marked as Exhibit 3?

09:12:00 16 A Yes.

09:12:01 17 Q And do you recognize the language on this
09:12:04 18 page?

09:12:05 19 A Looks to be a summary of CV information or
09:12:14 20 experience that I've had.

09:12:16 21 Q All right. Well, I'll tell you it's your
09:12:19 22 LinkedIn page that we found and downloaded. It's in
09:12:23 23 a little different format when you download it. But
09:12:25 24 does that sound right?

09:12:26 25 A Yes.

09:12:26 1 Q Who wrote the language that appears on your
09:12:31 2 LinkedIn page?

09:12:32 3 A I did.

09:12:33 4 Q No one maintained your LinkedIn page for
09:12:38 5 you?

09:12:38 6 A No.

09:12:38 7 Q And when was the last time you updated your
09:12:41 8 LinkedIn page?

09:12:42 9 A Oh, I don't necessarily recall off the top
09:12:53 10 of my head, but it probably was back in -- it
09:12:58 11 probably was back in March of 2024 when I became an
09:13:05 12 editor of Journal of Membrane Science Letters. I
09:13:08 13 think that's the last update that would have been on
09:13:13 14 here.

09:13:14 15 Q Thanks. And a little bit towards the end of
09:13:19 16 that summary paragraph at the top. Do you see that?

09:13:22 17 A Yes.

09:13:22 18 Q It says, "experienced expert witness for
09:13:25 19 patent litigation." Do you see that?

09:13:27 20 A Yes.

09:13:27 21 Q Can you explain what you meant by that?

09:13:30 22 A So I've served as an expert witness in other
09:13:37 23 patent litigation cases.

09:13:41 24 Q How many times have you been an expert
09:13:43 25 witness in any type of case, patent or otherwise?

09:13:46 1 A So in terms of patent cases, prior to this
09:13:55 2 one, two. And I think I've served in some capacity
09:14:03 3 or another in terms of expert witnessing in -- or as
09:14:08 4 an expert in, I think three other cases.

09:14:13 5 Q And you're also an expert in the IPR for one
09:14:21 6 of the Evonik patents, correct?

09:14:23 7 A Yes, that's correct.

09:14:24 8 Q Okay. Have you been an expert witness in
09:14:26 9 any other Patent Office proceedings besides the IPR
09:14:32 10 on what I'll call -- you understand what I mean by
09:14:34 11 the Priske patent?

09:14:36 12 A Yes.

09:14:36 13 Q So other than for the Priske patent, have
09:14:39 14 you ever been an expert witness in any Patent Office
09:14:42 15 proceedings?

09:14:42 16 A Yes, I was an expert in another IPR some
09:14:46 17 years ago.

09:14:46 18 Q How many times have you submitted expert
09:15:02 19 reports or declarations in patent cases or Patent
09:15:06 20 Office proceedings aside from this case and in the
09:15:09 21 Priske IPR?

09:15:10 22 A Aside from these -- aside from those two
09:15:14 23 matters, I think in the other patent litigation
09:15:18 24 case, I think there were two declarations. There
09:15:22 25 might have been a -- there might have been a shorter

09:15:25 1 third one, but I think there were at least two
09:15:27 2 declarations in that matter. And there was one
09:15:30 3 declaration in the IPR case.

09:15:33 4 Q How many times have you submitted expert
09:15:39 5 reports or declarations for claim construction in
09:15:42 6 patent cases?

09:15:43 7 A So the other -- the other patent matter that
09:15:48 8 I was a part of, that was a claims construction
09:15:52 9 process and so those two declarations that I
09:15:57 10 mentioned previously were both related to claims
09:16:01 11 construction.

09:16:01 12 Q Okay. And maybe I misunderstood, but I
09:16:05 13 thought you said you'd been an expert before in two
09:16:08 14 patent cases. Did I misunderstand that?

09:16:10 15 A I think I was referring to the matter where
09:16:15 16 I did the two declarations and the deposition as one
09:16:20 17 patent case and then the other IPR prior to that,
09:16:25 18 that was what I was considering as being the two
09:16:27 19 matters.

09:16:27 20 Q I see. So one previous patent, what I'll
09:16:31 21 call litigation, and then one previous IPR, is that
09:16:35 22 correct?

09:16:35 23 A That's correct.

09:16:35 24 Q And then you said three other non-patent
09:16:39 25 cases?

09:16:41 1 A Yes.

09:16:41 2 Q Right? Okay. And let's start with the
09:16:55 3 other patent case. Was that -- I think you said
09:16:58 4 your deposition -- well, your previous deposition,
09:17:01 5 was that in connection with the patent litigation or
09:17:03 6 the IPR?

09:17:04 7 A That was in -- for the patent litigation for
09:17:08 8 claims construction.

09:17:09 9 Q Okay. So similar to today?

09:17:11 10 A Yes.

09:17:12 11 Q Okay. And that was in February 2020, you
09:17:17 12 said?

09:17:17 13 A Yes.

09:17:17 14 Q And who were the parties in that litigation
09:17:23 15 to the extent you recall?

09:17:24 16 A Fisher Paykel and Flexicare.

09:17:28 17 Q Can you spell those for the court reporter
09:17:37 18 to the best you remember?

09:17:38 19 A I think f-i-s-c-h-e-r, [sic], p-a-y-k-e-l-l.
09:17:51 20 Forget whether it's one or two Ls to be honest; and
09:17:54 21 Flexicare, f-l-e-x-i-c-a-r-e. I'm doing the best I
09:18:00 22 can to remember those off the top of my head.

09:18:02 23 Q All right. Thanks. I appreciate that.
09:18:04 24 That was what, five years ago now almost, right?

09:18:07 25 And which side were you an expert for in

09:18:11 1 that case?

09:18:12 2 A I was retained by Fisher & Paykel.

09:18:14 3 Q And what law firm?

09:18:17 4 A Knobbe Martens.

09:18:20 5 Q Do you remember what lawyers you worked with
09:18:22 6 at Knobbe?

09:18:24 7 A I believe -- I believe the one lawyer's name
09:18:31 8 was Sheila Swaroop. And there was another lawyer
09:18:34 9 that I worked particularly with and I am blanking
09:18:37 10 out on his name right at the moment.

09:18:39 11 Q And do you remember what court that case was
09:18:41 12 pending in?

09:18:42 13 A I believe that was the District Court for
09:18:47 14 Southern California.

09:18:48 15 Q And do you recall generally what was in
09:18:51 16 dispute in that case?

09:18:51 17 A There were disputed terms related to the
09:18:56 18 operation of a material for transport of gasses or
09:19:00 19 related to transport of gasses.

09:19:02 20 Q And I know you've said this, but just so I
09:19:07 21 remember, you submitted two expert reports in that
09:19:11 22 case and they were both for claim construction?

09:19:13 23 A I believe there were two and both would have
09:19:16 24 been for claims construction. I'm trying to
09:19:20 25 remember whether it was exactly two, but I -- as I

09:19:24 1 sit here presently, I think it was two.

09:19:26 2 Q And you were working for the defendant in
09:19:31 3 that case, right, Flexicare?

09:19:35 4 A No, I was working for Fisher & Paykel.

09:19:38 5 Q And do you recall where your deposition was
09:19:46 6 in that case?

09:19:48 7 A It was done in Los Angeles.

09:19:51 8 Q Do you know if the case was settled? Is
09:19:56 9 that why you didn't go on to testify later at trial
09:19:58 10 or in other depositions?

09:20:00 11 A I don't actually know. I never got the
09:20:04 12 follow-up, but clearly they went in a different
09:20:08 13 direction.

09:20:08 14 Q All right. Then let's go to the previous
09:20:11 15 IPR, okay. And what parties were involved in that
09:20:17 16 IPR?

09:20:17 17 A So I believe that was -- the patent owner
09:20:21 18 was I think called Sharp Innovations and the other
09:20:27 19 side was T-Mobile.

09:20:29 20 Q And which side did you work for there?

09:20:33 21 A I represented the patent owner.

09:20:34 22 Q Sharp?

09:20:36 23 A Yes.

09:20:36 24 Q And what law firm did you work with?

09:20:43 25 A I don't recall off the top of my head what

09:20:51 1 the firm's name was.

09:20:52 2 Q And I think you said you submitted one

09:20:58 3 declaration in that case?

09:20:59 4 A Yes.

09:20:59 5 Q In that matter? But you weren't deposed?

09:21:02 6 A I was not.

09:21:03 7 Q Okay. And then the other three cases, the
09:21:23 8 non-patent matters, can you -- just to start with,
09:21:28 9 can you just give me an overview of what those cases
09:21:31 10 were about?

09:21:32 11 A So they were all -- or they're all civil
09:21:38 12 litigation cases related to either, I would say
09:21:42 13 broadly, product performance or failure.

09:21:45 14 Q Okay. And were the products membranes?

09:21:48 15 A They were plastic materials. And actually
09:21:59 16 one was more a plastic material in a battery system.
09:22:05 17 It was a little different.

09:22:06 18 Q And if I'm asking for any confidential
09:22:10 19 information from those cases, don't tell me anything
09:22:12 20 that was under the Protective Order, but just tell
09:22:15 21 me if it was.

09:22:16 22 But let's go -- let's talk about the first
09:22:19 23 one in time, the earliest one you did. Do you
09:22:21 24 recall when that was?

09:22:23 25 A Are we speaking just about those three

09:22:27 1 versus the IPR and the patent we've already talked
09:22:30 2 about?

09:22:30 3 Q Yes.

09:22:31 4 A Okay. So I think the first one on there was
09:22:38 5 a case related to failure of a battery system.

09:22:47 6 Q Do you remember the parties in that case?

09:22:49 7 A I do. I'd prefer not to disclose that
09:22:54 8 though.

09:22:54 9 Q Okay. Well, was -- did you submit an expert
09:23:02 10 report in that case?

09:23:03 11 A No.

09:23:04 12 Q Okay. And you didn't have your deposition
09:23:08 13 taken?

09:23:08 14 A No.

09:23:08 15 Q What year did you do the work in that case,
09:23:14 16 year or years?

09:23:17 17 A I don't recall exactly. It was probably
09:23:22 18 2021 or 2022. It was after -- it was after the
09:23:27 19 Fisher Paykel case, but I don't -- I don't remember
09:23:31 20 exactly which year that was.

09:23:33 21 Q And was that pending in state court or
09:23:35 22 federal court or do you remember?

09:23:37 23 A I don't recall.

09:23:39 24 Q And what about the second case, the second
09:23:53 25 non-patent case, what was that case about?

09:23:56 1 A So that case was about a packaging material
09:24:02 2 and so a polystyrene-based packaging material.

09:24:06 3 Q And can you tell me what parties were
09:24:10 4 involved in that case?

09:24:11 5 A Since I haven't filed any documentation or
09:24:15 6 anything, I would prefer not to disclose that at
09:24:18 7 this time.

09:24:18 8 Q And what about the third case, what was it
09:24:21 9 about in general?

09:24:22 10 A That was also a polymer packaging material
09:24:27 11 matter and likewise, I have not submitted any
09:24:30 12 materials on that one either at this point.

09:24:33 13 Q Were any of those three non-patent cases
09:24:38 14 related to membranes?

09:24:39 15 A No.

09:24:40 16 Q Okay. And sorry if I already asked you, but
09:24:45 17 was your previous patent case related to membranes?

09:24:50 18 A It was related to a small molecule transport
09:24:53 19 through polymers, but we weren't taking maybe so
09:24:58 20 much about membranes per se, but I would consider it
09:25:01 21 to be very similar to the issues that come up in
09:25:07 22 membrane-based systems.

09:25:08 23 Q Okay. And that's the Fisher/Flexicare case
09:25:12 24 we're talking about now?

09:25:14 25 A That's right.

09:25:15 1 Q And the Sharp versus T-Mobile case, was that
09:25:18 2 about membranes?

09:25:19 3 A No, it was not.

09:25:20 4 Q And that one is an IPR, so it should be
09:25:25 5 public. So can you describe more about what you did
09:25:28 6 in that case in the IPR?

09:25:29 7 A So that was looking at plastic properties
09:25:34 8 for a SIM card as it related to the patent holder's
09:25:42 9 patents. I was asked to opine upon issues related
09:25:46 10 to how plastics particularly perform under different
09:25:51 11 temperature conditions.

09:25:52 12 Q So if I have this right, it sounds like
09:26:08 13 you've -- in your career total, you've submitted
09:26:10 14 five expert reports, is that correct, two in this
09:26:16 15 case, two in the Fisher case and one in the IPR?

09:26:20 16 A I guess one in the other IPR for the Priske
09:26:29 17 patent, but yes.

09:26:32 18 Q Sorry. I missed that one. And actually, I
09:26:35 19 think you've submitted two declarations in the
09:26:37 20 Priske one, right?

09:26:38 21 A That is true. There was a supplemental
09:26:41 22 filed in that as well.

09:26:42 23 Q Okay. So seven total, does that sound
09:26:45 24 right?

09:26:46 25 A That sounds about right.

09:26:47 1 Q And you've had your deposition taken one
09:26:50 2 time before. We talked about that and it was as an
09:26:54 3 expert, correct?

09:26:54 4 A Yes.

09:26:55 5 Q Okay. And I didn't ask you this, but have
09:27:00 6 you ever testified in a trial before as an expert or
09:27:02 7 a non-expert?

09:27:04 8 A I have not.

09:27:05 9 Q Going back to Exhibit 3, your LinkedIn page,
09:27:14 10 it says -- after it says experienced expert witness
09:27:18 11 for patent litigation, it talks about being a due
09:27:21 12 diligence consultant. Do you see that?

09:27:23 13 A Yes.

09:27:24 14 Q Can you give me a general description of
09:27:26 15 what that meant, due diligence consultant?

09:27:30 16 A So I was hired by a venture capital firm who
09:27:35 17 was considering investing in a company and so I was
09:27:39 18 asked to go in and review documents and meet with
09:27:42 19 people on the company and ultimately author a report
09:27:48 20 looking at essentially evaluating that company for
09:27:52 21 the venture capital firm.

09:27:54 22 Q And I take it that was confidential. It's
09:27:58 23 not a matter of public record. Can you tell me if
09:28:01 24 it was related to membranes, your work in that
09:28:03 25 matter?

09:28:03 1 A It was related to membranes.

09:28:05 2 Q Okay. Can you generally describe what
09:28:12 3 technology?

09:28:14 4 A I would say, broadly speaking, it was in the
09:28:17 5 realm of energy systems.

09:28:19 6 Q Okay. And about what years was that?

09:28:28 7 A I don't recall exactly. It probably was
09:28:38 8 somewhere around 2022. It was -- it was on the --
09:28:44 9 it was on the after side of the pandemic, I remember
09:28:47 10 that.

09:28:50 11 Q All right. Did your work in that -- for the
09:28:58 12 due diligence, did it involve analyzing patents?

09:29:03 13 A It involved reviewing the IP portfolio for
09:29:10 14 the company.

09:29:11 15 Q Okay. And have you ever -- other than your
09:29:22 16 work in this litigation and in the Priske IPR, have
09:29:28 17 you ever done any other work for Evonik?

09:29:30 18 A No, I have not.

09:29:31 19 Q Have you ever done any work for Air
09:29:36 20 Products?

09:29:36 21 A Not to my knowledge.

09:29:37 22 Q Have you ever done any work for Greenlane?

09:29:40 23 A Not to my knowledge.

09:29:41 24 Q Has Air Products ever funded any of your
09:29:53 25 research or your group's research?

09:29:55 1 A Air Products has not funded any of my
 09:29:59 2 group's research, no.
 09:30:00 3 Q Has Evonik?
 09:30:02 4 A No.
 09:30:02 5 Q Have you ever applied for funding from Air
 09:30:09 6 Products?
 09:30:09 7 A No, I have not.
 09:30:10 8 Q Have you ever applied for funding from
 09:30:13 9 Evonik?
 09:30:13 10 A No.
 09:30:14 11 Q And for same two questions for Greenlane?
 09:30:17 12 A No.
 09:30:18 13 Q Okay. When were you first asked to work on
 09:30:25 14 this litigation?
 09:30:26 15 A It was probably either very late November or
 09:30:34 16 early December. I believe it was after Thanksgiving
 09:30:42 17 for this particular proceeding.
 09:30:44 18 Q And that's 2024?
 09:30:45 19 A That's correct, yes.
 09:30:47 20 Q And who first contacted you to help on this
 09:30:53 21 litigation?
 09:30:54 22 A I'm trying to remember exactly who made the
 09:31:07 23 contact. I think it might have been an email to set
 09:31:10 24 up a call and that email may have come from Chandler
 09:31:15 25 Sturm.

09:31:16 1 Q So as best as you recall, you were contacted
09:31:26 2 directly by Evonik's lawyers, you weren't working
09:31:29 3 through an expert search firm?

09:31:31 4 A No, I was contacted directly by the lawyers.

09:31:34 5 Q Are you working at all with an expert search
09:31:38 6 firm in your expert work for Evonik? And by that
09:31:41 7 I'm including all your expert work.

09:31:44 8 A Not related to Evonik. I do have myself
09:31:49 9 listed on, you know, an expert search site somewhere
09:31:54 10 else, but that has no bearing on these -- these
09:31:59 11 matters.

09:31:59 12 Q All right. So for your expert work for
09:32:02 13 Evonik, you were contacted directly by the
09:32:04 14 attorneys?

09:32:04 15 A Yes.

09:32:05 16 Q Okay. And are you being paid directly for
09:32:11 17 your work? You're not -- it's -- the payments
09:32:15 18 aren't going through any search firm or anything
09:32:17 19 like that, right?

09:32:19 20 A No, I'm sending invoices to the law firm.

09:32:21 21 Q And do you have like a PC or anything set up
09:32:26 22 that gets paid or they pay -- they make the payments
09:32:29 23 directly to you, Geoff Geise?

09:32:33 24 A It would be made directly to me, yes.

09:32:36 25 Q When were you engaged to work as an expert

09:32:39 1 on this litigation?

09:32:40 2 A It would have been shortly after that
09:32:45 3 initial phone call, so I'm going to say it was early
09:32:50 4 December 2024.

09:32:51 5 Q Okay. And if you want to, you don't have
09:32:56 6 to, but in your opening expert report that's been
09:33:01 7 marked as Exhibit 1, on paragraph 9, do you have
09:33:08 8 that?

09:33:09 9 A Yes.

09:33:10 10 Q Okay. And it says you've been retained by
09:33:13 11 Tarter Krinsky & Drogin LLP, counsel for Evonik in
09:33:19 12 this action. Do you see that?

09:33:21 13 A I see that.

09:33:21 14 Q And is that accurate?

09:33:22 15 A Yes.

09:33:23 16 Q So you've been engaged by Evonik's lawyers,
09:33:26 17 not Evonik directly, right?

09:33:29 18 A That's correct.

09:33:30 19 Q Okay. And you have an engagement letter, an
09:33:35 20 engagement agreement with Tarter Krinsky?

09:33:37 21 A Yes.

09:33:38 22 Q And pursuant to that letter agreement,
09:33:42 23 you're being paid by Tarter Krinsky to work on this
09:33:45 24 matter?

09:33:46 25 A Yes.

09:33:46 1 Q When was the first time you heard about this
09:33:56 2 litigation? Was it around that same time when you
09:33:59 3 were first contacted or had you heard about it
09:34:00 4 before?

09:34:01 5 A The specific civil litigation, the first
09:34:05 6 time I heard about it was when I was contacted.

09:34:08 7 Q Okay. And are you qualifying that? You're
09:34:12 8 saying specific litigation. Are you qualifying
09:34:15 9 that? Had you heard something else about it before
09:34:17 10 you were contacted?

09:34:19 11 A Well, so I had been working -- I guess I'm
09:34:23 12 saying that relative to I had been working on the
09:34:26 13 IPR matter prior to this. But this specific civil
09:34:32 14 element of things did not come up during the course
09:34:34 15 of working on the IPR.

09:34:36 16 Q I see. So you first started working on the
09:34:39 17 IPR and then later you started working on the
09:34:42 18 litigation?

09:34:43 19 A That's correct.

09:34:44 20 Q Do you just have one engagement letter for
09:34:47 21 both?

09:34:47 22 A No, there are two separate letters.

09:34:49 23 Q Okay. Have you had any discussions or
09:34:54 24 communications, email, phone, Zoom, Teams, text,
09:34:58 25 et cetera, regarding this litigation with anyone who

09:35:02 1 works at Evonik?

09:35:05 2 A No.

09:35:06 3 Q Have you had any discussions or
09:35:09 4 communications regarding your expert work for Evonik
09:35:13 5 with anyone who works at Evonik?

09:35:16 6 A No.

09:35:17 7 Q Have you had any discussions or
09:35:20 8 communications regarding this litigation with anyone
09:35:24 9 who formerly worked at Evonik?

09:35:27 10 A No.

09:35:28 11 Q All right. Let's put up, Mr. Kovar, the
09:35:38 12 patent if we can. So we're going to put up the
09:35:44 13 8,999,038 patent, Dr. Geise. And you're familiar
09:35:48 14 with that patent, I take it?

09:35:50 15 A Yes.

09:35:50 16 (Geise Exhibit 4 marked for
09:35:51 17 identification.)

09:35:51 18 BY MR. LANE:

09:35:51 19 Q And is it okay if we refer to that as the
09:35:56 20 '038 patent in the deposition today?

09:35:57 21 A That works for me.

09:35:59 22 Q Okay. And you've reviewed the '038 patent
09:36:03 23 before the deposition today? And I'll give you a
09:36:06 24 chance to open it.

09:36:06 25 A Yes.

09:36:07 1 Q Did you know about Evonik's '038 patent

09:36:11 2 before you were contacted by Evonik's lawyers to

09:36:13 3 help them in this litigation?

09:36:15 4 A I did not.

09:36:15 5 Q Okay. And at a high level, you're an expert

09:36:20 6 in membrane separations, correct?

09:36:22 7 A Correct.

09:36:23 8 Q But you'd never heard of Evonik's '038

09:36:28 9 patent before you were contacted by Evonik's lawyers

09:36:30 10 to help them in this litigation?

09:36:32 11 A That's correct.

09:36:33 12 Q The '038 patent had never come up in any of

09:36:37 13 your work before?

09:36:37 14 A No.

09:36:38 15 Q The '038 patent had never come up in any of

09:36:45 16 your research or other work before you started

09:36:48 17 working on this litigation?

09:36:49 18 A No, it had not.

09:36:50 19 Q Okay. And none of your colleagues had ever

09:36:54 20 shown you the '038 patent or discussed or emailed

09:36:57 21 with you about it before your work in this

09:36:59 22 litigation, is that right?

09:37:00 23 A Not to my knowledge.

09:37:02 24 Q And was the '038 patent ever discussed at

09:37:06 25 any conferences or meetings you'd been to before you

09:37:08 1 worked on this litigation?

09:37:10 2 A Not that I recall.

09:37:11 3 Q Do you know if the '038 patent has ever been
09:37:15 4 licensed to anyone?

09:37:16 5 A I do not know.

09:37:18 6 Q Did you review the '038 patent in preparing
09:37:26 7 for your deposition today?

09:37:28 8 A Yes.

09:37:28 9 Q And when was the last time you reviewed the
09:37:33 10 '038 patent?

09:37:35 11 A I think I took a look through it this
09:37:37 12 morning.

09:37:39 13 Q In doing your work to prepare your two
09:37:47 14 declarations and your work for this litigation, did
09:37:51 15 you carefully review the claims of the '038 patent?

09:37:54 16 A Yes.

09:37:54 17 Q Did you carefully review the specification?

09:37:57 18 A Yes.

09:37:58 19 Q Did you carefully review the figures in the
09:38:02 20 '038 patent?

09:38:03 21 A Yes.

09:38:03 22 Q Did you review the prosecution history?

09:38:07 23 A Yes.

09:38:07 24 Q Did you review the files or the records from
09:38:12 25 the supplemental examinations?

09:38:14 1 A Yes.

09:38:14 2 Q Okay. And there were two supplemental

09:38:17 3 examinations, right?

09:38:18 4 A That's correct.

09:38:19 5 Q And I think we touched on this before you

09:38:21 6 mentioned it, but did you review the files from the

09:38:24 7 ex parte re-examination?

09:38:26 8 A Yes.

09:38:27 9 Q So you've carefully reviewed the entire '038

09:38:36 10 patent as recently as this morning, right?

09:38:37 11 A Yes.

09:38:38 12 Q Are there any parts of the '038 patent that

09:38:42 13 you believe you don't understand?

09:38:45 14 A No.

09:38:45 15 Q And going back to Exhibit 1, your first

09:38:50 16 declaration, and I'm going to turn your attention to

09:38:56 17 paragraph 16. Are you with me?

09:39:03 18 A Yes.

09:39:04 19 Q Thanks. In paragraph 16, the first sentence

09:39:08 20 says, "The invention of '038 patent relates to a

09:39:12 21 process and apparatus for separation of gas mixtures

09:39:17 22 using membranes."

09:39:18 23 Do you see that?

09:39:19 24 A I do.

09:39:19 25 Q And then if you flip to the page over to

09:39:22 1 back 5, there's a Section VI there that says,

09:39:26 2 "Summary of the '038 patent."

09:39:28 3 Do you see that?

09:39:29 4 A Yes.

09:39:29 5 Q Okay. And just to get oriented, I'll turn
09:39:34 6 your attention over to paragraph 21 on page 6 of
09:39:39 7 Exhibit 1, your January 3rd declaration. And there
09:39:44 8 it says, "Figure 11 of the '038 patent depicts an
09:39:49 9 illustrative connection arrangement for the
09:39:51 10 apparatus according to the invention."

09:39:54 11 Do you see that?

09:39:54 12 A I do.

09:39:55 13 Q Can you explain what your understanding is
09:40:03 14 of the invention in the '038 patent?

09:40:06 15 A So my understanding is that the invention is
09:40:14 16 describing a process which is used to separate gas
09:40:20 17 mixtures for the purpose of producing product gasses
09:40:25 18 of high purity.

09:40:27 19 Q And does the invention involve a three-stage
09:40:34 20 membrane gas separation apparatus?

09:40:38 21 A Yes.

09:40:38 22 Q Okay. And does the invention involve a
09:40:45 23 membrane gas separation apparatus with recycling of
09:40:49 24 the second permeated and third retentate stream?

09:40:52 25 A Yes.

09:40:53 1 Q And does the invention involve a membrane
09:41:00 2 gas separation apparatus with no recompression of
09:41:03 3 the first permeate stream?

09:41:07 4 A Yes.

09:41:07 5 Q Okay. And membrane gas separation
09:41:18 6 apparatuses with three stages were known before
09:41:25 7 May 2011, correct?

09:41:26 8 A That's correct.

09:41:27 9 Q And membrane gas separation apparatuses with
09:41:30 10 three stages with recycling of the second permeate
09:41:34 11 and third retentate stream were known before
09:41:38 12 May 2011, correct?

09:41:40 13 A I believe that's correct.

09:41:43 14 Q Okay. And membrane gas separation
09:41:49 15 apparatuses with three stages with recycling of the
09:41:51 16 second permeate and third retentate stream with no
09:41:54 17 recompression of the first permeate stream were
09:41:58 18 known before May 2011, correct?

09:42:11 19 A I don't recall regarding the recompression
09:42:31 20 piece of your question.

09:42:32 21 Q Let me try to tease that out a little bit.
09:42:37 22 So let's turn to your first declaration again, your
09:42:43 23 January 3rd declaration and the last page is
09:42:48 24 Appendix B. Do you see that?

09:42:52 25 A Yes.

09:42:52 1 Q And this is a list of the materials you
09:42:56 2 considered in forming your opinions in your first
09:42:59 3 declaration, your January 3rd declaration, is that
09:43:02 4 right?

09:43:02 5 A That's correct.

09:43:03 6 Q Okay. And about three-fifths of the way
09:43:08 7 down, there's an entry that says "Defendant Air
09:43:10 8 Products and Chemicals Inc.'s First Amended Initial
09:43:15 9 Invalidity and Unenforceability Contentions
09:43:18 10 (Redacted Version)."

09:43:19 11 Do you see that?

09:43:20 12 A Yes.

09:43:20 13 Q Okay. And you reviewed that document before
09:43:24 14 you submitted your January 3rd declaration, right?

09:43:29 15 A Yes.

09:43:29 16 Q And let's pull that up as Exhibit 5 if we
09:43:32 17 can, Mr. Kovar.

09:43:32 18 (Geise Exhibit 5 marked for
09:43:42 19 identification.)

09:43:42 20 BY MR. LANE:

09:43:43 21 Q Before we do that, before we look at
09:43:46 22 Exhibit 5, let's go back to Exhibit 4, the '038
09:43:52 23 patent for a minute, Dr. Geise. And I want to turn
09:43:55 24 your attention to column 2, line -- make sure I get
09:44:02 25 it right here -- line 54. Are you with me?

09:44:13 1 A Yes.

09:44:13 2 Q Okay. And there it says, "U. S. Patent
09:44:23 3 No. 6,565,626 B1 and U. S. Patent No. 6,168,649 B1
09:44:28 4 each disclose membrane separation processes" --
09:44:32 5 process -- "processes with three membrane separation
09:44:37 6 stages where a retentate stream and a permeate
09:44:42 7 stream from stages 2 and 3 respectively are recycled
09:44:46 8 to the crude stream."

09:44:47 9 Do you see that?

09:44:47 10 A I do.

09:44:48 11 Q And do you understand that that patent
09:44:52 12 ending in '626 there, number 6,565,626 is prior art
09:44:57 13 to the '038 patent?

09:45:01 14 A Yes.

09:45:02 15 Q All right. Well, let's turn to Exhibit 5
09:45:07 16 then now. And I'll turn -- it's a little bit of a
09:45:14 17 long document, but I'll turn your attention to pages
09:45:18 18 -- the PDF page 122.

09:45:22 19 A Let me find that.

09:45:24 20 Q I'll give you a minute.

09:45:41 21 A Okay. 122, yes. It starts with Exhibit A.

09:45:48 22 Q Exactly. Thanks. I think we're together.
09:45:50 23 And you see that's -- that part, that Exhibit A is
09:45:55 24 referring to that same '626 patent that we just
09:45:58 25 talked about that's cited in column 2 of the '038

09:46:02 1 patent?

09:46:03 2 A Yes.

09:46:04 3 Q Okay. And do you see on the next page, page
09:46:08 4 123 of Exhibit 5, that there's a Figure 2 that's
09:46:14 5 from the '626 patent?

09:46:16 6 A Yes.

09:46:17 7 Q Okay. And you agree that Figure 2 is a
09:46:21 8 three-stage membrane gas separation system, right,
09:46:25 9 or a depiction of one?

09:46:27 10 A Yes.

09:46:27 11 Q Okay. And stream 206 in that Figure 2 is a
09:46:37 12 recycled second permeate stream, correct?

09:46:42 13 A That's correct.

09:46:43 14 Q And stream 209 is a third -- is a recycled
09:46:49 15 third retentate stream, correct?

09:46:51 16 A Yes.

09:46:51 17 Q And stream 204 is the first permeate stream?

09:46:58 18 A Yes.

09:46:59 19 Q Okay. And stream -- there's no compressor
09:47:03 20 shown in stream 204, correct?

09:47:05 21 A That's correct.

09:47:06 22 Q And there is a compressor 210 shown, right?

09:47:11 23 A That's correct.

09:47:12 24 Q Okay. So would you agree with me that this
09:47:14 25 depicts a membrane gas separation system with no

09:47:19 1 recompression of the first permeate stream?

09:47:23 2 A Yes.

09:47:24 3 Q Okay. So going back, membrane gas

09:47:32 4 separation systems with three stages with recycling

09:47:35 5 of the second permeate and third retentate stream

09:47:38 6 with no recompression of the first permeate stream

09:47:41 7 were known before May 2011, correct?

09:47:45 8 A Yes.

09:47:45 9 Q So going back, can you tell me what your

09:47:55 10 understanding is, what specific parts of the

09:47:59 11 invention in the '038 patent were new and not known

09:48:02 12 before May 2011?

09:48:08 13 A I'm trying to collect my thoughts from

09:48:31 14 having read the prosecution histories and the issues

09:48:37 15 involved here. So as I recall, the elements of the

09:48:49 16 invention related to -- that were discussed at least

09:48:54 17 in the prosecution history related to issues

09:49:02 18 pertaining to the amount of recycle in the

09:49:08 19 particular invention. I believe there may have been

09:49:11 20 some discussion in those cases in terms of membrane

09:49:16 21 selectivity and also then relating to the purities

09:49:21 22 that could be produced by the process described in

09:49:25 23 the '038 patent.

09:49:31 24 Q Okay. You talked about -- I think you said

09:49:36 25 the amount of gas recycled. Is that -- in your

09:49:42 1 opinion, is that something that was new and not

09:49:45 2 known before May 2011?

09:50:01 3 A I believe that was one of the things that

09:50:05 4 was discussed in the prosecution history. I'm

09:50:09 5 struggling to remember precisely as I sit here right

09:50:13 6 now.

09:50:13 7 Q Well, the claims in the '038 patent, right,

09:50:17 8 which -- they require recycle volume of less than

09:50:23 9 60 percent of the volume of the crude stream, right?

09:50:30 10 A Yes, there's a passage in the claims that do

09:50:33 11 speak to the gas volume is recycled in the second

09:50:37 12 permeate stream and the third retentate stream

09:50:41 13 totaling less than 60 percent by volume of the crude

09:50:44 14 stream, yes.

09:50:45 15 Q In your opinion, was that part of what was

09:50:47 16 new in the invention in the '038 patent that wasn't

09:50:50 17 known before May 2011?

09:50:52 18 A I believe that those parts of the claims

09:50:55 19 were discussed in the prosecution history and were

09:51:04 20 determined as being suitable to be retained in the

09:51:10 21 claim language.

09:51:11 22 Q Okay. And that was determined by the Patent

09:51:14 23 Office, right?

09:51:15 24 A Yes.

09:51:16 25 Q Okay. But I'm asking -- I'm asking you as

09:51:19 1 an expert in this technology field what you believe
09:51:22 2 was new in the invention in the '038 patent before
09:51:28 3 -- that was new in May 2011 that wasn't known
09:51:30 4 before?

09:51:33 5 MR. LIPPERT: John, I'm going to object to
09:51:37 6 this line. Dr. Geise is here on claim construction
09:51:40 7 and you're questioning him on patent law and what is
09:51:46 8 new.

09:51:47 9 MR. LANE: You're making a speaking
09:51:50 10 objection. His declaration talks about -- we just
09:51:53 11 talked about it. He talks about what the invention
09:51:55 12 is in the patent and I'm asking him what the
09:51:58 13 invention is in the patent. It's in the
09:51:59 14 declaration.

09:51:59 15 MR. LIPPERT: I just don't -- it's not a
09:52:02 16 speaking objection, John. It's a question of how
09:52:06 17 broadly you go on this. And you know, this
09:52:09 18 deposition is for claim construction. And I
09:52:14 19 understand we are -- because of what he said in the
09:52:16 20 declaration, I'm not going to object to those
09:52:18 21 questions. I'm just going to ask that we be a
09:52:21 22 little more strictly on what this witness is here to
09:52:24 23 testify on.

09:52:26 24 MR. LANE: Well, he talked about the
09:52:27 25 invention. I'm allowed to ask him what he submitted

09:52:31 1 declarations on. But we'll move on. I'll move on.

09:52:35 2 MR. LIPPERT: Yes.

09:52:35 3 BY MR. LANE:

09:52:36 4 Q It doesn't seem like you're able to tell me
09:52:39 5 what was the invention -- what was new or so we'll
09:52:43 6 move on. Okay, Dr. Geise?

09:52:45 7 A Okay.

09:52:45 8 Q Were membranes with mixed gas selectivity
09:52:49 9 over 30 for CO2 over CH4 known before May 2011?

09:52:57 10 A For CO2 over methane or CH4, yes, there were
09:53:05 11 membranes that had selectivity that were reported in
09:53:09 12 the literature above that.

09:53:12 13 Q Before May 2011, correct?

09:53:14 14 A I believe so, yes.

09:53:15 15 Q And were membranes with mixed gas
09:53:18 16 selectivity over 40 for CO2 over CH4 known before
09:53:25 17 May 2011?

09:53:25 18 A I believe at least it was known for single
09:53:34 19 gas selectivity. I can't speak as definitively to
09:53:39 20 the mixed gas qualification.

09:53:41 21 Q Okay. But they may have been?

09:53:44 22 A They may have been, yes.

09:53:46 23 Q Let's switch topics then.

09:53:52 24 How much time total have you spent working
09:53:55 25 for Evonik or its attorneys as an expert witness in

09:53:58 1 any matters?

09:54:02 2 A Probably been -- probably been at least --
09:54:21 3 probably at least 75 hours. I don't have a number
09:54:24 4 precisely off the top of my head at this point, so
09:54:27 5 I'm speculating there, but it's probably been at
09:54:31 6 least that much.

09:54:32 7 Q You have records though on that?

09:54:34 8 A I do.

09:54:35 9 Q And how much time have you spent working for
09:54:39 10 Evonik or its attorneys as an expert witness on this
09:54:43 11 litigation?

09:54:48 12 A That again has probably been -- probably
09:54:54 13 been at least 30 or 40 hours. I don't recall off
09:54:57 14 the top of my head though the exact numbers.

09:55:00 15 Q How much time did you spend working on your
09:55:03 16 first January 3rd declaration that's been marked as
09:55:07 17 Exhibit 1?

09:55:12 18 A I'd have -- I'd have to go back and look at
09:55:16 19 the records, but it probably was somewhere in the
09:55:19 20 ballpark of 20 hours if I had to -- had to guess;
09:55:22 21 maybe a little less.

09:55:25 22 Q Sorry. What about your second declaration?

09:55:28 23 A The second declaration was probably a little
09:55:34 24 -- it might have been around 10 to 15 hours on
09:55:38 25 preparing that one. That one was a little bit

09:55:41 1 shorter.

09:55:42 2 Q There wasn't a lot of turnaround time, was
09:55:45 3 there? You had to do it quickly. And I'm sorry
09:55:48 4 about that that we had to do that over the holidays,
09:55:50 5 but that's just the way the schedule worked out.

09:55:54 6 Was there any information you wanted to
09:55:56 7 review before you signed your first declaration that
09:55:59 8 you were not able to review?

09:56:02 9 A No.

09:56:02 10 Q Was there any information you wanted to
09:56:06 11 review before you signed your second declaration
09:56:09 12 that you were not able to review?

09:56:10 13 A No.

09:56:11 14 Q Were you able to ask Evonik's lawyers any
09:56:15 15 questions you had about the claim construction
09:56:18 16 process before you signed your declarations?

09:56:23 17 A Yes.

09:56:23 18 Q Were you able to ask Evonik's lawyers any
09:56:26 19 questions you had about anything related to your
09:56:29 20 declaration before you signed your declarations?

09:56:32 21 A Yes.

09:56:33 22 Q Do you think it's relevant what the named
09:56:39 23 inventors of the '038 patent think the five claims
09:56:44 24 terms mean that are in dispute in this claim
09:56:46 25 construction proceeding?

09:56:52 1 A I think the intrinsic evidence that is
09:56:56 2 presented in the specification and the claims
09:56:59 3 provides guidance on what the inventors were
09:57:02 4 thinking when they -- when they put together the
09:57:06 5 patent.

09:57:06 6 Q Okay. But I don't think that was exactly --
09:57:09 7 my question was do you think it's relevant what the
09:57:11 8 named inventors think the five claim terms mean?

09:57:20 9 A I suppose I'm not prepared to speak to that
09:57:24 10 from a strictly legal perspective. Speaking from,
09:57:33 11 you know, an engineer and a scientist, I'm always
09:57:36 12 interested in what people thought about things, but
09:57:38 13 that's not necessarily the same as the legal
09:57:41 14 situation.

09:57:43 15 Q Okay. And you understand there's four
09:57:46 16 inventors on the '038 patent, named inventors? You
09:57:50 17 can refer to the patent. It's been marked as
09:57:53 18 Exhibit 4 if you need to.

09:57:55 19 A Yes, that's correct.

09:57:56 20 Q It's Markus Ungerank, Goetz Baumgarten,
09:58:03 21 Markus Priske, and Harald Roegl, right?

09:58:05 22 A Yes.

09:58:06 23 Q And you've never spoken to any of them in
09:58:09 24 connection with preparing your declarations, is that
09:58:12 25 correct?

09:58:12 1 A No.

09:58:13 2 Q That's not correct or that is correct?

09:58:15 3 A I'm sorry. I have not spoken with them.

09:58:19 4 And to my knowledge, I don't think I have ever

09:58:22 5 spoken to any of them outside of this either.

09:58:24 6 Q Well, let's go back. You said outside of

09:58:28 7 this. Have you ever spoken to any of those four

09:58:31 8 individuals?

09:58:31 9 A Not to my knowledge.

09:58:32 10 Q So you didn't speak with any of them in

09:58:35 11 connection with preparing your two declarations that

09:58:38 12 have been submitted in this litigation, is that

09:58:40 13 correct?

09:58:40 14 A I did not speak with any of them, no.

09:58:42 15 Q And you've never spoken with any of them in

09:58:45 16 connection with any of your expert work for Evonik,

09:58:47 17 is that correct?

09:58:48 18 A That's correct.

09:58:48 19 Q Did you ever ask to speak to any of them?

09:58:53 20 A I did not.

09:58:54 21 Q Have you ever talked or communicated with

09:59:15 22 any other Evonik expert witnesses in this

09:59:19 23 litigation?

09:59:20 24 A No.

09:59:21 25 Q In connection with the work you did to

09:59:27 1 prepare your two declarations that you submitted,

09:59:31 2 did you speak to anyone except Evonik's lawyers?

09:59:38 3 A No, I only spoke -- well, no. I only spoke
09:59:42 4 with Evonik's lawyers to prepare.

09:59:45 5 Q What about other -- let me try to be more
09:59:48 6 clear.

09:59:48 7 In connection with the work you did to
09:59:50 8 prepare your two declarations, did you have any
09:59:52 9 communications, emails, text messages, Zoom calls,
09:59:56 10 anything, with anyone except Evonik's lawyers?

10:00:01 11 A I did not have any contact with anyone in
10:00:03 12 terms of preparing these materials.

10:00:06 13 Q Except for Evonik's lawyers, correct?

10:00:08 14 A Except for Evonik's lawyers, that's correct.

10:00:11 15 Q And you're being paid \$300 an hour for your
10:00:15 16 work on the declarations, is that correct?

10:00:16 17 A That's correct.

10:00:17 18 Q Are you being paid \$300 an hour for all your
10:00:22 19 expert work for Evonik?

10:00:23 20 A I have a fee structure that has a different
10:00:28 21 daily rate for deposition days like today, but the
10:00:32 22 base hourly rate for work outside of deposition --
10:00:35 23 excuse me -- depositions or trials is 300 an hour.

10:00:38 24 Q How much are you being paid for your
10:00:41 25 deposition today?

10:00:41 1 A I think the daily rate, if I remember
 10:00:45 2 correctly, I think it's 3,750. I think that's
 10:00:49 3 correct.
 10:00:49 4 Q Have you ever been paid \$300 an hour or more
 10:01:01 5 for being an expert witness other than for your
 10:01:03 6 expert work for Evonik?
 10:01:07 7 A No.
 10:01:07 8 Q What was the highest amount that you were
 10:01:11 9 paid before?
 10:01:13 10 A \$250 an hour.
 10:01:16 11 Q Have you ever been paid \$300 an hour or more
 10:01:24 12 for any other work you've done in your career?
 10:01:29 13 A Not to my knowledge.
 10:01:30 14 Q I've seen in the public record that your
 10:01:36 15 salary at University of Virginia in 2022 was
 10:01:40 16 \$161,100. Does that sound correct?
 10:01:43 17 A I'm sorry. Could you say that again?
 10:01:45 18 Q Yeah, it's been -- I saw, I think it was --
 10:01:48 19 I can pull it up if you want to, but I think it was
 10:01:51 20 in a UVA newspaper. It said your salary at UVA in
 10:01:56 21 2022 was \$161,000 -- let me try to say that again --
 10:02:03 22 \$161,100. Does that sound correct?
 10:02:08 23 A That sounds reasonable. I don't remember
 10:02:10 24 exactly, but that sounds reasonable.
 10:02:12 25 Q Is it substantially more today in 2025?

10:02:16 1 A It is more today in 2025. Yeah, we
10:02:26 2 typically get, you know, annual raises of a couple
10:02:30 3 percent here or there.

10:02:31 4 Q Is it less than \$250,000 today?

10:02:34 5 A Yes.

10:02:35 6 Q And you would agree that your salary today
10:02:38 7 at UVA works out to being less than \$300 an hour,
10:02:44 8 correct?

10:02:45 9 A I would assume so. I have not done that
10:02:47 10 calculation, but I would assume -- I would assume at
10:02:51 11 least given the numbers of hours I work, that it
10:02:54 12 probably is.

10:02:55 13 Q You're a hard worker, I bet. And do you
10:02:59 14 agree that your salary at UVA today works out to
10:03:03 15 less than \$3,750 per day?

10:03:06 16 A I would agree with that, yes.

10:03:08 17 Q And we went over this before, I think, but
10:03:14 18 you're being paid the \$300 an hour, the \$3,750 a
10:03:19 19 day, directly; no one else is taking a cut of that,
10:03:21 20 correct?

10:03:22 21 A I'm billing the law firm directly, so
10:03:26 22 there's no intermediate.

10:03:28 23 Q And just to wrap up, the \$300 an hour you're
10:03:32 24 being paid for your work in this matter is the
10:03:35 25 highest hourly rate you've ever been paid for any

10:03:37 1 work, is that correct?

10:03:40 2 A To my knowledge, yes.

10:03:41 3 Q Can you describe the process that you and
10:03:51 4 Evonik's lawyers used to prepare your declarations?

10:03:53 5 A Yes. So in terms of getting started with
10:03:59 6 the preparation, I was provided with and reviewed a
10:04:04 7 number of materials related to the matter, then
10:04:10 8 engaged in discussions with counsel where I provided
10:04:14 9 my opinions and discussed the matter further with
10:04:18 10 them.

10:04:20 11 During that time, they acted as scribes
10:04:24 12 capturing the nature of those discussions. And then
10:04:28 13 that material was what was used to ultimately draft
10:04:32 14 the declarations. And then I worked with counsel to
10:04:36 15 review the declarations, make sure that they were
10:04:39 16 consistent with my opinions in the matter and
10:04:42 17 ultimately finalize them before signing and filing.

10:04:46 18 Q Okay. Did counsel do the drafts of your
10:04:51 19 declarations?

10:04:52 20 A Yeah, they were working as scribes capturing
10:04:55 21 my opinions and drafted the documents. And then we
10:04:59 22 reviewed them to make sure that those opinions and
10:05:03 23 thoughts were captured appropriately during that
10:05:05 24 process.

10:05:06 25 Q Did you ever have any meetings in person

10:05:09 1 with counsel in preparing your declarations?

10:05:13 2 A No.

10:05:14 3 Q Besides you and Evonik's attorneys, did
10:05:19 4 anyone else prepare or write parts of your
10:05:22 5 declarations?

10:05:25 6 A I'm not aware of anyone else that did.

10:05:27 7 Q For the parts of your declaration that were
10:05:32 8 written by Evonik's lawyers, when you signed your
10:05:36 9 declarations, did you think you understood
10:05:38 10 everything the lawyers wrote and that it was
10:05:40 11 accurate?

10:05:41 12 A Yes.

10:05:41 13 Q And we've looked at this briefly before, but
10:05:47 14 if I can turn your attention back to your Exhibit 1,
10:05:50 15 your January 3rd declaration and the Appendix B on
10:05:55 16 the very back. Are you with me?

10:05:59 17 A Yes.

10:05:59 18 Q Is that a complete and accurate list of the
10:06:02 19 materials you considered in preparing your first
10:06:05 20 declaration?

10:06:10 21 A It is a complete list. I mean, certainly
10:06:12 22 there are -- you know, certainly I have a body of
10:06:17 23 prior knowledge related to these sorts of matters
10:06:22 24 that, you know, informs my perspectives and opinions
10:06:25 25 on things that would be outside of this list. But

10:06:30 1 in terms of documents specifically related to the
10:06:32 2 matter, this is the list of those documents.

10:06:38 3 Q And in your second declaration, your
10:06:43 4 January 15th declaration, Appendix A has your
10:06:45 5 additional materials considered. Do you see that?

10:06:51 6 A Yes.

10:06:51 7 Q Is that a complete list of the additional
10:06:54 8 materials you considered?

10:06:56 9 A Yes.

10:06:56 10 Q And staying there at that Appendix A of your
10:07:03 11 second declaration, that document was provided to
10:07:06 12 you by Evonik's lawyers, correct?

10:07:09 13 A That's correct.

10:07:10 14 Q Okay. And going back to Appendix B of your
10:07:14 15 January 3rd declaration that's been marked as
10:07:16 16 Exhibit 1, are there any documents listed there --
10:07:24 17 well, let me go back. Let me strike that.

10:07:26 18 The documents listed on Appendix B of your
10:07:29 19 first declaration, were all those documents provided
10:07:32 20 to you by Evonik's lawyers?

10:07:34 21 A Yes.

10:07:34 22 Q Okay. You didn't provide any of those
10:07:37 23 documents to Evonik's lawyers?

10:07:43 24 A No, I did not.

10:07:45 25 Q So you didn't consider any documents in

10:07:51 1 preparing your two declarations other than documents

10:07:54 2 given to you by Evonik's lawyers, is that correct?

10:08:21 3 A I don't believe so; not specifically at

10:08:24 4 least outside of again, you know, prior knowledge

10:08:26 5 from experience in the field.

10:08:29 6 Q Okay. So sorry, just so we have a clean

10:08:33 7 record there.

10:08:33 8 All the documents you considered in

10:08:36 9 preparing your two declarations were documents that

10:08:40 10 were provided to you by Evonik's lawyers, correct?

10:08:42 11 A Yes.

10:08:43 12 Q Why don't we -- we've been on the record for

10:08:47 13 about an hour and five minutes. Let's take a break

10:08:49 14 there for five -- let's say ten minutes. Is that

10:08:51 15 okay with you, Nels?

10:08:54 16 MR. LIPPERT: Yes, it is okay.

10:08:57 17 VIDEOGRAPHER: We are off the record. The

10:08:59 18 time is 10:09 a.m.

10:09:01 19 (Short recess.)

10:25:08 20 VIDEOGRAPHER: We are back on the record.

10:25:31 21 The time is 10:25 a.m.

10:25:35 22 BY MR. LANE:

10:25:38 23 Q Welcome back, Dr. Geise.

10:25:41 24 A Thank you.

10:25:41 25 Q Did you have any discussions with your

10:25:43 1 counsel about your previous testimony or future

10:25:48 2 testimony during the break?

10:25:49 3 A Not during the break.

10:25:50 4 Q Okay. I wanted to just go back on touch on

10:25:55 5 one thing before we go on. I asked you before about

10:26:00 6 membranes with mixed gas selectivity over 30 and 40,

10:26:05 7 but I wanted to ask you about one with 35.

10:26:08 8 So were membranes with mixed gas selectivity

10:26:11 9 over 35 for CO₂ over CH₄ known before May 2011?

10:26:18 10 A They may have been with mixed gas

10:26:20 11 selectivity. I believe they definitely were with

10:26:23 12 ideal or single gas selectivity.

10:26:26 13 Q So on mixed gas, you don't know? They may

10:26:31 14 have been, is that right?

10:26:32 15 A I don't recall off the top of my head.

10:26:34 16 Q Okay. Okay. Let's go on then to another

10:26:40 17 topic. On Exhibit 1, your first declaration, we

10:26:50 18 talked before about how it includes Air Products and

10:26:54 19 Chemicals' First Amended -- sorry -- Invalidity

10:26:59 20 Contentions. Do you recall that?

10:27:01 21 A Yes.

10:27:01 22 Q Exhibit 5?

10:27:06 23 A Yes.

10:27:07 24 Q And obviously you reviewed those before your

10:27:12 25 -- you submitted and signed your January 3rd

10:27:16 1 declaration, correct?

10:27:17 2 A Yes.

10:27:17 3 Q And I'm going to turn your attention back to
10:27:23 4 that Exhibit 5, Air Products' First Amended Initial
10:27:28 5 Invalidity Contentions and I want to turn your
10:27:31 6 attention to page 37 of the PDF. Are you with me?

10:27:45 7 A I'm getting there. Sorry. Okay, I think
10:27:51 8 I'm there.

10:27:51 9 Q And do you see that Section D there that's
10:27:56 10 entitled "Claim 1, all claims that depend on claim 1
10:28:00 11 and claim 59 (i.e., including all the Asserted
10:28:04 12 Claims) are invalid as indefinite because they do
10:28:07 13 not specify where the gas volumes are measured."

10:28:10 14 Do you see that?

10:28:11 15 A Yes.

10:28:11 16 Q Did you review that section before you
10:28:14 17 submitted your January 3rd declaration?

10:28:17 18 A Yes.

10:28:18 19 Q Okay. And then turning to the next page,
10:28:24 20 page 38 of the PDF of Exhibit 5, do you see a
10:28:29 21 Section E there entitled "Claim 1, all claims that
10:28:32 22 depend on claim 1 and claim 59 (i.e., including all
10:28:37 23 the Asserted Claims) are invalid as indefinite
10:28:39 24 because they do not specify how the concentrations
10:28:42 25 should be measured or what units they are in."

10:28:45 1 Do you see that?

10:28:45 2 A Yes.

10:28:46 3 Q And did you review that before you submitted
10:28:50 4 and signed your January 3rd declaration that's been
10:28:54 5 marked as Exhibit 1?

10:28:55 6 A Yes.

10:28:55 7 Q Let's go back to the Section D on page 37.
10:29:03 8 Do you see in the middle paragraph of that section
10:29:06 9 it says, "The intrinsic evidence does not explain
10:29:09 10 where any of the recited gas volumes in the claimed
10:29:15 11 systems (specifically in the second permeate stream,
10:29:19 12 third retentate stream, and crude gas stream) should
10:29:20 13 be measured, and depending on where the measurements
10:29:23 14 occur in the streams, different values for this
10:29:25 15 percentage of gas volume recycled could be
10:29:29 16 obtained. "

10:29:29 17 Do you see that?

10:29:30 18 A I see that.

10:29:30 19 Q Did you review that paragraph before you
10:29:33 20 submitted your January 3rd declaration?

10:29:35 21 A Yes.

10:29:35 22 Q Okay. And the last sentence in that
10:29:40 23 Section D on page 37 of Exhibit 5 says, "Nothing in
10:29:45 24 the intrinsic evidence addresses or even suggests
10:29:48 25 where the gas volumes should be measured or at what

10:29:50 1 conditions of, for example, temperature and

10:29:53 2 pressure. "

10:29:54 3 Do you see that?

10:29:54 4 A I do.

10:29:54 5 Q Okay. And as I understand it, you didn't

10:30:00 6 respond to those arguments in your January 3rd

10:30:03 7 declaration, is that correct?

10:30:04 8 A I don't believe so.

10:30:05 9 Q Okay. And can you explain why not? If you

10:30:09 10 had reviewed those arguments before you submitted

10:30:10 11 your declarations, why you didn't respond to them?

10:30:14 12 A So I mean, I was asked to think about how a

10:30:17 13 person of ordinary skill in the art would approach

10:30:20 14 reading the specification and understanding how to

10:30:23 15 -- how to practice the invention. And looking at

10:30:28 16 the patent and the intrinsic evidence, you know, it

10:30:31 17 suggested to me that a person of ordinary skill in

10:30:36 18 the art would understand how to do those things even

10:30:39 19 if it was not explicitly stated in the

10:30:43 20 specification.

10:30:43 21 Q Okay. But you do agree that in your first

10:30:47 22 declaration, you did not respond to those arguments

10:30:50 23 in Section D of page 37 of Exhibit 5, correct?

10:30:54 24 A No, I don't believe we did respond to those.

10:30:56 25 Q Okay. And the same is true for Section E on

10:31:00 1 page 38 of Exhibit 5, you didn't respond to the
10:31:05 2 arguments there in your first declaration either,
10:31:08 3 did you?

10:31:09 4 A Not explicitly.

10:31:11 5 Q And not -- did you respond otherwise, other
10:31:17 6 than explicitly?

10:31:19 7 A No, I do not believe so.

10:31:21 8 Q And I asked you for Section D why didn't you
10:31:37 9 respond and I'll ask you the same question for
10:31:39 10 Exhibit E. Why didn't you respond to the arguments
10:31:41 11 in Section E on page 38 in your first declaration?

10:31:45 12 A In the specification, concentrations are
10:31:50 13 referred to as volume percent throughout parts of
10:31:56 14 the specification. And so again, going back to the
10:32:04 15 idea that a person of ordinary skill reading the
10:32:06 16 specification would understand that as a measure of
10:32:07 17 concentration.

10:32:09 18 Q Have any of your opinions in your two
10:32:18 19 declarations changed since you signed your second
10:32:21 20 declaration on January 15th?

10:32:28 21 A No, I don't believe so.

10:32:29 22 Q And after you submitted your January 15th
10:32:35 23 declaration, did you review Dr. Freeman's
10:32:39 24 January 15th declaration?

10:32:41 25 A I did.

10:32:42 1 Q Okay. And let me -- let's go ahead and mark
10:32:46 2 Dr. Freeman's January 15th declaration. That will
10:32:50 3 be Exhibit 6.

10:32:50 4 (Geise Exhibit 6 marked for
10:32:59 5 identification.)

10:32:59 6 BY MR. LANE:

10:33:07 7 Q Do you have what's been marked as Exhibit 6,
10:33:10 8 Dr. Freeman's January 15th report there, Dr. Geise?

10:33:14 9 A Working its way through. Yes, I have that.

10:33:17 10 Q Okay, great. Thanks. And you said you
10:33:24 11 reviewed this Exhibit 6, Dr. Freeman's January 15th
10:33:28 12 declaration, after you signed your January 15th
10:33:31 13 declaration, correct?

10:33:32 14 A That's correct.

10:33:32 15 Q Okay. And did you -- let me turn your
10:33:36 16 attention to paragraph 35 of Dr. Freeman's
10:33:40 17 January 15th declaration that's been marked as
10:33:44 18 Exhibit 6.

10:33:45 19 A Yes.

10:33:45 20 Q And there's four papers cited there. Do you
10:33:49 21 see that?

10:33:49 22 A I do see that, yes.

10:33:52 23 Q Did you review those four papers after you
10:33:57 24 signed and submitted your January 15th declaration?

10:34:00 25 A I have not.

10:34:02 1 Q Okay. Did any of your opinions in your two
10:34:17 2 declarations change based on you reading
10:34:21 3 Dr. Freeman's January 15th declaration?

10:34:23 4 A No, they did not.

10:34:24 5 Q All right. I'm going to mark -- sorry. I'm
10:35:01 6 going to mark the next exhibit, Exhibit 7.

10:35:01 7 (Geise Exhibit 7 marked for
10:35:07 8 identification.)

10:35:07 9 BY MR. LANE:

10:35:09 10 Q Let me know when you've got that, Dr. Geise,
10:35:10 11 please.

10:35:18 12 A I have that.

10:35:18 13 Q Okay. Do you recognize this document?

10:35:26 14 A Yes.

10:35:26 15 Q Okay. And what is it?

10:35:29 16 A It's my research group website main landing
10:35:32 17 page.

10:35:33 18 Q And who wrote the language appearing on this
10:35:37 19 web page?

10:35:38 20 A I think it was -- it was mostly me. My wife
10:35:44 21 helped writing this back years ago when we did it,
10:35:47 22 but it was essentially one of the two of us; mostly
10:35:53 23 me, but...

10:35:54 24 Q And no one maintains the language on this
10:35:57 25 website for you? It was basically written by you

10:36:02 1 and your wife, is that fair?

10:36:03 2 A At this point it's just me in terms of
10:36:05 3 maintaining this.

10:36:06 4 Q When was the last time you updated this web
10:36:08 5 page?

10:36:09 6 A Probably back when I added the October 2024
10:36:16 7 entry in the news section on the seminar at
10:36:19 8 Columbia.

10:36:19 9 Q And is the information on this web page
10:36:26 10 accurate as far as you know?

10:36:29 11 A Aside from perhaps being slightly dated,
10:36:32 12 more or less, yes.

10:36:33 13 Q On the web page it says -- near the top
10:36:58 14 under the picture it says, "The Geise research group
10:37:03 15 seeks to develop structure/property/processing
10:37:08 16 relationships to guide polymeric materials designed
10:37:13 17 for membrane-based liquid separation and energy
10:37:16 18 applications by understanding the influence of nano-
10:37:20 19 and molecular-scale interactions and phenomena on
10:37:23 20 mass transfer and system-level performance."

10:37:27 21 Do you see that?

10:37:27 22 A I do.

10:37:27 23 Q And is that accurate?

10:37:30 24 A Yes, that's -- I would say that's our group
10:37:34 25 mission statement.

10:37:35 1 Q So is your group's mission mainly to conduct
10:37:40 2 research on membrane-based liquid separation and
10:37:44 3 energy applications?

10:37:45 4 A Yes, those are the areas where we have
10:37:49 5 sponsored research efforts.

10:37:50 6 Q And help me with this, but it seems to me in
10:38:08 7 reading your web pages and your CV that you kind of
10:38:10 8 have three research areas or research focuses, ion
10:38:15 9 exchange, batteries, and desalination, is that -- or
10:38:19 10 would you put it differently?

10:38:21 11 A I mean, I think that's -- that's pretty
10:38:25 12 accurate. I mean, we have research activities going
10:38:28 13 on in all of those spaces and there's probably some
10:38:32 14 overlap between areas there, but generally, yes.

10:38:35 15 Q Okay. And is the terminology I used fair?
10:38:41 16 Ion exchange, is that fair or accurate or would you
10:38:45 17 call it something different?

10:38:46 18 A I would probably say we think about ion
10:38:49 19 exchange membranes or ion exchange materials, but
10:38:54 20 that's pretty close.

10:38:55 21 Q Okay. And batteries and desalination, are
10:39:00 22 those accurate terms?

10:39:02 23 A Yes.

10:39:02 24 Q Okay. Can you explain what ion exchange is?

10:39:09 25 A So ion exchange is a process whereby certain

10:39:16 1 types of materials can be made in a way that causes
10:39:21 2 associations with ions of a given type and those
10:39:26 3 ions can be swapped out or exchanged with other
10:39:29 4 ions. One of the probably classic examples in this
10:39:33 5 space is ion exchange materials are often used in
10:39:37 6 water softeners. And so you do an exchange of
10:39:39 7 sodium ions for, say, calcium or magnesium ions.
10:39:43 8 But ultimately, ion exchange processes have this
10:39:47 9 capacity of being able to exchange ions which has
10:39:52 10 implications for how they function in separation
10:39:55 11 systems.

10:39:55 12 Q And can you explain how membranes are
10:40:03 13 related to that or what's the function of the
10:40:05 14 membranes in those types of systems?

10:40:07 15 A So those types of materials can be made into
10:40:11 16 membranes. And those membranes, because of the
10:40:14 17 amount of ions that they have present in them, offer
10:40:18 18 conductivity properties that are particularly useful
10:40:22 19 for a number of electric field-driven applications
10:40:26 20 or also for batteries. They have other ion
10:40:29 21 exclusion properties that may be interesting for
10:40:32 22 desalination or other applications. But
10:40:34 23 essentially, the intrinsic chemistry that makes
10:40:37 24 those materials ion exchange materials gives that
10:40:42 25 class of materials a unique set of properties for

10:40:45 1 doing membrane-based separations.

10:40:47 2 Q Okay. And in your research or work on ion
10:40:52 3 exchange, you mentioned water softeners --

10:40:56 4 A Uh-huh.

10:40:56 5 Q -- as one aspect of the research, is that
10:40:59 6 right?

10:40:59 7 A We don't explicitly work on that. That's
10:41:01 8 just a popular example of where those sorts of
10:41:05 9 materials are used in kind of everyday technologies
10:41:07 10 that people tend to be familiar with.

10:41:09 11 Q Okay. And that obviously is a liquid
10:41:13 12 separation, right, not a gas separation?

10:41:15 13 A That's correct.

10:41:16 14 Q Okay. Is any of your ion exchange work or
10:41:22 15 research -- well, let me say is all your -- let me
10:41:26 16 strike that and start over.

10:41:27 17 Is all your ion exchange work related to
10:41:32 18 liquid separations?

10:41:34 19 A The research that my group does in the
10:41:36 20 laboratory and the types of characterization that we
10:41:40 21 do are generally all focused on liquid phase
10:41:44 22 separations.

10:41:45 23 Q And the second sort of bucket of your
10:41:56 24 research is desalination, right?

10:41:59 25 A Yes.

10:41:59 1 Q And can you describe what that is?

10:42:01 2 A So desalination is a process whereby you
10:42:06 3 effectively separate water and salt. It's typically
10:42:09 4 used to purify water for drinking applications or
10:42:12 5 other situations where you need clean water.

10:42:15 6 Q And that's becoming increasingly a big issue
10:42:19 7 in the world, right?

10:42:20 8 A Yes.

10:42:20 9 Q It's really important, right. And then --
10:42:24 10 and that's again liquid separations, right, not gas
10:42:27 11 separations?

10:42:28 12 A Generally at least the feed there is a
10:42:30 13 liquid. There are some permutations of those
10:42:33 14 processes that involve a phase change to the gas
10:42:36 15 phase, but reverse osmosis at least is typically a
10:42:41 16 liquid phase process.

10:42:43 17 Q And the battery research you do, can you
10:42:48 18 generally explain what that is?

10:42:49 19 A So we work particularly on a subset of
10:42:51 20 batteries called redox flow batteries and these are
10:42:55 21 essentially very large-scale batteries that could
10:42:58 22 help provide high energy density or large-scale
10:43:02 23 storage capacity to the electric grid or to
10:43:05 24 utilities or things of that sort. And one of the
10:43:09 25 components of those batteries that is important is a

10:43:13 1 membrane separator that, you know, serves ultimately
10:43:16 2 to sort of regulate the passage of current or charge
10:43:21 3 as opposed to other molecules in that system. And
10:43:24 4 so our efforts in that space have largely focused on
10:43:27 5 that membrane separator.

10:43:29 6 Q And that membrane separation is liquid
10:43:32 7 separation too, correct?

10:43:34 8 A In those applications we are looking at
10:43:36 9 liquids, yes.

10:43:37 10 Q And turning back to Exhibit 7, the web page,
10:43:52 11 there's a section called "Water-Energy Nexus."

10:43:55 12 Do you see that?

10:43:56 13 A Yes.

10:43:56 14 Q And it talks about practical problems
10:44:00 15 related to water and ion transport through polymers
10:44:04 16 that could be used as membranes in a variety of
10:44:07 17 water and energy applications, right?

10:44:09 18 A Yes.

10:44:09 19 Q And does that research fall within the three
10:44:12 20 buckets that we talked about before?

10:44:15 21 A Yes. I mean, we come at that interplay from
10:44:20 22 the standpoint of thinking about applications that,
10:44:22 23 you know, perhaps contribute to water or contribute
10:44:25 24 to energy and then sort of via the connections of
10:44:28 25 these things, could impact, you know, other areas of

10:44:31 1 that nexus.

10:44:32 2 Q Okay. So the problems related to water and
10:44:36 3 ion transport through polymers are all related to
10:44:40 4 liquid separations, is that right?

10:44:43 5 A In the context that we tend to look at in my
10:44:47 6 research group, yes.

10:44:48 7 Q And the next section is called "Water
10:44:52 8 Purification for a Thirsty World" and does that
10:44:55 9 refer to the desalination that you were talking
10:44:57 10 about before?

10:44:58 11 A Yes.

10:44:58 12 Q Okay. And then the "Clean and Renewable
10:45:02 13 Energy to Light Our Future," does that refer to the
10:45:07 14 redox batteries that you were talking about before?

10:45:10 15 A Yeah. So we have there mentioned
10:45:13 16 large-scale flow batteries. Those would be the
10:45:14 17 redox flow batteries. And so yes, that's a part
10:45:18 18 that, you know, maps back onto that.

10:45:21 19 Q Okay. And again, those are liquid
10:45:23 20 separations, correct?

10:45:24 21 A Yes.

10:45:25 22 Q Okay. Let me mark another exhibit,
10:46:14 23 Dr. Geise. It's a web page that is -- you get when
10:46:21 24 you click on the "read more" link under "Clean and
10:46:28 25 Renewable Energy to Light Our Future" on Exhibit 7.

10:46:28 1 (Geise Exhibit 8 marked for
10:46:33 2 identification.)

10:46:33 3 BY MR. LANE:

10:46:34 4 Q So this has been marked -- this second web
10:46:37 5 page has been marked as Exhibit 8.

10:46:41 6 A Okay, I have that up.

10:46:43 7 Q Do you see that?

10:46:43 8 A Yes.

10:46:44 9 Q Can you explain what this web page is in
10:46:51 10 your own words?

10:46:51 11 A So this describes a little bit more context
10:46:55 12 for some of the work that we have done or perhaps
10:47:01 13 are currently doing in terms of the energy space.
10:47:08 14 So you know, it refers to energy demand and the use
10:47:13 15 of an vanadium redox flow battery in this case.
10:47:19 16 There's an example figure of that. Talks a little
10:47:21 17 bit more about flow batteries; some additional
10:47:23 18 technologies that we have worked on in the past,
10:47:25 19 reverse electrodialysis and capacitive mixing. And
10:47:29 20 then gives some perspective on the needs for
10:47:33 21 membranes.

10:47:34 22 This largely is, you know, a page that's
10:47:37 23 sort of, you know, focused on thinking about, you
10:47:42 24 know, marketing the group toward, you know, students
10:47:45 25 or other folks that might be interested in engaging

10:47:48 1 with us.

10:47:48 2 Q And who wrote the language appearing on this
10:47:52 3 web page that's been marked as Exhibit 8?

10:47:54 4 A Again, I would say I think I largely wrote
10:47:57 5 it perhaps with some editorial help years ago, but
10:48:02 6 largely me.

10:48:02 7 Q And when was the last time this web page
10:48:05 8 that's been marked as Exhibit 8 was updated?

10:48:10 9 A This has not been updated in a while. I
10:48:14 10 would have to -- I would have to go back, but it's
10:48:20 11 -- it's probably -- the text probably has not been
10:48:23 12 changed since we -- since we posted it for this
10:48:26 13 particular page.

10:48:27 14 Q And it's one page, right, the PDF that we've
10:48:33 15 marked? Can you review it and let me know if
10:48:34 16 there's anything in it that's inaccurate as you
10:48:38 17 understand it today?

10:48:40 18 A There's probably some of the energy
10:48:54 19 projections and things that, you know -- you know,
10:48:58 20 probably could use to be updated in terms of some of
10:49:02 21 those quantitative values. We have in the past
10:49:06 22 worked on reverse electrodialysis and capacitive
10:49:12 23 mixing. Those are applications that we're not
10:49:14 24 currently actively working. And so there are some
10:49:17 25 things that could benefit on some updates here.

10:49:23 1 Q Okay. And in that first paragraph, there's
10:49:27 2 a parenthetical that says, "such is the vanadium
10:49:30 3 redox flow battery depicted below" and there's a
10:49:34 4 picture below. Do you see that?

10:49:36 5 A Yes.

10:49:37 6 Q And there's a membrane in that picture,
10:49:39 7 right?

10:49:39 8 A Yes.

10:49:40 9 Q And that's a liquid separation? That's a
10:49:43 10 membrane separation separating liquids, correct?

10:49:46 11 A That's correct.

10:49:47 12 Q Okay. And the -- you talked about or
10:49:53 13 mentioned the reverse electrodialysis and capacitive
10:49:56 14 mixing that's mentioned on this Exhibit 8. Is that
10:50:00 15 liquid separations also?

10:50:01 16 A Yes, those are.

10:50:02 17 Q At the bottom of Exhibit 8 -- sorry, I'm
10:51:12 18 having a hard time finding the place I want to ask
10:51:14 19 you about. Okay.

10:51:19 20 In the last paragraph, there's a sentence
10:51:22 21 that starts, "little is known." Do you see that?

10:51:28 22 A Yes.

10:51:29 23 Q Okay. It says, "Little is known about how
10:51:32 24 different ions and complex ion mixtures influence
10:51:38 25 polymer membrane transport properties, and our

10:51:41 1 research seeks to understand fundamental
10:51:44 2 relationships between ions and polymers that
10:51:47 3 contribute to selectivity in energy applications. "

10:51:50 4 Do you see that?

10:51:50 5 A I do.

10:51:51 6 Q Okay. And is your research, is it accurate
10:51:56 7 to say it's focused on the polymer chemistry and
10:51:59 8 structures of membranes?

10:52:01 9 A I would characterize the research that my
10:52:03 10 group does as involving elements of polymer
10:52:07 11 chemistry. We do make materials. We do a lot of
10:52:11 12 characterization and modelling as well. And so I
10:52:15 13 would say that there definitely is a chemistry piece
10:52:18 14 to what the group does, but there's also a
10:52:22 15 significant characterization and modelling component
10:52:25 16 to what we do.

10:52:25 17 Q Okay. Is any of the research in your group
10:52:37 18 focused on designing multi-stage or multi-step
10:52:42 19 apparatuses for gas separation?

10:52:45 20 A The group does not work on gas separations
10:52:50 21 explicitly. We do -- we do have a project that's
10:52:54 22 looking at sort of multi-stage membrane processes,
10:52:57 23 but it is not for a gas separation application.

10:53:00 24 Q All right. Let me mark another web page as
10:53:32 25 Exhibit 10, Dr. Geise. Or was this --

10:53:41 1 CERTIFIED STENOGRAPHER: I think it might be
 10:53:42 2 9.
 10:53:43 3 MR. LANE: 9, sorry. I knew I'd mess that
 10:53:46 4 up eventually.
 10:53:46 5 (Geise Exhibit 9 marked for
 10:54:03 6 identification.)
 10:54:03 7 BY MR. LANE:
 10:54:04 8 Q Do you have that, Dr. Geise?
 10:54:05 9 A I do.
 10:54:05 10 Q Okay, thanks. Have you seen this web page
 10:54:10 11 before?
 10:54:10 12 A Yes, so -- yes.
 10:54:12 13 Q And what is it?
 10:54:13 14 A This is my faculty landing page on the UVA
 10:54:19 15 School of Engineering website.
 10:54:20 16 Q And who wrote the language appearing on this
 10:54:24 17 web page?
 10:54:26 18 A I wrote components of it. Others in -- our
 10:54:32 19 media folks wrote or edited other components of it.
 10:54:37 20 Q And do you know when the last time this web
 10:54:47 21 page was updated?
 10:54:49 22 A I don't off the top of my head. The School
 10:55:04 23 of Engineering went through and redid the website
 10:55:06 24 probably about a year ago, and so my guess is that
 10:55:09 25 that was probably the last time it was substantively

10:55:13 1 touched, but that would have been by other folks.

10:55:18 2 Q I guess it's a little ways down, there's a
10:55:41 3 heading "Research Interests." Do you see that?

10:55:43 4 A Yes.

10:55:43 5 Q And you're going to have to explain this
10:55:47 6 one, microwave dielectric relaxation spectroscopy.
10:55:52 7 Can you explain what that is because I'm guessing --
10:55:55 8 well, I don't know what that is.

10:55:56 9 A Sure. So that is a characterization
10:56:01 10 technique that ultimately you take your sample,
10:56:06 11 whatever that is, and you subject it to microwave
10:56:12 12 radiation over a range of frequencies. So you know,
10:56:16 13 microwaves are a type of radiation that, you know,
10:56:21 14 most commonly gets used to heat up food, but over
10:56:25 15 some ranges of frequency, those microwaves can be
10:56:29 16 used to probe or interrogate dynamics and different
10:56:34 17 processes that occur within a wide range of
10:56:37 18 materials.

10:56:38 19 We use the technique to look at how
10:56:42 20 molecules move around in polymer membranes. And
10:56:46 21 it's a technique that we've been developing over the
10:56:50 22 last decade or so and use relatively frequently
10:56:54 23 within the lab.

10:56:55 24 Q Okay. Has any of your work in that area
10:57:06 25 involved gas separations or is that all liquid

10:57:09 1 separations?

10:57:10 2 A We've applied that primarily to our
10:57:13 3 membranes that are used in liquid separations.

10:57:17 4 Q In the first section there the one that's
10:57:48 5 titled "About," do you see that?

10:57:50 6 A Yes.

10:57:51 7 Q Okay. Near the end there it refers to
10:57:56 8 ion-specific separations.

10:57:58 9 A Yes.

10:57:58 10 Q And is that something -- that's -- we've
10:58:03 11 talked about earlier, right? That's liquid
10:58:05 12 separations also?

10:58:05 13 A It is.

10:58:06 14 Q Okay. And the non-aqueous redox flow
10:58:13 15 battery membranes, that's liquid separations, right?

10:58:15 16 A That's correct.

10:58:16 17 Q And what about microwave dielectric -- oh,
10:58:20 18 that's what we just talked about, right?

10:58:22 19 A Yes.

10:58:23 20 Q Okay. All right. I think we got it.

10:58:31 21 Earlier in that paragraph it talks about how
10:58:36 22 you got your master's and Ph.D. in chemical
10:58:40 23 engineering at the University of Texas. Do you see
10:58:42 24 that?

10:58:43 25 A Yes.

10:58:43 1 Q Okay. I'm facing the wrong direction, but
10:58:47 2 I'm almost looking at it. We're here in Austin
10:58:50 3 today. And it says there that in doing your work on
10:58:56 4 your master's and Ph.D., you developed experimental
10:58:59 5 techniques for measuring individual ion sorption in
10:59:03 6 polymers. Do you see that?

10:59:06 7 A Yes.

10:59:07 8 Q Okay. Can you describe what that research
10:59:09 9 was?

10:59:10 10 A Yes, that was some of my thesis research
10:59:14 11 where at the time there had been very little, if
10:59:17 12 any, measurements of how an individual ion would
10:59:24 13 partition or move into a polymer material. There
10:59:27 14 had been a lot of people looking at sort of salt,
10:59:30 15 broadly speaking, so you know, perhaps sodium and
10:59:33 16 chloride. And so I worked to develop techniques
10:59:36 17 where we went in and ultimately probed, for example,
10:59:40 18 the amount of chloride that ends up in the polymer
10:59:44 19 or the amount of sodium, but making those
10:59:47 20 measurements via separate techniques that probed
10:59:49 21 those things individually.

10:59:51 22 Q Okay. And when you refer to polymers there,
10:59:55 23 you're referring to polymer membranes?

10:59:56 24 A Yes.

10:59:57 25 Q Okay. And were those membranes for liquid

11:00:00 1 separation also?

11:00:01 2 A That was the primary application focus at
11:00:05 3 the time.

11:00:05 4 Q And a little later in that sentence on
11:00:10 5 Exhibit 9 it says in your research work for your
11:00:14 6 Ph.D. -- master's and Ph.D. you established a
11:00:18 7 fundamental selectivity/permeability tradeoff
11:00:22 8 relationship in desalination membrane materials.

11:00:24 9 Do you see that?

11:00:25 10 A I do.

11:00:25 11 Q And that was liquid separation also?

11:00:27 12 A You know, that work was built off of some of
11:00:32 13 the fundamentals of gas separations where there are
11:00:37 14 a series of papers that get into these issues for
11:00:41 15 gas separations. But we took a page from that prior
11:00:46 16 literature and extended that sort of analysis into
11:00:51 17 liquid desalination separations.

11:00:53 18 Q Let's go back to Exhibit 3, your LinkedIn
11:01:07 19 page.

11:01:14 20 A Okay.

11:01:15 21 Q Give me a second. I've got to find it. All
11:01:20 22 right. In the summary section there at the top, do
11:01:37 23 you see that?

11:01:37 24 A Yes.

11:01:38 25 Q It talks about ion and liquid separation.

11:01:46 1 Do you see that?

11:01:46 2 A Uh-huh.

11:01:47 3 Q And the ion separation that's referred to is

11:01:49 4 liquid separations, correct?

11:01:51 5 A Ions and liquids, but yes.

11:01:54 6 Q And desalination is liquid separations,

11:01:57 7 right?

11:01:58 8 A Yes.

11:01:58 9 Q And lithium extraction is recovering lithium

11:02:04 10 from brine, is that correct?

11:02:05 11 A That's correct.

11:02:05 12 Q And that's liquid separation also, correct?

11:02:08 13 A The brines are liquids, yes.

11:02:10 14 Q And the flow battery technologies are liquid

11:02:13 15 separations? We talked about that, right?

11:02:14 16 A Yes.

11:02:15 17 Q Have you ever designed a three-stage

11:02:59 18 membrane gas separation apparatus?

11:03:04 19 A No, I have not.

11:03:05 20 Q Have you ever designed a membrane gas

11:03:11 21 separation apparatus for separating biogas?

11:03:14 22 A No, I have not.

11:03:16 23 Q Sorry. My computer plug keeps falling out.

11:03:20 24 I'll take it out. Deal with that later.

11:03:28 25 Can you describe the work you've done, other

11:03:32 1 than in this litigation, on membrane gas separation
11:03:36 2 apparatuses for biogas?

11:03:42 3 A So I've engaged in other work related to
11:03:47 4 issues of gas transport or gas separations in
11:03:50 5 polymers, but not specifically in the space of
11:03:54 6 biogas.

11:03:55 7 Q Okay. So you've never done any work in
11:03:57 8 biogas, is that correct?

11:04:00 9 A I've not done any research in biogas in the
11:04:04 10 laboratory setting. I've certainly read about it
11:04:08 11 and am familiar with it. But in terms of research
11:04:11 12 that we do in the group or other work outside, no.

11:04:15 13 Q In the education section of your LinkedIn
11:04:44 14 page that's been marked as Exhibit 3, do you see
11:04:50 15 that?

11:04:51 16 A Yes.

11:04:51 17 Q Okay. You received your undergraduate
11:04:56 18 degree from Penn State in 2007, is that correct?

11:04:59 19 A That's correct.

11:05:00 20 Q Okay. Up until the time you received your
11:05:06 21 undergraduate degree in 2007, did you do any
11:05:10 22 research or work on membranes?

11:05:17 23 A I took courses that were related to things
11:05:21 24 involving membranes, but I had not done any research
11:05:25 25 explicitly in membranes up until that point.

11:05:27 1 Q Okay. When did you first start doing
11:05:31 2 research or work on membranes?

11:05:34 3 A First started doing membrane research
11:05:37 4 actively in 2007.

11:05:40 5 Q Okay. Do you remember what month?

11:05:41 6 A It would have been at some point in the
11:05:44 7 fall. I forget exactly when -- when research group
11:05:49 8 assignments were made that particular semester, but
11:05:52 9 it would have been during the fall term of 2007.

11:05:54 10 Q And your Ph.D. dissertation title was "Water
11:06:15 11 and Salt Transport Structure/Property Relationships
11:06:20 12 in Polymer Membranes for Desalination and Power
11:06:25 13 Generation Applications." Is that right?

11:06:27 14 A That sounds familiar.

11:06:28 15 Q Okay. Was that -- well, let me start over.

11:06:39 16 Can you describe the research you did for
11:06:41 17 your Ph.D. dissertation?

11:06:43 18 A So the research that went into that -- that
11:06:50 19 went into my dissertation was largely focused on
11:06:54 20 exploring a series of ion exchange membranes. We
11:06:58 21 looked at other materials as well, but it had a
11:07:03 22 focus on trying to characterize and understand how
11:07:06 23 water and ions moved through those materials. And
11:07:10 24 so we discussed previously some of the techniques
11:07:14 25 that were developed during that time period thinking

11:07:16 1 about what ions do in those systems. Also looked at
11:07:21 2 water, looked at things modelling from the
11:07:24 3 standpoint of how those materials, you know, would
11:07:28 4 ultimately perhaps function in a desalination or in
11:07:34 5 a power generation-type application. I think that
11:07:37 6 was back in the time when some of those reverse
11:07:40 7 electrodialysis-type processes were a little bit
11:07:42 8 more popular. But ultimately, it was a largely
11:07:49 9 experimental characterization thesis using materials
11:07:54 10 provided by an industrial partner.

11:07:57 11 Q Are you able to tell me who that industrial
11:08:04 12 partner was?

11:08:04 13 A It was Kraton Polymers.

11:08:08 14 Q That's k-r-a-y-t-o-n?

11:08:12 15 A No. Just k-r-a-t-o-n.

11:08:15 16 Q And that work -- research work you described
11:08:22 17 for your Ph.D. dissertation, that was all liquid
11:08:27 18 separations, correct?

11:08:29 19 A Yeah, the day-to-day things that I did to
11:08:32 20 contribute to my dissertation were largely focused
11:08:36 21 in that at the time. In the research group we sort
11:08:40 22 of had -- you know, half of the folks in round
11:08:43 23 numbers were working on gas separations, the other
11:08:45 24 half were working on liquids. And so I was -- my
11:08:48 25 day-to-day activities were more on that liquid side

11:08:51 1 of things in terms of what ultimately went into my
11:08:55 2 dissertation.

11:08:56 3 Q Did you do any research or work on membranes
11:09:05 4 between fall of 2007 and when you received your
11:09:09 5 Ph.D. other than the research for your dissertation?

11:09:13 6 A Yeah. I helped out other people in the
11:09:17 7 group. You know, we had a culture of, you know,
11:09:20 8 sort of helping -- helping people do their
11:09:23 9 experiments. So certainly spent a lot of time
11:09:26 10 during that period of time learning about the wide
11:09:30 11 range of activities that were going on in membrane
11:09:33 12 separations, you know, trying my hand at other types
11:09:37 13 of characterization or other things related to gas
11:09:40 14 separations because that was another large component
11:09:43 15 of things going on in the group at the time.

11:09:46 16 Q And you received your Ph.D. in 2012, is that
11:11:01 17 correct?

11:11:01 18 A That's correct.

11:11:01 19 Q Okay. Do you recall what month?

11:11:04 20 A I defended my dissertation I believe at the
11:11:07 21 end of August. I think the date on the degree is
11:11:11 22 December 2012, but essentially all of the
11:11:16 23 requirements were complete earlier in that year.

11:11:19 24 Q Between the fall of 2007 when you started
11:11:35 25 working on membranes and when you received your

11:11:39 1 Ph.D., what percentage of your research or work was
11:11:42 2 on membrane gas separation systems?

11:11:46 3 A It's hard to put an exact figure on it. I
11:12:00 4 mean, we sort of were routinely talking about things
11:12:04 5 about both liquid and gas separations. So I, for
11:12:08 6 example, shared an office for a number of years with
11:12:10 7 two other students who were primarily working on gas
11:12:13 8 separations and so, you know, regularly engaged in
11:12:18 9 discussions with them about, you know, their
11:12:21 10 research and their data analysis and the sorts of
11:12:24 11 issues that they were looking at.

11:12:28 12 It certainly was not the primary focus. The
11:12:32 13 primary focus was obviously on my dissertation
11:12:35 14 research. But I would say, you know, with some
11:12:40 15 level of regularity, it would not have been uncommon
11:12:43 16 to have spent, you know, a little bit of time on
11:12:45 17 most days thinking about or talking about something
11:12:49 18 related to gas separations in addition to doing the
11:12:52 19 work that was contributing to my dissertation.

11:12:56 20 Q What percentage of your work and research
11:13:02 21 though was on membrane gas separation systems
11:13:05 22 between fall 2007 and when you got your Ph.D.?

11:13:08 23 A I'm sorry. You're asking what percentage of
11:13:15 24 my -- I'm sorry.

11:13:16 25 Q Your own work and research, other than

11:13:20 1 discussing with the other Ph.D. students who were
11:13:24 2 working on gas, for your work and research, what
11:13:26 3 percentage of it between fall 2007 and when you got
11:13:29 4 your Ph.D. was on membrane gas separation systems?

11:13:33 5 A I mean, in terms of my I guess formally
11:13:38 6 assigned project, I would say I don't believe any of
11:13:47 7 that formally assigned project research was on gas
11:13:53 8 separations.

11:13:54 9 Q So is it fair to say up until the time you
11:14:22 10 got your Ph.D., you didn't have at least three years
11:14:27 11 of work experience in membrane gas separation
11:14:29 12 systems?

11:14:31 13 MR. LIPPERT: Object to the form.

11:14:35 14 A I guess I would characterize my experience
11:14:37 15 with gas separations up until that point as having
11:14:41 16 been, you know, largely in the classroom, largely in
11:14:47 17 determining or developing skills in the underlying
11:14:50 18 phenomena that are important for these applications.

11:14:54 19 It turns out that a lot of the fundamental
11:14:57 20 mechanisms and things that influence the liquid
11:15:00 21 phase separations have very, very close analogs to
11:15:04 22 gas separation systems. So you know, strictly
11:15:08 23 speaking, the work that I was doing in my research
11:15:12 24 was not focused on a gas separation application,
11:15:17 25 however, the things I was learning about, the things

11:15:21 1 I was exposed to on a day-to-day base, the
11:15:26 2 principles that we were working with, are all things
11:15:28 3 that I consider to be very relevant to gas
11:15:34 4 separation systems. And so to that extent, I do
11:15:38 5 feel like my time in a research group that focused
11:15:41 6 on gas separations, you know, equipped me with
11:15:47 7 relevant skills for those types of systems.

11:15:51 8 Q Okay. But you'd agree that your own work --
11:15:54 9 you didn't have at least three years of your own
11:15:57 10 work experience on gas separation systems up until
11:16:01 11 the time you got your Ph.D., correct?

11:16:05 12 MR. LIPPERT: Object to the form.

11:16:07 13 A So I would agree that the -- that I did not,
11:16:11 14 you know, work for a membrane company. I did not do
11:16:15 15 -- or I did not have a defined or specific project
11:16:19 16 in the realm of membrane gas separation
11:16:23 17 applications.

11:16:23 18 Q Okay. And did any of your work leading up
11:16:29 19 to your Ph.D. involve biogas membrane separations?

11:16:34 20 A It did not.

11:16:35 21 Q All right. Changing gears a little bit.
11:16:45 22 You're an associate professor now at University of
11:16:47 23 Virginia?

11:16:48 24 A That's correct.

11:16:48 25 Q Okay. And that means you're not tenured

11:16:51 1 yet, is that right?

11:16:52 2 A That's incorrect. I am tenured.

11:16:55 3 Q Okay. Great. Congratulations.

11:16:58 4 A Thank you.

11:16:58 5 Q When did you get tenure?

11:17:01 6 A During 2020.

11:17:04 7 Q I just don't understand. So how does having
11:17:10 8 tenure relate to being an associate professor versus
11:17:14 9 a non-associate professor? Can you explain that a
11:17:17 10 little bit?

11:17:17 11 A So at the University of Virginia, the tenure
11:17:21 12 track process involves faculty coming in and being
11:17:24 13 hired as assistant professors. And at our
11:17:28 14 institution, promotion with -- or promotion to
11:17:32 15 associate professor also occurs at the same time as
11:17:36 16 the tenure process. And so at our institution, when
11:17:41 17 you -- in large -- I guess maybe there are other
11:17:44 18 cases, but the lion's share of people who are
11:17:48 19 promoted to associate professor are promoted with
11:17:51 20 tenure at that stage. There are different systems
11:17:54 21 at different institutions, but that's just how our
11:17:57 22 institution does it.

11:17:58 23 Q Okay. Thank you. And what's the next step
11:18:03 24 in the career path after associate professor at
11:18:06 25 University of Virginia?

11:18:07 1 A So there would be an opportunity for
11:18:09 2 promotion to full professor. That would be the next
11:18:13 3 logical progression.

11:18:15 4 Q Can you describe any experience you've had
11:18:23 5 consulting on membranes since you received your
11:18:27 6 Ph.D. ?

11:18:28 7 A So I mean, like we discussed earlier, you
11:18:34 8 know, I was involved in -- as an expert in a
11:18:40 9 litigation matter related to, you know, gas and
11:18:46 10 other small molecule transport in materials that are
11:18:49 11 effectively membranes. And then also we talked
11:18:53 12 about the due diligence activities related to --
11:18:59 13 related to a company that was looking to do things
11:19:02 14 in the membrane space.

11:19:03 15 Q And the due diligence, you've just done one
11:19:08 16 due diligence project, right?

11:19:09 17 A Yes.

11:19:10 18 Q Okay. And other than the due diligence and
11:19:13 19 the litigation -- other than expert work, have you
11:19:16 20 done any consulting on membranes since you received
11:19:21 21 your Ph.D. ?

11:19:21 22 A No.

11:19:23 23 Q Okay. You've never been hired by any
11:19:26 24 company as a consultant on membrane separations
11:19:29 25 other than Evonik in this litigation or your other

11:19:35 1 clients in terms of expert work?

11:19:37 2 A Not that I recall.

11:19:38 3 Q What do you consider yourself to be an
11:19:50 4 expert on for this litigation?

11:19:53 5 A So I considered myself to be an expert as a
11:19:57 6 chemical engineer, as someone who has extensive
11:20:02 7 training and expertise in how small molecules move
11:20:06 8 through membranes and polymers, and broadly
11:20:11 9 speaking, in that sense of being an expert in
11:20:13 10 chemical engineering, ways that one would think
11:20:16 11 about or manage various processing apparatuses.

11:20:21 12 Q What do you mean processing apparatuses?

11:20:25 13 A Well, a chemical process like, for example,
11:20:30 14 of the kinds that show up through many of the
11:20:32 15 documents that we're looking at.

11:20:33 16 Q And just so we have a clear record, you're
11:20:39 17 not an attorney, correct?

11:20:40 18 A That's correct.

11:20:41 19 Q And you're not an expert on patent law?

11:20:43 20 A No, I'm not.

11:20:45 21 Q And you're not a registered patent agent?

11:20:47 22 A I am not.

11:20:48 23 Q And you're not an expert on what constitutes
11:20:53 24 prior art under U.S. patent law, correct?

11:20:56 25 A No.

11:20:57 1 Q That's correct?

11:20:58 2 A That's correct. I am not.

11:21:00 3 Q Okay. And you're not an expert on Patent

11:21:02 4 Office -- the United States -- let me start over.

11:21:05 5 You're not an expert on Patent Office

11:21:07 6 procedures, correct?

11:21:09 7 A No, I'm not an expert on that.

11:21:12 8 Q Let's turn back to Exhibit 1, your

11:21:24 9 January 3rd declaration.

11:21:25 10 A Okay.

11:21:26 11 Q And Exhibit -- sorry, Appendix A is your CV.

11:21:34 12 Are you with me?

11:21:35 13 A Yes.

11:21:35 14 Q And was that -- your CV that was submitted

11:21:42 15 as Appendix A in your January 3rd declaration, was

11:21:45 16 it accurate and current when you submitted it on

11:21:48 17 January 3rd?

11:21:49 18 A Yes, that was the most current version I had

11:21:52 19 at that time.

11:21:52 20 Q Okay. Does -- did it include all the

11:21:56 21 publications that you had authored or co-authored at

11:21:59 22 that time?

11:21:59 23 A To the best of my knowledge, yes.

11:22:01 24 Q Is there anything new since January 3rd,

11:22:06 25 publications, or awards or anything else that you

11:22:10 1 would add?

11:22:10 2 A There's at least one -- there's at least one
11:22:17 3 new paper that has published. There's another -- I
11:22:23 4 think it's just one since this that has published.
11:22:33 5 I think that's probably the extent of what has
11:22:38 6 changed since then.

11:22:39 7 Q Okay. And so that would be -- there's 62
11:22:43 8 publications. That would be number 63?

11:22:45 9 A Yes.

11:22:46 10 Q Okay. And can you describe generally what
11:22:49 11 that 63rd publication is?

11:22:52 12 A So that's a publication related to ion
11:22:57 13 transport in membranes for fuel cell applications.
11:23:03 14 We did a little bit of work on looking at how those
11:23:06 15 materials responded to exposure to moisture.

11:23:10 16 Q And does that involve membranes?

11:23:13 17 A It does.

11:23:14 18 Q And is it liquid separations?

11:23:19 19 A So it's -- the application there is a fuel
11:23:21 20 cell which would use liquids. We did some
11:23:24 21 experiments that related to water in the gas phase.

11:23:28 22 Q It doesn't involve biogas, correct?

11:23:33 23 A It does not.

11:23:34 24 Q And Dr. Benny Freeman was your Ph.D. advisor
11:23:45 25 at -- or at least co-advisor when you were at the

11:23:48 1 University of Texas getting your Ph.D.?

11:23:50 2 A Yes, co-advisor.

11:23:52 3 Q And you'd agree that Dr. Freeman is a very
11:23:55 4 highly regarded expert in the field of membrane
11:23:57 5 separations?

11:23:58 6 A Yes.

11:23:58 7 Q And you'd agree that Dr. Freeman is one of
11:24:01 8 the world's leading experts in the field of membrane
11:24:04 9 separations?

11:24:04 10 A Yes.

11:24:06 11 Q And you would agree that Dr. Freeman is one
11:24:10 12 of the world's leading authorities on the field of
11:24:12 13 membrane separations?

11:24:16 14 A Yes.

11:24:16 15 Q And you would agree that Dr. Freeman has
11:24:19 16 been working in the field of membrane separations
11:24:23 17 much longer than you have, correct?

11:24:24 18 A Yes.

11:24:25 19 Q Decades longer?

11:24:27 20 A I think so, yes.

11:24:29 21 Q And so Dr. Freeman has much more experience
11:24:33 22 in membrane separations than you have, correct?

11:24:37 23 A I would agree with that statement.

11:24:38 24 Q Let's take a break there. I think we've
11:24:46 25 been on for a little -- about an hour if that's okay

11:24:50 1 with you. A ten-minute break. Is that okay with
11:24:53 2 you Nels?
11:24:53 3 MR. LIPPERT: Yes, it is.
11:24:55 4 MR. LANE: Thank you.
11:24:56 5 VIDEOGRAPHER: We are off the record. The
11:24:57 6 time is 11:25 a.m.
11:25:00 7 (Short recess.)
11:38:14 8 VIDEOGRAPHER: We are back on the record.
11:46:56 9 The time is 11:47 a.m.
11:46:59 10 BY MR. LANE:
11:47:01 11 Q Welcome back, Dr. Geise.
11:47:03 12 A Thank you.
11:47:04 13 Q Did you have any discussions with any of the
11:47:06 14 attorneys about your previous or anticipated
11:47:10 15 testimony?
11:47:10 16 A No, I did not.
11:47:12 17 Q Let's turn back to Exhibit 1, your first
11:47:19 18 declaration, Section VII starting at paragraph 25.
11:47:31 19 A Okay.
11:47:31 20 Q And this section is entitled "Claim
11:47:37 21 Construction Principles."
11:47:37 22 Do you see that?
11:47:38 23 A Yes.
11:47:38 24 Q And is this language that the attorneys
11:47:41 25 wrote in this section?

11:47:43 1 A They drafted this language, yes.

11:47:45 2 Q And to the best of your abilities, did you
11:47:53 3 try to apply these standards in doing your work in
11:47:57 4 this case, or these principles?

11:47:58 5 A Yes.

11:47:59 6 Q In paragraph 27, you talked about intrinsic
11:48:41 7 evidence. Do you see that?

11:48:42 8 A Yes.

11:48:43 9 Q And I know you're not an attorney, but
11:48:45 10 what's your understanding of intrinsic evidence as
11:48:47 11 it applies to claim construction?

11:48:49 12 A So intrinsic evidence is the material in the
11:48:54 13 patents, claims, specification, and prosecution
11:48:57 14 history.

11:48:57 15 Q Okay. And conversely, what is extrinsic
11:49:01 16 evidence as you understand it?

11:49:03 17 A So it would be evidence outside of that.

11:49:06 18 Q And there's a second sentence in
11:49:25 19 paragraph 27. It says, "I understand that the
11:49:27 20 patent specification has been described as the
11:49:30 21 single best guide to the meaning of a claim term."

11:49:34 22 Do you see that?

11:49:34 23 A I do.

11:49:35 24 Q And did you try to apply that principle in
11:49:39 25 your analysis in forming your opinions in your two

11:49:40 1 declarations?

11:49:41 2 A Yes.

11:49:41 3 Q Turning a little bit back in your first

11:50:18 4 declaration that's been marked as Exhibit 1,

11:50:23 5 paragraph 20, and I think you touched on this

11:50:26 6 before, but you talk there about elevated purity and

11:50:31 7 I think you use high purity elsewhere or maybe said

11:50:35 8 that. Does that sound fair?

11:50:37 9 A Yeah, I think we may have talked about that,

11:50:40 10 yeah.

11:50:41 11 Q Okay. In the context of biogas separations,

11:50:47 12 what is your understanding of high purity or

11:50:50 13 elevated purity? What does that entail?

11:50:53 14 A So in the context of a biogas separation,

11:51:00 15 you know, oftentimes the goal is to produce a stream

11:51:05 16 that is enriched in methane. You're trying to get

11:51:09 17 things like CO₂ or other gasses out. And so

11:51:14 18 generally, you know, high purity on the methane side

11:51:17 19 of things would be, you know, pushing the upper

11:51:22 20 limits of the compositional space. You know,

11:51:26 21 usually there's a tolerance of perhaps a couple

11:51:29 22 percent or so for other impurities, but that methane

11:51:35 23 stream is -- you know, the vast majority of the

11:51:37 24 molecules are methane.

11:51:39 25 And then on the other end of things, you

11:51:42 1 know, on the one hand, methane is your product so
11:51:45 2 you don't want to lose that. It also has greenhouse
11:51:49 3 gas effects and so there's a benefit to not
11:51:53 4 releasing or losing excess methane. And so, you
11:51:56 5 know, typically you would want very little methane
11:52:01 6 in the stream that is enriched in your impurity
11:52:06 7 quantities. And you might be pushing 99 or
11:52:10 8 99.5 percent of CO₂ in a CO₂/methane mixture, so
11:52:19 9 maybe half a percent or so of methane in that other
11:52:22 10 stream.

11:52:25 11 Q You talked about a couple of percent
11:52:32 12 impurities in the methane stream, right?

11:52:37 13 A Uh-huh.

11:52:37 14 Q And in the context of these three-stage
11:52:40 15 systems that are talked about in the '038 patent,
11:52:44 16 that would be the second retentate stream, right?

11:52:47 17 A Yes, the -- yeah, the second retentate
11:52:51 18 stream is the methane rich stream, yes.

11:52:55 19 Q And in the context of the '038 -- the
11:52:58 20 three-stage systems in the '038 patent's claims, the
11:53:05 21 CO₂ stream or the relatively pure CO₂ stream would be
11:53:09 22 the third permeate stream, correct?

11:53:12 23 A That's correct.

11:53:12 24 Q And in the United States, do you know how
11:53:19 25 pure methane must be in that -- for example, in that

11:53:22 1 second retentate stream in order to inject it into
11:53:26 2 the natural gas system, so for example, it can be
11:53:29 3 used to heat homes or used in people's stoves in
11:53:32 4 their houses?

11:53:33 5 A I know there are specifications. I don't
11:53:37 6 have those values at the top of my head right now,
11:53:40 7 but there are -- there are values for various
11:53:43 8 impurities that must be met.

11:53:46 9 Q Okay. And before you said a couple percent.
11:53:55 10 Is that -- is that volume percent, mass percent or
11:53:58 11 do you know?

11:53:59 12 A So it would be typical in the field and in
11:54:03 13 most of the ways that these systems get discussed
11:54:05 14 for that to be, you know, essentially volume or mol
11:54:11 15 percent, which for these types of systems, generally
11:54:14 16 speaking, those two would be equivalent. So that
11:54:17 17 would be the understanding I would use there.

11:54:19 18 Q Are you an expert in the regulations on
11:54:25 19 methane purity in the United States?

11:54:27 20 A I am not.

11:54:28 21 Q Are you an expert on the regulations on
11:54:31 22 methane purity in Europe?

11:54:33 23 A No, I am not.

11:54:34 24 Q Are you an expert on the regulations on
11:54:38 25 methane purity in any country?

11:54:40 1 A No, I am not.

11:54:42 2 Q In a three-stage system like the ones
11:54:50 3 described in the '038 patent, would a third permeate
11:54:54 4 stream with 99 percent mol fraction CO₂ be
11:54:58 5 considered high purity?

11:55:04 6 A I think the answer to that depends on the
11:55:07 7 criteria that you're applying to define high purity.
11:55:11 8 From the standpoint of, you know, trying to minimize
11:55:18 9 methane release into the environment, for example,
11:55:21 10 one might want to do a little bit better. But it
11:55:24 11 certainly is an improvement in purity relative to
11:55:28 12 say a 50/50 feed.

11:55:30 13 Q Okay. In a three-stage system like the ones
11:55:35 14 described in the '038 patent, would a second
11:55:38 15 retentate stream with 98 percent mol fraction
11:55:41 16 methane be considered high purity?

11:55:45 17 A Again, I'd say that, you know, probably
11:55:49 18 plays into the context of regulations or other
11:55:52 19 things that are being considered there. It
11:55:56 20 certainly is an elevated concentration relative to,
11:55:59 21 again, say a 50/50 feed.

11:56:01 22 Q And again, you're not an expert in those --
11:56:04 23 well, let me go back.

11:56:05 24 You said -- you talked about criteria for
11:56:08 25 purity before. Is that a reference to the

11:56:12 1 regulations that we talked about?

11:56:15 2 A It could be a reference to the regulations.

11:56:19 3 It also could be some other target for, you know,

11:56:24 4 perhaps some other business or economic or

11:56:26 5 environmental reasons.

11:56:28 6 Q Okay. So like another application might be

11:56:30 7 to drive a power generation turbine?

11:56:36 8 A That might be one -- one additional, yes, a

11:56:40 9 different -- a different end use.

11:56:44 10 Q Okay. And for that end use, for example,

11:56:49 11 you would have to look at the specifications set by

11:56:52 12 the -- by the operator or the owner of the turbine,

11:56:57 13 correct?

11:56:59 14 A Yeah, I think one would typically look to

11:57:01 15 the manufacturer of the equipment, some sort of

11:57:04 16 guidance or specification as to what that threshold

11:57:06 17 was.

11:57:07 18 Q Okay. So if you were separating biogas for

11:57:11 19 that application, the methane purity would have to

11:57:15 20 meet the specification for the equipment, correct?

11:57:21 21 A To enable proper use of the equipment, I

11:57:24 22 would say that would be a very reasonable target.

11:57:26 23 Q Okay. That's a fair point. Okay. In

11:57:32 24 paragraph 22 in your declaration, you talked about

11:57:40 25 high selectivity membranes. Do you see that?

11:57:49 1 A In paragraph 22, yes.

11:57:52 2 Q Okay. Highly selective membranes. In the
11:58:00 3 context of the '038 patent, what are highly
11:58:05 4 selective membranes? How much selectivity must they
11:58:11 5 have?

11:58:11 6 A Well, the specification and the claims
11:58:14 7 discuss a mixed gas selectivity of at least 30, so I
11:58:20 8 would start there with the information provided in
11:58:23 9 the intrinsic evidence.

11:58:24 10 Q And that mixed -- that's mixed gas
11:58:29 11 selectivity for CO₂ over CH₄, correct, carbon
11:58:36 12 dioxide over methane?

11:58:39 13 A I think that depends to some extent on the
11:58:42 14 context that you're looking at. So in the claim
11:58:45 15 language, there are situations where the identities
11:58:48 16 of the gasses are not explicitly specified.

11:58:52 17 Q So in the claim language, when it says a
11:58:54 18 mixed gas selectivity over 30, it would need to be
11:58:57 19 for the -- whatever gas you're separating, right?
11:59:03 20 Like if it were methane/carbon dioxide, it would be
11:59:07 21 mixed gas selectivity of over 30 for CH₄ over CO₂
11:59:11 22 but if it were some other gas pair, it would be the
11:59:15 23 mixed gas selectivity for that gas pair? Is that
11:59:19 24 right?

11:59:19 25 MR. LIPPERT: I'm going to object to the

11:59:20 1 form. Go ahead.

11:59:21 2 A The way you'd read the claims, you know,
11:59:28 3 thinking about this idea of having two gasses that
11:59:30 4 are being separated by the system, yes, I would
11:59:32 5 apply the selectivity part of that to the specific
11:59:39 6 gasses that would be considered if you were
11:59:43 7 evaluating the applicability of the claims.

11:59:45 8 Q You said it better than I did. All right.
11:59:48 9 And let me -- if you need to turn your attention
11:59:51 10 over to the -- on Exhibit 4, the '038 patent, but
11:59:55 11 none of the claims in the '038 patent require
11:59:59 12 elevated gas purity, correct?

12:00:25 13 A I mean, there are places where the claims
12:00:28 14 are discussing increases in concentration.

12:00:35 15 Q Okay. Do those discussions in the claims of
12:00:39 16 increased concentration apply to the product
12:00:44 17 streams?

12:01:28 18 A There is language that, you know, speaks to
12:01:33 19 the composition of some of those product gas
12:01:38 20 streams.

12:01:40 21 Q Okay. And what are you referring to there,
12:01:43 22 what language in the claims?

12:01:48 23 MR. LIPPERT: Could you speak up, please?
12:01:51 24 Was that a question?

12:01:53 25 MR. LANE: Sorry. I asked him what language

12:01:54 1 he was referring to in the claims that refer to the
12:01:58 2 purity of the product streams.

12:02:02 3 A So one example being -- I'm looking at
12:02:06 4 column 17, wherein the third permeate stream
12:02:14 5 comprises more than 95 volume percent of a retentate
12:02:18 6 gas of the feed stream separation stage in the gas
12:02:21 7 mixture stream, and the second retentate system
12:02:26 8 comprises more than 95 vol -- volume percent of a
12:02:30 9 permeate gas of the feed stream separation stage in
12:02:34 10 the gas mixture stream.

12:02:36 11 Q Back on paragraph 22 of Exhibit 1, when you
12:03:07 12 said there, "In particular, the '038 patent is
12:03:12 13 directed to a three-stage process and apparatus
12:03:15 14 using highly selective membranes that can afford
12:03:20 15 pure streams of permeate and retentate," do you see
12:03:23 16 that?

12:03:26 17 A I do see that language, yes.

12:03:28 18 Q Okay. And when you were referring there to
12:03:32 19 the pure streams of permeate and retentate, were you
12:03:35 20 referring there to the second retentate stream and
12:03:38 21 the third permeate stream?

12:03:40 22 A Well, that language is quoted from the
12:03:44 23 specification, so I need to go and look at that.
12:04:19 24 I'm sorry, just to make sure, could you repeat your
12:04:22 25 question?

12:04:23 1 Q Yeah. And I do see it now that you're
12:04:25 2 saying that that is quoted. So I guess I'll change
12:04:28 3 my question slightly.

12:04:29 4 But is your understanding that where the
12:04:34 5 specification language that you quoted in
12:04:36 6 paragraph 22 of your first declaration discusses or
12:04:40 7 says "can afford pure streams of permeate and
12:04:44 8 retentate" that it's referring to the product
12:04:46 9 streams?

12:04:47 10 A That is my understanding.

12:04:49 11 Q Okay. And let's turn to the next page, a
12:05:02 12 couple more paragraphs in your first declaration,
12:05:04 13 paragraph 24. Do you see that?

12:05:09 14 A Yes.

12:05:09 15 Q And is this -- is this language that you
12:05:15 16 wrote or do you remember?

12:05:25 17 A I mean, again, a lot of the language in that
12:05:37 18 paragraph is quoted from the specification, but this
12:05:43 19 was one of the -- I mean, obviously this was, you
12:05:47 20 know, put into the declaration to refer to those
12:05:50 21 passages.

12:05:51 22 Q Again, you pointed out that a lot of it is
12:05:56 23 quoted language. Can you explain in your own words
12:05:59 24 what this quoted language means?

12:06:04 25 A In short, it's if you have a more highly

12:06:27 1 selective membrane, you would end up perhaps needing
12:06:32 2 to do less recycling which might be more
12:06:36 3 economically beneficial.

12:06:38 4 Q Okay. So higher selectivity membranes
12:06:49 5 result in less gas being recycled, is that right?

12:06:53 6 A That can be one of the outcomes of using a
12:06:56 7 higher selectivity membrane is needing to recycle
12:07:00 8 less.

12:07:00 9 Q And when you recycle less, then it's -- it's
12:07:09 10 necessary to compress less gas twice then, correct?

12:07:12 11 A If your recycle streams are being injected,
12:07:16 12 you know, upstream of a compressor then, you know,
12:07:21 13 the amount of material in the recycle stream has an
12:07:23 14 impact on what that compressor sizing and duty would
12:07:28 15 need to be.

12:07:28 16 Q And in that case where the recycles are
12:07:32 17 being supplied upstream of the compressor, you need
12:07:38 18 -- essentially the higher selectivity membranes
12:07:42 19 cause less recycling and then you need a smaller
12:07:45 20 compressor, correct?

12:07:48 21 A If you're compressing less gas, then, you
12:07:51 22 know, you can get away with either a smaller
12:07:55 23 compressor or less energy input essentially to that
12:07:59 24 compressor.

12:07:59 25 Q That's what I was getting at. So one of --

12:08:03 1 so higher selectivity membranes can cause less gas
12:08:08 2 to be recycled which means less gas needs to be
12:08:11 3 recompressed which means less energy is used, is
12:08:16 4 that fair?

12:08:20 5 A I'm sorry. Can you repeat the question?

12:08:22 6 Q Right. So higher selectivity membranes can
12:08:30 7 result in less gas being recycled which means it's
12:08:35 8 necessary to compress -- recompress less gas which
12:08:40 9 means less energy is used, is that fair?

12:08:43 10 A That's my interpretation of what the
12:08:46 11 specification is saying in these passages.

12:08:49 12 Q So that's an advantage of using higher
12:09:02 13 selectivity membranes, is that fair?

12:09:06 14 A I think that's a fair assessment.

12:09:08 15 Q Are there any disadvantages of using higher
12:09:11 16 selectivity membranes?

12:09:22 17 A I think there certainly could be, you know,
12:09:27 18 another side to this piece. You know, having
12:09:31 19 prepared for, you know, claims construction on some
12:09:34 20 of the things that we're talking about here today,
12:09:37 21 I'm not -- not prepared to speak in detail to some
12:09:42 22 of those -- those details.

12:09:44 23 Q Okay. Do higher selectivity membranes
12:09:47 24 generally cost more than lower selectivity
12:09:51 25 membranes?

12:10:08 1 A I think again given the preparation here for
12:10:11 2 today to talk about claims construction, I'm not --
12:10:15 3 not prepared today to discuss some of those details.

12:10:19 4 Q So you don't know sitting here today if
12:10:25 5 higher selectivity membranes are generally larger
12:10:29 6 than -- or cost more than -- let me start that.
12:10:34 7 Strike that and start over.

12:10:36 8 You don't know sitting here today if higher
12:10:38 9 selectivity membranes generally cost more than lower
12:10:42 10 selectivity membranes, is that right?

12:10:44 11 A I'd say that my preparation for today did
12:10:47 12 not, you know, involve going through that as
12:10:49 13 carefully as I would want to be sure to give you a
12:10:54 14 good -- the best answer that I can give you.

12:10:56 15 Q And what about are higher selectivity
12:10:59 16 membranes generally larger than lower selectivity
12:11:01 17 membranes?

12:11:08 18 A I'm going to go with the same answer, that
12:11:15 19 within the scope of what I've prepared today, I'm
12:11:17 20 not prepared to speak to that here today.

12:11:20 21 Q Well, let's go back to your declaration then
12:11:25 22 and maybe we can get back to something you'll want
12:11:28 23 to talk about.

12:11:32 24 In paragraph 48 of your first declaration
12:11:37 25 that's been marked as Exhibit 1 -- are you with me?

12:11:40 1 That's in the Section D on page 14.

12:11:44 2 A Yes.

12:11:45 3 Q Okay. And it says, "In my opinion, the
12:11:56 4 plain and ordinary meaning of the term 'a gas volume
12:12:01 5 recycled in the second permeate stream and in the
12:12:04 6 third retentate stream totals less than 60 percent
12:12:07 7 by volume of accrued gas stream' to a person of
12:12:11 8 ordinary skill in the art is 'a volume of recycled
12:12:16 9 gas in the second permeate stream and third
12:12:19 10 retentate stream totals less than 60 percent by
12:12:22 11 volume of accrued gas stream.'"

12:12:24 12 Do you see that?

12:12:24 13 A I do.

12:12:25 14 Q Okay. So that -- so the disputed claim term
12:12:30 15 is "a gas volume recycled in the second permeate
12:12:36 16 stream and in the third retentate stream totals less
12:12:41 17 than 60 percent by volume of a crude gas stream."

12:12:44 18 Do you see that?

12:12:44 19 A That's correct.

12:12:45 20 Q And your opinion is that the plain and
12:12:47 21 ordinary meaning of that to a person of ordinary
12:12:49 22 skill in the art is a volume of recycled gas in the
12:12:52 23 second permeate stream and third retentate stream
12:12:56 24 totals less than 60 percent by volume of a crude gas
12:13:00 25 stream. Is that right?

12:13:01 1 A That's correct.

12:13:02 2 Q Okay. What is the plain and ordinary
12:13:09 3 meaning of volume to you?

12:13:09 4 A So within the context of the specification,
12:13:14 5 this is referring to a volumetric flow rate that's
12:13:19 6 being evaluated at some standard condition.

12:13:24 7 Q Okay. But let me go back. Outside of the
12:13:38 8 context of the patent, what is your understanding --
12:13:41 9 what is the meaning of volume to you?

12:13:53 10 A What context -- in what context?

12:13:58 11 Q In the context of chemical engineering?

12:14:02 12 A I'm sorry. I missed that.

12:14:03 13 Q In the context of chemical engineering?

12:14:06 14 A Within the context of chemical engineering,
12:14:10 15 you know, volume can refer to, you know, the amount
12:14:18 16 of space that some particular material takes up.

12:14:22 17 Q Okay. And that's measured in three
12:14:26 18 dimensions, right, meters cubed, feet cubed, liters,
12:14:30 19 right?

12:14:30 20 A Correct.

12:14:31 21 Q And a POSITA would have understood volume to
12:14:38 22 mean what you just said, right?

12:14:45 23 MR. LIPPERT: Can I just object? Did you
12:14:47 24 say -- could I have that read back? I wasn't sure
12:14:54 25 who you were referring to, John.

12:14:58 1 BY MR. LANE:

12:14:58 2 Q How would a POSITA have understood volume in
12:15:02 3 May 2011, the term "volume"?

12:15:05 4 MR. LIPPERT: That was the word I -- it's
12:15:09 5 the way you pronounced POSITA. Sorry.

12:15:13 6 MR. LANE: I want to have a clear record
12:15:14 7 without counsel objecting. If you need to make an
12:15:19 8 objection, make an objection. But how --

12:15:21 9 MR. LIPPERT: I'm just trying to make a
12:15:23 10 clarification. You're calling POSITA and that's not
12:15:26 11 the word. I was just asking you just to spell it
12:15:30 12 because I don't pronounce it that way. I'm sorry.
12:15:33 13 I want a clear record also.

12:15:34 14 BY MR. LANE:

12:15:35 15 Q Do you understand, Dr. Geise, what I mean by
12:15:37 16 POSITA?

12:15:38 17 A You're referring to a person of skill in the
12:15:41 18 art.

12:15:41 19 Q Yes. Okay. So you understand that. So how
12:15:44 20 would a person of ordinary skill in the art, or a
12:15:46 21 POSITA, have understood the word "volume" in
12:15:51 22 May 2011?

12:15:53 23 A In the absence of any other context to speak
12:15:56 24 one way or the other, you know, one way of looking
12:16:00 25 at that would be, you know, in that space-filling

12:16:04 1 analogy that we just talked about.

12:16:07 2 Q So a POSITA in May 2011 would have
12:16:10 3 understood volume to be measured in three
12:16:13 4 dimensions, for example, meters cubed or feet cubed?

12:16:16 5 MR. LIPPERT: Object to the form.

12:16:17 6 A That would be one -- one interpretation that
12:16:22 7 would be consistent, yes.

12:16:24 8 Q And volume and volumetric flow rate are not
12:16:37 9 the same thing, correct?

12:16:42 10 A They can be interpreted differently. Again,
12:16:47 11 this is a question of sort of which context, you
12:16:51 12 know, things are being used.

12:16:53 13 Q Do you teach chemical engineering classes to
12:16:58 14 undergraduates?

12:17:00 15 A I have.

12:17:01 16 Q And to graduate students?

12:17:03 17 A Yes.

12:17:03 18 Q Okay. And in those classes, would you tell
12:17:06 19 your students that volume and volumetric flow rate
12:17:09 20 are the same thing?

12:17:16 21 A I would likely teach that specifying flow
12:17:23 22 rate would be useful.

12:17:24 23 Q And well, that's not my question. My
12:17:28 24 question is would you tell your students that volume
12:17:30 25 and volumetric flow rate are the same thing?

12:17:36 1 A No, I would not say that as a -- as an
12:17:39 2 isolated specific the way that it was stated.

12:17:44 3 Q Okay. And volumetric flow rate has
12:17:47 4 different units than volume, correct?

12:17:50 5 A It does.

12:17:50 6 Q Volumetric flow rate is measured in, for
12:17:57 7 example, meters cubed per second?

12:18:02 8 A That would be an appropriate unit set for
12:18:06 9 volumetric flow rate.

12:18:08 10 Q So volumetric flow rate, in other words, is
12:18:10 11 -- the units are volume per time, correct?

12:18:16 12 A Yes.

12:18:16 13 Q Can I turn you over to Exhibit 2, your
12:19:54 14 second declaration, and paragraph 24?

12:20:02 15 A Yes.

12:20:06 16 Q Okay. And in the first sentence there, you
12:20:09 17 say, "Moreover, a person of ordinary skill in the
12:20:12 18 art would also have been able to measure the
12:20:16 19 required volumes in a real-world apparatus."

12:20:19 20 Do you see that?

12:20:19 21 A Yes.

12:20:20 22 Q Okay. In a real-world membrane gas
12:20:24 23 separation apparatus, a gaseous volume depends on
12:20:28 24 where it's measured, correct?

12:20:37 25 A Depending on how the volume is represented,

12:20:42 1 that can be true.

12:20:46 2 Q In a real-world membrane gas separation
12:20:53 3 apparatus, volume depends on various factors,
12:20:56 4 correct?

12:21:01 5 A Yes.

12:21:02 6 Q And those factors could include the length
12:21:06 7 of the pipe, the inside diameter of the pipe, or the
12:21:10 8 pressure and temperature where the volume is
12:21:13 9 measured, right?

12:21:29 10 A Yes, those would be factors that can
12:21:31 11 influence the calculation of volume as we've been
12:21:35 12 discussing it in that space-filling context, yes.

12:21:39 13 Q In a real-world membrane gas separation
12:21:53 14 apparatus, volume can vary depending on where it's
12:21:57 15 measured, correct?

12:22:10 16 A Well, inherently if one is measuring
12:22:13 17 strictly the volume in some constrained space, then
12:22:18 18 yes, the choice of that -- that environment becomes
12:22:23 19 important for defining that particular volume, which
12:22:27 20 is why oftentimes people will use, you know, a
12:22:31 21 standard state approach which alleviates those
12:22:36 22 particular concerns.

12:22:37 23 Q Real-world membrane gas separation
12:22:51 24 apparatuses don't operate at standard states
12:22:54 25 necessarily, correct? Or let me strike that.

12:23:00 1 Real-world gas separation membrane
12:23:03 2 apparatuses don't operate at standard conditions
12:23:05 3 necessarily, correct?

12:23:09 4 A Oftentimes processes are running at
12:23:11 5 different -- at different conditions, which is why
12:23:17 6 using standard states is known to be important to
12:23:22 7 perfectly address that -- that issue.

12:23:24 8 Q Okay. So when you said different conditions
12:23:26 9 there, you meant that real-world membrane gas
12:23:29 10 separation apparatuses are often run on conditions
12:23:33 11 that are not standard conditions, correct?

12:23:35 12 A You could have different -- you know, the
12:23:39 13 patent discusses this as well, right. You can have
12:23:41 14 different temperatures or different pressures in a
12:23:45 15 system and the standard states allow you to account
12:23:48 16 for those differences.

12:23:49 17 Q In real-world membrane gas separation
12:24:03 18 apparatuses, volumetric flow rates depend on several
12:24:09 19 factors, correct?

12:24:16 20 A I'd say in real-world, yes, separation
12:24:20 21 apparatuses, it is -- it is common to refer to
12:24:23 22 volumetric flow rates using the standard state to
12:24:28 23 ultimately alleviate some of the issues that would
12:24:35 24 be a factor if the volumes were -- were looked at in
12:24:40 25 the absence of using the standard states.

12:24:42 1 Q And the standard states are used because the
12:24:46 2 actual volumetric flow rates are not in standard
12:24:49 3 states, correct?

12:24:51 4 A That's correct.

12:24:51 5 Q And measuring an actual volumetric flow rate
12:24:58 6 in an actual real-world membrane gas separation
12:25:02 7 apparatus depends, for example, on the size of the
12:25:07 8 opening where the flow rate is measured, correct?

12:25:10 9 A So a typical, a flow meter, for example,
12:25:15 10 that would be used to measure a flow rate in a
12:25:19 11 real-world gas apparatus, you know, has -- has
12:25:27 12 geometrical considerations that are defined and
12:25:30 13 built into the way that the analysis is done. So in
12:25:33 14 that sense, the tools that one would use to
12:25:36 15 characterize that would take into account those
12:25:40 16 factors.

12:25:42 17 Q So to measure an actual volumetric -- let me
12:25:52 18 strike that.

12:25:55 19 Actual volumetric flow rates in real-world
12:25:59 20 membrane gas separation apparatuses depend on the
12:26:06 21 size of the opening where the flow rates are
12:26:09 22 measured, is that correct?

12:26:12 23 A Yes.

12:26:13 24 Q Okay. And actual volumetric flow rates in
12:26:19 25 real-world membrane gas separation apparatuses

12:26:24 1 depend on the temperature and pressure where they're
12:26:28 2 measured, correct?

12:26:32 3 A When we're talking about volume as the
12:26:35 4 absolute space-filling thing, not at the standard
12:26:38 5 state conditions, then yes.

12:26:39 6 Q In paragraph 24 of your second declaration
12:27:14 7 that's been marked as Exhibit 2, there's a sentence
12:27:20 8 about halfway. It says, "A person of ordinary skill
12:27:24 9 in the art would also have known the effects of a
12:27:27 10 pressure reducing valve and a resulting change in
12:27:31 11 temperature (Joule-Thomson effect), a T-joint, and
12:27:36 12 changes in pipe diameter."

12:27:39 13 Do you see that?

12:27:39 14 A I see that, uh-huh.

12:27:40 15 Q And what would a person of ordinary skill in
12:27:45 16 the art have known the effects of a pressure
12:27:47 17 reducing valve and resulting change in temperature,
12:27:51 18 a T-joint and a change in pipe diameter to be in
12:27:54 19 terms of actual volumetric flow rates?

12:27:58 20 A Well, so for example, the -- you know, let's
12:28:05 21 take the reducing valve. So you'd flow a gas
12:28:11 22 through a pressure reducing valve and you'd expect
12:28:14 23 to see a decrease in the temperature. That decrease
12:28:19 24 in temperature then can ultimately influence the
12:28:22 25 absolute volume of that material. So that would be

12:28:29 1 one example of how this plays out.

12:28:32 2 In terms of T-joints or changes in pipe
12:28:35 3 diameter, you know, you have various factors that
12:28:39 4 are involved there that are taught, you know,
12:28:44 5 related to pressure drops in those systems. You
12:28:49 6 know, that would be things that are, you know,
12:28:53 7 taught and learned about in terms of, say, a
12:28:55 8 chemical engineering curriculum.

12:28:57 9 Q Okay. So a pressure reducing valve in a
12:29:04 10 stream can change the volumetric flow rate in the
12:29:08 11 stream, is that correct?

12:29:10 12 A If we're talking about volumetric flow rate
12:29:12 13 in terms of, you know, absolute and not standard
12:29:16 14 state conditions, then -- then it can.

12:29:19 15 Q Okay. So in a real-world membrane gas
12:29:22 16 separation apparatus, the actual volumetric flow
12:29:27 17 rate in a stream can be changed by a pressure
12:29:30 18 reducing valve, is that right?

12:29:32 19 A On that absolute basis, yes.

12:29:35 20 Q And a T-joint can also change the volumetric
12:29:40 21 flow rate in a stream, correct?

12:29:42 22 A You know, in a circumstance where that, you
12:29:45 23 know, creates changes to things like pressure, for
12:29:50 24 example, then again, you know, this is where the --
12:29:57 25 you know, the standard state approach to things

12:29:59 1 takes these things into consideration. But in the
12:30:02 2 absence of that, then, you know, the change in
12:30:05 3 pressure, for example, coming out of that T-joint
12:30:07 4 could have that effect.

12:30:08 5 Q And similarly, a change in pipe diameter
12:30:15 6 stream in a real-world membrane gas separation
12:30:18 7 apparatus could change the actual volumetric flow
12:30:22 8 rate in the stream, correct?

12:30:25 9 A Similar to the other ones, yes, in the
12:30:27 10 absence of that, you know, standard state
12:30:31 11 adjustment, that could affect that.

12:30:32 12 Q So in a real-world membrane gas separation
12:30:37 13 apparatus, there can be different volumetric flow
12:30:41 14 rates in the same stream, correct, actual volumetric
12:30:47 15 flow rates?

12:30:47 16 A If we're looking at the actual absolute
12:30:50 17 volumes and not applying that standard state
12:30:52 18 consideration, then these sorts of things, you know,
12:30:57 19 can have influences. But, you know, as explained in
12:31:01 20 my declaration, you know, these are also factors
12:31:05 21 that a person of ordinary skill in the art would
12:31:08 22 know how to work with and address.

12:31:11 23 Q But to be clear, the actual volumetric flow
12:31:21 24 rates in a stream can be different at different
12:31:25 25 points in the stream, correct?

12:31:26 1 A The absolute volumetric flow rates in that
12:31:29 2 context could be.

12:31:31 3 Q And they could vary significantly in the
12:31:33 4 same stream, the volumetric flow rates, correct?

12:31:36 5 A It would depend on the nature of what was
12:31:39 6 being done in the process, but one could -- one
12:31:42 7 could certainly imagine extreme circumstances, I
12:31:48 8 suppose.

12:31:48 9 Q Could the actual volumetric flow rates in
12:32:32 10 the same stream at different points in the stream
12:32:36 11 vary by more than 25 percent?

12:32:42 12 MR. LIPPERT: Object to the form.

12:32:44 13 A I think there are certainly conditions or
12:32:54 14 physical things that could be done to the stream to
12:32:59 15 cause that to happen.

12:33:02 16 Q And you gave some examples of those things
12:33:05 17 like a pressure reducing valve, a T-joint, or a
12:33:08 18 change in pipe diameter, correct?

12:33:09 19 A Those would be -- well, at the very least,
12:33:15 20 you know, certainly adjusting pipe diameter, you
12:33:20 21 know, could do that. It depends on the nature of
12:33:23 22 the specific example that's being considered.

12:33:25 23 Q Are there other things other than the things
12:33:28 24 you mentioned in paragraph 24 that could change the
12:33:31 25 volumetric flow rate in a stream?

12:33:34 1 A There may be. I'm -- there might be other
12:33:57 2 things that could happen.

12:33:59 3 Q Okay. And if you need to go back to
12:34:09 4 Exhibit 4, the '038 patent, feel free to in the
12:34:14 5 claims. But the claims in the patent require
12:34:17 6 comparing the volumes of the recycle streams to the
12:34:22 7 volume of the crude stream, right?

12:34:31 8 A That's correct.

12:34:35 9 Q Okay. And the claims in the '038 patent
12:34:41 10 don't say where to measure the volume of the crude
12:34:44 11 gas, correct?

12:34:47 12 A Well, they specify the streams that are
12:34:49 13 being considered, so it's telling someone which
12:34:55 14 streams you're measuring. So that's a specification
12:35:00 15 of where.

12:35:02 16 Q Okay. Okay. The claims in the '038 patent
12:35:06 17 don't say where in the crude stream to measure the
12:35:11 18 volume, correct?

12:35:13 19 A The specification doesn't, you know,
12:35:16 20 explicitly say, you know, go this many feet from
12:35:20 21 this point and measure it here.

12:35:23 22 Q I asked about the claims, but you said the
12:35:26 23 specification, but I was going to ask about that
12:35:28 24 next so maybe we'll just combine it.

12:35:30 25 So let's just say -- let's just say the

12:35:32 1 intrinsic evidence overall, you understand that's
12:35:34 2 the claims, the specification, the prosecution
12:35:36 3 history, right?

12:35:37 4 A Yes.

12:35:37 5 Q Okay. Does the intrinsic evidence of the
12:35:43 6 '038 patent say where in the crude gas stream to
12:35:48 7 measure the volumes?

12:35:56 8 A The intrinsic evidence, you know, suggests
12:36:00 9 that that volume would be measured in that stream,
12:36:03 10 but it does not explicitly specify a precise
12:36:08 11 location for doing that measurement.

12:36:10 12 Q Okay. And the intrinsic evidence of the
12:36:17 13 '038 patent doesn't say where to measure the volume
12:36:22 14 in the second retentate stream, right?

12:36:26 15 A The intrinsic evidence is not explicitly
12:36:30 16 specifying where that is supposed to be measured in
12:36:35 17 some sort of, you know, precise evidence. You know,
12:36:41 18 a person of ordinary skill in the art practicing the
12:36:43 19 invention though would -- would understand, you
12:36:49 20 know, how to do these sorts of measurements, but the
12:36:51 21 intrinsic evidence does not explicitly give a
12:36:55 22 precise location.

12:36:56 23 Q And the intrinsic evidence for the '038
12:37:00 24 patent doesn't say where to measure the volume in
12:37:04 25 the third permeate stream, correct?

12:37:06 1 A Similar to the others, the intrinsic
12:37:09 2 evidence does not -- not explicitly suggest a
12:37:13 3 precise location outside of the stream.

12:37:17 4 Q Thanks. The intrinsic evidence in the '038
12:37:21 5 patent doesn't say where to measure the volumetric
12:37:26 6 flow rate of the crude gas stream, right?

12:37:37 7 A I'm sorry. Could you repeat that?

12:37:39 8 Q Let me go back because I think we made an
12:37:42 9 error. So we have a clear record, I'm sorry to ask
12:37:45 10 you again. I think I flipped permeate and
12:37:49 11 retentate. Bad habit.

12:37:50 12 Again, the intrinsic evidence in the '038
12:37:53 13 patent doesn't say where to measure the volume of
12:38:06 14 the second permeate stream, correct?

12:38:12 15 A The intrinsic evidence does not give a
12:38:14 16 precise location outside of the stream for that.

12:38:17 17 Q And the intrinsic evidence in the '038
12:38:21 18 patent doesn't say where to measure the volume of
12:38:24 19 the third retentate stream, correct?

12:38:29 20 A No, the intrinsic evidence does not
12:38:33 21 explicitly give a precise location outside of just
12:38:36 22 in that stream.

12:38:37 23 Q And the intrinsic evidence of the '038
12:38:41 24 patent doesn't say where to measure the volumetric
12:38:44 25 flow rates of the crude gas stream, correct?

12:38:50 1 A The intrinsic evidence doesn't give a
12:38:55 2 precise location for that. The examples given in
12:38:59 3 the specification, you know, do suggest the location
12:39:05 4 for where -- where those would be measured.

12:39:09 5 Q The intrinsic evidence of the '038 patent
12:39:15 6 doesn't say where to measure the volumetric flow
12:39:19 7 rate of the second permeate stream, correct?

12:39:25 8 A Aside from being given that it's being
12:39:27 9 measured in that stream, it does not -- the
12:39:30 10 intrinsic evidence does not explicitly state that.

12:39:33 11 Q And the intrinsic evidence in the '038
12:39:36 12 patent doesn't say where to measure the volumetric
12:39:41 13 flow rate of the third retentate stream, right?

12:39:44 14 A No, the intrinsic evidence does not give an
12:39:48 15 explicit location for where to make that
12:39:51 16 measurement.

12:39:52 17 Q And a minute ago you talked about the
12:39:56 18 examples and I can't remember what you said. Can
12:40:00 19 you tell me again what you said about the examples
12:40:01 20 and measuring the volume or volumetric flow rates?

12:40:08 21 MR. LIPPERT: Object to the form.

12:40:37 22 A I'm sorry. I was just referring to an
12:40:40 23 example being comparative example 1, you know, where
12:40:46 24 it's giving a flow rate that's being measured and
12:40:50 25 it's -- or sorry. I'll just read it. 1.78 cubic

12:40:56 1 meters per hour of a crude gas mixture of 50 percent
12:40:59 2 methane and 50 percent carbon dioxide which
12:41:03 3 corresponds approximately to a gas mixture of biogas
12:41:06 4 is introduced into a mixing chamber which is not
12:41:09 5 shown in Figure 11; so just suggesting via that
12:41:14 6 example a little bit more of a suggestion of
12:41:18 7 location.

12:41:23 8 Q And that's for the crude gas stream,
12:41:25 9 correct?

12:41:26 10 A That's correct.

12:41:26 11 Q It's not for the second -- that doesn't
12:41:29 12 pertain to the second permeate or third retentate
12:41:34 13 streams, correct?

12:41:35 14 A That specific passage that I just read is
12:41:41 15 just referring to the crude gas mixture or crude gas
12:41:45 16 stream.

12:41:45 17 Q Is there anything else in the examples that
12:41:48 18 suggest to you where to measure the volumes or
12:41:52 19 volumetric flow rates in the crude gas stream, the
12:41:56 20 second permeate stream, or the third retentate
12:42:07 21 stream?

12:42:07 22 A There's similar language in the other
12:42:29 23 examples related to the crude gas stream, but not in
12:42:33 24 terms of the other -- other streams.

12:42:58 25 Q The intrinsic evidence of the '038 patent

12:43:01 1 doesn't say to measure the volume or volumetric flow
12:43:07 2 rate of the crude gas stream in standard conditions,
12:43:10 3 correct?

12:43:15 4 A The values that are given in the examples
12:43:21 5 would lead a person of ordinary skill in the art to
12:43:25 6 understand that that is how those volumes are being
12:43:27 7 considered.

12:43:29 8 Q Why do you say that?

12:43:30 9 A So the -- you know, the way that the
12:43:42 10 comparative examples are structured, they have
12:43:46 11 volumetric flow rates that are specified. And if
12:43:50 12 one were to take those values and go and do a
12:43:56 13 relatively straightforward material balance, like
12:44:00 14 one would do in chemical engineering undergraduate
12:44:05 15 course work, you would come to the conclusion that
12:44:11 16 for applying those values to the process described
12:44:15 17 in the patent that those values are being considered
12:44:20 18 at some sort of standard state where the expected,
12:44:25 19 for example, temperature changes are being taken
12:44:29 20 into account.

12:44:30 21 Q Did you do -- you didn't include any types
12:44:34 22 of those mass balances in your declarations,
12:44:37 23 correct?

12:44:37 24 A I didn't explicitly put an example of that
12:44:41 25 in the declaration.

12:44:42 1 Q Did you do any kind of mass balance like
12:44:46 2 that in connection with your work in this case?

12:44:48 3 A Yes. I have worked through the material
12:44:51 4 balances for the examples.

12:44:53 5 Q But you didn't put them in your report?

12:44:56 6 A I did not.

12:44:57 7 Q Does the specification or the claims of the
12:45:07 8 '038 patent ever mention standard conditions?

12:45:17 9 A So the claims of the specification of the
12:45:21 10 patent, you know, do not have, you know, explicit,
12:45:26 11 you know, verbal language that, you know, specifies
12:45:30 12 that. However, within the context of the field that
12:45:34 13 a person of ordinary skill would be fluent in, and
12:45:38 14 within the way the information is being presented
12:45:43 15 within the specifications, specifically the
12:45:47 16 examples, you know, a person of ordinary skill in
12:45:50 17 the art would have been able to look at that and
12:45:52 18 recognize that that sort of analysis is being
12:45:56 19 applied in the system.

12:45:59 20 Q But you -- in your declarations, you didn't
12:46:03 21 address that concept, right? You never talked about
12:46:06 22 standard conditions in your declarations, correct?

12:46:07 23 A No, it's not -- that is not discussed in the
12:46:10 24 declaration.

12:46:11 25 Q And standard conditions are not mentioned in

12:46:14 1 the patent anywhere, the '038 patent, correct?

12:46:17 2 A They're not explicitly mentioned, no.

12:46:20 3 Q And do you recall standard conditions ever
12:46:24 4 being mentioned in the prosecution history?

12:46:26 5 A You know, there definitely are examples of
12:46:31 6 some of the prior art patents where, you know,
12:46:34 7 volumetric flow rates are explicitly given in units
12:46:38 8 where standard state is referenced. And so in some
12:46:43 9 of the -- in some of the examples that do show up in
12:46:47 10 the prior art and throughout the prosecution
12:46:49 11 history, there is some evidence of that.

12:46:51 12 Q Okay. So in those prior art examples, in
12:46:54 13 the prosecution history, it was specified that the
12:46:59 14 flow rates were at standard conditions, correct?

12:47:01 15 A There are definitely, you know, other
12:47:05 16 patents where that is explicitly mentioned.

12:47:07 17 Q And that's in contrast to the '038 patent
12:47:11 18 which doesn't mention standard conditions at all,
12:47:13 19 correct?

12:47:15 20 A The '038 patent doesn't explicitly state
12:47:19 21 that, but does demonstrate that through the use of
12:47:21 22 its examples.

12:47:22 23 Q And again, you haven't put anything in your
12:47:31 24 declarations, any mass balance or any discussion
12:47:34 25 showing that the examples in the '038 patent are at

12:47:40 1 standard conditions, correct?

12:47:41 2 A I did not put any of those examples in the
12:47:44 3 declaration.

12:47:46 4 Q And you haven't cited any extrinsic evidence
12:48:10 5 discussing where to measure the volume or the
12:48:15 6 volumetric flow rate in the crude gas streams,
12:48:18 7 correct?

12:48:21 8 A I don't believe I cited any extrinsic
12:48:25 9 evidence to that point. In my opinion, that would
12:48:30 10 have been something that would have been apparent to
12:48:31 11 a person of ordinary skill in the art as to how to
12:48:35 12 go about doing that.

12:48:35 13 Q So it would have been apparent, but you
12:48:37 14 didn't offer any evidence in support of that?

12:48:40 15 A I did not.

12:48:41 16 Q Okay. And you didn't offer or cite any
12:48:45 17 extrinsic evidence saying that the volume or the
12:48:52 18 volumetric flow rate of the second -- strike that.

12:48:57 19 You didn't cite or discuss any extrinsic
12:49:01 20 evidence talking about where to measure the volume
12:49:04 21 or the volumetric flow rate of the second permeate
12:49:08 22 stream, correct?

12:49:09 23 A That's correct.

12:49:09 24 Q Okay. And you didn't cite or discuss any
12:49:14 25 extrinsic evidence talking about where to measure

12:49:16 1 the volume or the volumetric flow rate of the third
12:49:19 2 retentate stream, correct?

12:49:20 3 A That's correct.

12:49:22 4 Q Let me turn you to paragraph 25 in your
12:50:37 5 January 15th declaration that's been marked as
12:50:41 6 Exhibit 2.

12:50:44 7 A You said 25?

12:50:46 8 Q Yeah. And I'm -- it's at the bottom of
12:50:49 9 page 7 and top of page 8. Do you see that?

12:50:52 10 A I'm there.

12:50:53 11 Q Okay. And it says, "In my opinion,
12:50:58 12 considered in the context of Figure 11 and
12:51:02 13 fundamental principles of gas flows, a person of
12:51:05 14 ordinary skill in the art would have known the most
12:51:08 15 reasonable place to measure the required volumes
12:51:12 16 would be at the second permeate stream where it
12:51:16 17 leaves the retentate separation stage 2."

12:51:21 18 Do you see that?

12:51:22 19 A Yes.

12:51:22 20 Q Okay. And there's nothing in the intrinsic
12:51:26 21 evidence for the '038 patent saying to measure the
12:51:30 22 volume of the second permeate stream where it leaves
12:51:35 23 the retentate separation stage, correct?

12:51:38 24 A That's correct. The intrinsic evidence does
12:51:41 25 not state that.

12:51:42 1 Q And the intrinsic evidence for the '038
12:51:46 2 patent does not say to measure the volumetric flow
12:51:51 3 rate of the second permeate stream where it leaves
12:51:54 4 the retentate separation stage, right?

12:51:57 5 A Correct. It does not explicitly state that.

12:52:00 6 Q Okay. And the intrinsic evidence of the
12:52:03 7 '038 patent does not say to measure the volume or
12:52:07 8 volumetric flow rate of the third retentate stream
12:52:12 9 where it leaves permeate separation stage three,
12:52:16 10 correct?

12:52:17 11 A That's correct, it does not explicitly state
12:52:20 12 that.

12:52:20 13 Q The intrinsic evidence of the '038 patent
12:52:24 14 does not say to measure the volume or the volumetric
12:52:31 15 flow rate of the crude gas stream at a point where
12:52:33 16 it enters the apparatus, correct?

12:52:36 17 A That's correct. It does not explicitly
12:52:39 18 state that.

12:52:40 19 Q And if the volume or volumetric flow rate of
12:52:44 20 the second permeate stream was measured where it
12:52:48 21 leaves the retentate separation stage in a
12:52:51 22 real-world membrane gas separation apparatus, that
12:52:55 23 measurement would not be at standard conditions,
12:52:57 24 correct?

12:53:07 25 A So in my opinion, a person of ordinary skill

12:53:11 1 would make that measurement at that location
12:53:16 2 consistent with how, you know, things were typically
12:53:20 3 done in the field, would make that measurement. You
12:53:23 4 know, the flow meter or some other analysis approach
12:53:26 5 would be taken to convert that to the standard state
12:53:29 6 conditions and that would all be done as part of
12:53:32 7 monitoring the process operations. And in that --
12:53:35 8 from that perspective, you know, it remains my
12:53:39 9 opinion that that would be what a person of ordinary
12:53:41 10 skill in the art would do.

12:53:46 11 Q So in your opinion, in a real-world membrane
12:53:49 12 gas separation apparatus, a person of ordinary skill
12:53:53 13 in the art would have measured the volume or
12:53:56 14 volumetric flow rate of the second permeate stream
12:54:00 15 where it leaves the retentate separation stage?

12:54:07 16 A I'm sorry. I just want to make sure I got
12:54:09 17 you correctly. Could you repeat that?

12:54:11 18 Q Yes, it's a lot. But in your opinion, a
12:54:14 19 person of ordinary skill in the art would have
12:54:17 20 measured the volume or volumetric flow rate of the
12:54:21 21 second permeate stream where it leaves the retentate
12:54:25 22 separation stage, right?

12:54:30 23 A That's where -- that's where I think it
12:54:32 24 would be, you know, most reasonable to go in and
12:54:35 25 install a flow meter, you know, at that location.

12:54:39 1 Q Okay. And a flow meter installed at that
12:54:41 2 location would measure the actual flow rate, not the
12:54:45 3 flow rate of standard conditions, right?

12:54:48 4 A It would have the ability to do both.

12:54:52 5 Q But what it would be measuring would be the
12:54:56 6 actual flow rate at the actual conditions, correct?

12:55:01 7 A It would be determining that. I mean, most
12:55:03 8 of the -- a lot of flow meters actually directly
12:55:06 9 measure other things, but it would be then doing
12:55:09 10 calculations and could spit that out at standard
12:55:12 11 state conditions or at other -- or just at the
12:55:17 12 process conditions at that point.

12:55:21 13 Q And by process conditions, you mean the
12:55:24 14 actual process conditions, not the standard -- not
12:55:27 15 standard conditions, correct?

12:55:29 16 A Correct.

12:55:30 17 Q And the same would be true for a flow meter
12:55:35 18 in the third retentate stream where it leaves the
12:55:37 19 permeate separation stage and a flow meter in the
12:55:41 20 crude gas stream at a point where it enters the
12:55:43 21 apparatus, right?

12:55:45 22 A Yes.

12:55:46 23 Q You haven't pointed to any extrinsic
12:56:01 24 evidence saying that a person of ordinary skill in
12:56:04 25 the art would have measured the volumes at the

12:56:08 1 points you're saying they should be measured in

12:56:11 2 paragraph 25 of your report, correct?

12:56:13 3 A I haven't pointed at any extrinsic evidence

12:56:17 4 there. You know, I think from my perspective and

12:56:21 5 thinking about how these systems are operated, you

12:56:24 6 know, the common sense locations would be to do it

12:56:27 7 in that way. And so that forms my opinion on what a

12:56:31 8 person of ordinary skill would do in this situation.

12:56:35 9 Q So is it your opinion that the claims of the

12:56:57 10 '038 patent should be interpreted such that the

12:57:04 11 volumes or volumetric flow rates in the second

12:57:07 12 permeate stream, third retentate stream, and crude

12:57:11 13 gas stream are measured at the points you say they

12:57:15 14 should be measured in paragraph 25 of your second

12:57:18 15 declaration that's been marked as Exhibit 2?

12:57:28 16 A It's my opinion that a person of ordinary

12:57:31 17 skill in the art, you know, reading the patent and

12:57:34 18 understanding that would -- would -- you know, could

12:57:40 19 choose to do that or it would be reasonable for them

12:57:43 20 to choose to do that in the course of practicing the

12:57:46 21 invention and operating one of these processes.

12:57:49 22 Q Okay. So I understand your answer about

12:58:05 23 practicing one of these processes, but how would a

12:58:08 24 person of ordinary skill in the art determine if a

12:58:13 25 particular real-world membrane gas separation

12:58:15 1 apparatus met the requirements in claim 1 of the
12:58:20 2 patent and the requirements regarding the volumes
12:58:24 3 that we've been talking about in the crude gas
12:58:26 4 stream, the second --

12:58:29 5 A So a person of ordinary skill in the art
12:58:31 6 would know that, you know, flow meters exist that
12:58:39 7 are capable of measuring this type of information.
12:58:42 8 You know, informed by the examples in the
12:58:47 9 specification and informed by common practice in the
12:58:52 10 field, you know, they would obtain flow meters,
12:58:58 11 install them in the apparatus. I think, you know, a
12:59:02 12 common sense location, you know, for doing that
12:59:04 13 would be, you know, around the process streams.

12:59:08 14 But also given their training in the field
12:59:11 15 to recognize the effects of things like pressure and
12:59:14 16 temperature and also, you know, coming from that
12:59:18 17 information that's in the examples in the patent,
12:59:23 18 they would be doing these comparisons using the
12:59:26 19 standard state values which then, you know,
12:59:29 20 alleviate concerns over just where those meters are
12:59:35 21 positioned. Again, that would allow them to
12:59:38 22 validate it through the same sort of approach that
12:59:41 23 is used in the examples in the patent. And that
12:59:45 24 sets up a situation where I think it's very
12:59:48 25 reasonable that a person of ordinary skill in the

12:59:51 1 art could go in and obtain the information and make
12:59:54 2 the comparisons that would allow them to do that
12:59:57 3 evaluation.

12:59:58 4 Q In paragraph 25, have you ever measured
13:00:17 5 volumes in a real-world membrane gas separation
13:00:20 6 apparatus?

13:00:24 7 A I guess I haven't measured gas flows in a
13:00:27 8 membrane separation process, but I have measured gas
13:00:30 9 flows in pipes and other apparatuses. As a graduate
13:00:36 10 student in the chemical processing lab, I actually
13:00:41 11 was responsible for the gas flow monitoring
13:00:44 12 experiment. And so we led the students through a
13:00:48 13 number of experiments where we were measuring gas
13:00:50 14 flows. There were no membranes in that process, but
13:00:53 15 we had to -- had to use a bunch of flow meters and
13:00:57 16 think about the ways that you analyze that data.

13:00:59 17 Q And you're talking about volumetric flow
13:01:02 18 rates, not volumes, right?

13:01:04 19 A We were mostly measuring flow rates in that
13:01:07 20 experiment.

13:01:08 21 Q Have you ever advised anyone on where to
13:01:31 22 measure volumes or volumetric flow rates in a
13:01:34 23 real-world membrane gas separation apparatus?

13:01:39 24 A I guess not in a gas separation process, but
13:01:44 25 you know, I have been involved in experimental

13:01:46 1 design where we've talked about, you know,
13:01:48 2 positioning of flow meters relative to, you know,
13:01:52 3 membrane separations or other types of processes.
13:01:56 4 But I guess those were in liquid examples.

13:01:59 5 Q At the end of paragraph 25 in your second
13:02:06 6 declaration, your January 15th declaration, it says,
13:02:10 7 "This process information could be determined using
13:02:13 8 software commonly used in the field to assist with
13:02:16 9 monitoring and measuring of volume flows in similar
13:02:20 10 apparatuses. "

13:02:21 11 Do you see that?

13:02:21 12 A Uh-huh, yes.

13:02:22 13 Q What software are you referring to there?

13:02:25 14 A So there's a wide range of, you know,
13:02:29 15 process control software that's used industrially.
13:02:36 16 You know, I wouldn't want to necessarily speak to
13:02:40 17 any one in particular, but process control software
13:02:44 18 has been used for decades and would commonly be used
13:02:50 19 in a lot of chemical processing, you know, for
13:02:54 20 keeping track of flow rates in streams and would be
13:02:58 21 consistent with how a person of ordinary skill would
13:03:02 22 be likely approaching this type of process.

13:03:04 23 Q Did you review or analyze any of that type
13:03:09 24 of software in doing your work in this case?

13:03:11 25 A Outside of being aware that that sort of

13:03:15 1 software exists, I haven't -- you know, I haven't
13:03:18 2 explicitly gone and looked at any software packages
13:03:22 3 along those lines.

13:03:23 4 Q In a real-world membrane gas separation --
13:04:11 5 sorry.

13:04:11 6 In a real-world membrane gas separation
13:04:14 7 apparatus, is it possible that a membrane
13:04:17 8 selectivity can change over time?

13:04:26 9 A It is possible that that could happen.

13:04:29 10 Q In a real-world membrane gas separation
13:04:33 11 apparatus, is it possible that a membrane's
13:04:35 12 permeability can change over time?

13:04:39 13 A It is possible.

13:04:40 14 Q Can phenomena like gas concentration
13:04:48 15 polarization change a membrane's selectivity over
13:04:56 16 time?

13:04:56 17 A I think within the scope of the claims
13:05:03 18 construction process that I'm prepared to speak
13:05:06 19 about today, I'm going to decline to respond in
13:05:10 20 detail to that.

13:05:11 21 Q You're not going to answer my questions that
13:05:14 22 I'm asking you in the deposition?

13:05:17 23 A Does this -- it's unclear to me that the
13:05:23 24 question is within the scope of the claims
13:05:25 25 construction process that I've prepared for.

13:05:29 1 Q So you're not prepared to answer my
13:05:31 2 question? Is that what you're saying?

13:05:32 3 A I've prepared to speak to the things that
13:05:36 4 we've talked about in the declarations and the claim
13:05:40 5 construction terms that we have here. So...

13:05:45 6 Q Membranes in actual gas separation
13:05:51 7 apparatuses have to be changed over time, right?
13:05:54 8 They have to be replaced; they wear out, right?

13:05:58 9 A Certainly within, you know, my experience
13:06:01 10 with desalination membranes, you know, there can be
13:06:05 11 things that occur in those types of systems that
13:06:07 12 cause replacement of membranes over time.

13:06:09 13 Q And the same is true in gas separation
13:06:12 14 apparatuses, right, the membranes need to be
13:06:16 15 replaced over time?

13:06:21 16 A I think that depends quite a bit on the
13:06:24 17 nature of the process. And so, you know, again I'm
13:06:30 18 not quite prepared to speak in detail to that, but I
13:06:33 19 think it would depend on the context of how the
13:06:35 20 membrane was being used.

13:06:37 21 Q Can changes in a membrane's selectivity and
13:07:05 22 permeance affect the volumetric flow rate of the
13:07:10 23 streams in a membrane gas separation apparatus?

13:07:16 24 A I'm sorry. Can you repeat the question,
13:07:20 25 please?

13:07:20 1 Q Yeah. Can changes in a membrane's
13:07:30 2 selectivity and permeability over time affect the
13:07:33 3 volumetric flow rates of the streams in a membrane
13:07:37 4 gas separation apparatus?

13:07:41 5 A Well, it would depend very much on how the
13:07:44 6 process was being run. It is certainly possible
13:07:49 7 that the process could be run in a way to maintain
13:07:55 8 the flows, even as other aspects of the process are
13:08:01 9 changing. So there's a more complicated context to
13:08:05 10 informing that.

13:08:06 11 Q Can changes in a membrane selectivity and
13:08:23 12 permeance over time affect the volumetric flow rate
13:08:27 13 of the second permeate stream in membrane gas
13:08:35 14 separation apparatuses like in the '038 patent?

13:08:39 15 A Again, this all would come down to questions
13:08:42 16 of how the process is being -- being operated
13:08:45 17 because it would be possible to operate a process --
13:08:52 18 it would be conceivable or possible to operate a
13:08:55 19 process to mitigate any sort of changes in response
13:09:00 20 to any of those sorts of factors.

13:09:02 21 Q But it's also possible that the flow rates
13:09:05 22 would change, right, in the -- for example, in the
13:09:09 23 second permeate stream as the membrane's selectivity
13:09:13 24 and permeance change over time?

13:09:16 25 A It would depend on how the process was being

13:09:18 1 run, but it's within the realm of possibility.

13:09:21 2 Q And the same question for the third permeate
13:09:25 3 stream, can changes in a membrane's selectivity and
13:09:29 4 permeance over time affect the volumetric flow rate
13:09:33 5 in the third retentate stream in the types of
13:09:40 6 membrane gas separation apparatuses claimed in the
13:09:43 7 '038 patent?

13:09:45 8 A It would depend again on the way that the
13:09:47 9 process was being run or monitored, but it is within
13:09:51 10 the realm of possibility.

13:09:52 11 Q In a membrane gas separation apparatus like
13:10:03 12 in the claims in the '038 patent, the gas recycle
13:10:09 13 volumetric flow rates and compositions are highly
13:10:13 14 interdependent with other variables, is that
13:10:18 15 correct?

13:10:18 16 A I'm sorry. Could you repeat the question?

13:10:20 17 Q Yeah. In a membrane gas separation
13:10:23 18 apparatus, like in the claims in the '038 patent,
13:10:27 19 the gas recycle volumes and compositions are highly
13:10:31 20 interdependent with other variables?

13:10:34 21 MR. LIPPERT: Object to the form.

13:10:39 22 A Within any sort of, you know, process
13:10:42 23 apparatus, you know, the -- within the context of an
13:10:50 24 entire system, making changes at one part of a
13:10:53 25 system certainly can have influences on other parts

13:10:58 1 and so there is naturally some coupling of some of
13:11:01 2 these -- these process parameters.

13:11:03 3 Q So in a membrane gas separation apparatus
13:11:14 4 like in the claims in the '038 patent, changing
13:11:17 5 various process variables may change the recycle
13:11:22 6 stream's composition and volumetric flow rates,
13:11:24 7 right?

13:11:33 8 A I'm just trying to string together a few
13:11:36 9 different things there. Could you repeat or perhaps
13:11:39 10 maybe we go one thing at a time?

13:11:42 11 Q Okay. So I'm talking about membrane gas
13:11:46 12 separation apparatuses like the ones claimed in the
13:11:48 13 '038 patent. Okay?

13:11:50 14 A Uh-huh.

13:11:51 15 Q You with me on that?

13:11:52 16 A Yes.

13:11:53 17 Q Okay. And in those types of systems,
13:11:57 18 changing various process variables may change the
13:12:02 19 recycle stream's composition and volumetric flow
13:12:06 20 rates, correct?

13:12:08 21 A There are likely some variables that could
13:12:13 22 influence changes on those parameters, yes.

13:12:16 23 Q And changing those variables could change
13:12:31 24 the recycle stream's composition flow rates in
13:12:35 25 unpredictable ways, is that correct?

13:12:38 1 MR. LIPPERT: Object to the form.

13:12:39 2 A It's difficult to speak to that without a
13:12:51 3 little bit more concrete context because I would
13:12:57 4 tend to think that depending on the context, that
13:12:59 5 could go either way.

13:13:01 6 Q So it's possible?

13:13:02 7 A I think so.

13:13:03 8 Q Okay. And again, talking about membrane gas
13:13:08 9 separation apparatuses like those in the claims of
13:13:11 10 the '038 patent -- you with me on that, right?

13:13:14 11 A Uh-huh.

13:13:15 12 Q Okay. If the gas recycle volumetric flow
13:13:21 13 rate was changed, that may change other variables in
13:13:26 14 the apparatus? Is that right?

13:13:40 15 A I think in a typical operation that wouldn't
13:13:42 16 be the -- that wouldn't be the independent variable
13:13:46 17 that would be most likely changed, I guess. So in
13:13:52 18 the form asked, I think that requires a little bit
13:13:55 19 more context to understand exactly how that would
13:14:00 20 go.

13:14:00 21 Q Can changes in variables in a membrane gas
13:14:07 22 separation apparatus, like those claimed in the '038
13:14:11 23 patent, have unexpected effects on other process
13:14:14 24 variables?

13:14:18 25 A I think it is possible for that to be the

13:14:20 1 case.

13:14:20 2 Q Can small changes in a variable in a
13:14:25 3 membrane gas separation apparatus, like those in the
13:14:29 4 '038 patent, have unexpected effects on other
13:14:32 5 process variables?

13:14:34 6 A I think that depends a lot on what the small
13:14:38 7 change is and some of the other contexts that are
13:14:41 8 involved.

13:14:41 9 Q It's possible though, right?

13:14:46 10 A I wouldn't go so far as to say it's
13:14:48 11 impossible.

13:14:49 12 Q Can small changes in a variable in a
13:14:52 13 membrane gas separation apparatus, like those
13:14:54 14 claimed in the '038 patent, have disparate effects
13:14:58 15 on the overall system?

13:15:00 16 MR. LIPPERT: Object to form.

13:15:02 17 A I think again the -- it would depend on
13:15:09 18 context of what was specifically being considered.

13:15:13 19 Q It's possible though?

13:15:15 20 MR. LIPPERT: Object to the form.

13:15:16 21 A I think it could be possible.

13:15:21 22 Q Can small changes to a variable in a
13:15:24 23 membrane gas separation system lead to large and
13:15:28 24 unpredictable changes to the feasibility of a
13:15:30 25 system?

13:15:31 1 MR. LIPPERT: Object to the form.

13:15:32 2 A I think again it depends very much on the
13:15:45 3 context and the specifics that are being -- being
13:15:48 4 thought about.

13:15:49 5 Q It's possible though, right?

13:15:51 6 MR. LIPPERT: Object to the form.

13:15:56 7 A I think it could be possible.

13:15:58 8 Q In a real-world membrane gas separation
13:16:36 9 apparatus, could changes in the ambient temperature,
13:16:39 10 for example, between summer and winter, affect the
13:16:44 11 volumetric flow rates in the system?

13:16:59 12 A That would come down to a question as to,
13:17:03 13 you know, a lot of different aspects of the process
13:17:09 14 and also would be predicated on the idea that here
13:17:12 15 we're talking about absolute volumes as opposed to
13:17:15 16 volumes under the standard state conditions or
13:17:18 17 volumetric flow rates under the standard state
13:17:21 18 conditions.

13:17:21 19 Q In a real-world membrane gas separation
13:17:24 20 apparatus, could changes in ambient temperature
13:17:29 21 between summer and winter affect the compositions of
13:17:37 22 the streams?

13:17:44 23 A I think I would need more context or
13:18:09 24 specifics to appropriately respond to that.

13:18:13 25 Q In real-world membrane gas separation

13:18:40 1 apparatuses, can there be changes in the composition
13:18:43 2 of the crude gas stream that are seasonal?

13:18:57 3 A I think the seasonal compositional
13:19:02 4 dependences of a crude gas stream like that are
13:19:05 5 outside the scope of my expertise as I'm sitting
13:19:08 6 here.

13:19:09 7 Q Okay. And what about in real-world membrane
13:19:15 8 gas separation apparatuses, could there be changes
13:19:19 9 in the flow rate of the crude gas stream that are
13:19:23 10 seasonal?

13:19:23 11 A Again, that's outside of my -- my expertise.

13:19:42 12 MR. LANE: Let's take a break there if
13:19:43 13 that's okay with you. And I know it's -- I guess
13:19:47 14 you're an hour later than --

13:19:49 15 VIDEOGRAPHER: I apologize, counsel. Let me
13:19:51 16 go ahead and take us off. We are off the record.
13:19:53 17 The time is 1:19 p.m.

13:19:53 18 (Whereupon, the deposition in the
13:19:53 19 above-entitled cause was recessed
13:19:53 20 to 2:11 p.m. this date.)

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14:10:22 1 A F T E R N O O N S E S S I O N

14:10:22 2 VIDEOGRAPHER: We are back on the record.

14:11:10 3 The time is 2:11 p.m.

14:11:14 4 CROSS EXAMINATION (resumed)

14:11:14 5 BY MR. LANE:

14:11:14 6 Q Welcome back, Dr. Geise.

14:11:16 7 A Thank you.

14:11:17 8 Q You've had a chance to have some lunch, I

14:11:20 9 hope?

14:11:20 10 A Yep.

14:11:20 11 Q I wanted to go back to your second

14:11:24 12 declaration that's been marked -- before that did

14:11:28 13 you have any discussions with your counsel about

14:11:30 14 your testimony or your anticipated testimony at

14:11:33 15 lunchtime?

14:11:33 16 A No.

14:11:34 17 Q So I want to go back to paragraph 23 in your

14:11:40 18 rebuttal report that's been marked as Exhibit 2.

14:11:45 19 A Sorry, which paragraph?

14:11:46 20 Q 23.

14:11:52 21 A Okay.

14:11:53 22 Q And in that paragraph, you talk about

14:11:57 23 simulation software such as Aspen. Do you see that?

14:12:00 24 A Yes.

14:12:00 25 Q And you talk about some default settings in

14:12:03 1 Aspen. Do you see that?

14:12:04 2 A Yes.

14:12:05 3 Q And I believe -- I don't have the
14:12:07 4 paragraph number, apologies, but I think you also
14:12:10 5 talked about Aspen in another section. Does that
14:12:13 6 ring a bell?

14:12:14 7 A It's certainly possible.

14:12:15 8 Q Okay. Do you use simulation software like
14:12:21 9 Aspen in your work?

14:12:22 10 A I use it regularly in my teaching.

14:12:26 11 Q To do what?

14:12:28 12 A So we use Aspen to simulate all sorts of
14:12:34 13 separation processes associated with courses that I
14:12:38 14 teach. So I teach the students how to use the
14:12:42 15 software and then we use it to simulate actual
14:12:46 16 processes and also as a tool to help the learning
14:12:50 17 process.

14:12:51 18 Q Does any of your teaching involve using --
14:12:56 19 or doing Aspen simulations on membrane gas
14:13:03 20 separation apparatuses?

14:13:05 21 A A lot of simulations that we run do involve
14:13:10 22 gas streams and gas separations. Generally
14:13:15 23 speaking, they're not membrane separations, however.

14:13:17 24 Q Have you ever used Aspen or other simulation
14:13:22 25 software to simulate a three-stage gas separation

14:13:26 1 apparatus?

14:13:27 2 A No, I have not.

14:13:28 3 Q In May 2011 -- and you understand the
14:13:34 4 significance of May 2011 in this case?

14:13:36 5 A I do.

14:13:37 6 Q That's the priority date that Evonik has
14:13:40 7 alleged for the patent. Okay.

14:13:44 8 In May 2011 -- was Aspen available in
14:13:49 9 May 2011?

14:13:51 10 A Yes, there were -- there were Aspen products
14:13:54 11 available at that time. When I was an undergraduate
14:13:58 12 student, we used an Aspen product specifically
14:14:02 13 called HYSYS in senior design. So those programs
14:14:05 14 had been available for some time in 2011.

14:14:08 15 Q And HYSYS -- I've used it also before I was
14:14:13 16 a lawyer -- it's more for -- geared toward
14:14:18 17 simulating petrochemical processes, correct?

14:14:20 18 A That's my understanding, yes.

14:14:21 19 Q So not membrane, gas membrane separations,
14:14:25 20 correct?

14:14:25 21 A Well, I think the design of the software is
14:14:28 22 supposed to facilitate that, but the types of
14:14:30 23 calculations and the things that are going on within
14:14:32 24 the software, the material balances, things of that
14:14:37 25 sort, are all, you know, applicable in both realms.

14:14:41 1 Q And HYSYS later was purchased by Aspen, if I
14:14:46 2 understand correctly, right? Now it's part of
14:14:48 3 Aspen?

14:14:49 4 A It is, yes.

14:14:50 5 Q And what other simulation software besides
14:14:54 6 Aspen and HYSYS was available in May 2011?

14:14:58 7 A Off the top of my head, I'm not sure. I
14:15:03 8 know there were others that have existed for some
14:15:05 9 time. You know, I can't point to a specific example
14:15:09 10 for 2011 at this point.

14:15:12 11 Q Do you know if CHEMCAD was available in
14:15:16 12 May 2011?

14:15:16 13 A I believe it may have been, but I can't say
14:15:20 14 with 100 percent certainty as I'm sitting here right
14:15:23 15 now.

14:15:23 16 Q And simulation software like Aspen is
14:15:43 17 software that's used to try and simulate how
14:15:46 18 real-world systems perform, correct?

14:15:50 19 A Correct.

14:15:50 20 Q And it's possible, at least today, to use
14:16:08 21 simulation software such as Aspen to try and
14:16:11 22 simulate real-world membrane gas separation
14:16:15 23 apparatuses?

14:16:16 24 A Yes.

14:16:17 25 Q Okay. Was that possible in May 2011?

14:16:20 1 A I believe the same sorts of capabilities
14:16:25 2 that exist today would have existed at that time and
14:16:28 3 been useful at that time.

14:16:30 4 Q A software simulation is not the same thing
14:16:34 5 as a real-world membrane gas separation apparatus,
14:16:36 6 correct?

14:16:37 7 A That's true.

14:16:38 8 Q And a simulation from software simulation
14:16:44 9 like Aspen is not a design for a real-world membrane
14:16:48 10 gas separation apparatus, correct?

14:16:49 11 A Well, the simulations are set up to assist
14:16:56 12 in the design process and to help designers
14:17:00 13 understand how a process would work. So in that
14:17:04 14 sense, I think they're an integral part of designing
14:17:08 15 what would end up being a real-world process.

14:17:12 16 Q All right. Fair enough. Designing a
14:17:14 17 real-world membrane gas separation apparatus
14:17:17 18 involves much more than just doing a software
14:17:20 19 simulation, correct?

14:17:21 20 A That's true. The practice of an actual
14:17:24 21 process is more involved than simulating it.

14:17:27 22 Q Right. Can you explain that a little more
14:17:30 23 as an expert chemical engineer? What are some of
14:17:33 24 the additional things that need to be done to design
14:17:36 25 a membrane -- an actual membrane gas simulation

14:17:40 1 apparatus aside from doing a simulation?

14:17:42 2 A Yeah, so the simulation software can help,
14:17:47 3 you know, structure and design, you know, the
14:17:49 4 overall scope of the process, the way things are
14:17:52 5 going to go. But then there's the practical
14:17:55 6 elements of needing to actually select equipment,
14:17:58 7 figure out, you know, where control systems, logic,
14:18:03 8 flow meters, you know, things of that sort, you
14:18:08 9 know, actually go in the process; you know, figuring
14:18:11 10 out sighting and what actually is the physical
14:18:15 11 footprint, how is this all going to all be -- to
14:18:17 12 work together. All of those things would be
14:18:20 13 examples of things that engineers would need to work
14:18:22 14 with, you know, suppliers, contractors and other
14:18:24 15 folks to sort out.

14:18:26 16 Q All right. I used to do that before I was a
14:18:31 17 lawyer. And referring back to the patent,
14:18:38 18 Exhibit 4, the '038 patent, and looking at claim 1,
14:18:45 19 for example. Do you see that?

14:18:56 20 A Yes, I'm there.

14:18:57 21 Q Okay. And claim 1, the first two words are
14:19:02 22 "an apparatus for separating gasses." Do you see
14:19:04 23 that?

14:19:04 24 A Yes.

14:19:04 25 Q And if you turn to claim 59, which is in the

14:19:13 1 re-exam certificate -- you're familiar with the
14:19:15 2 re-exam certificate?

14:19:16 3 A Yes.

14:19:17 4 Q So yeah, claim 59. And it starts, an
14:19:21 5 apparatus -- sorry. My Apple Watch has decided to
14:19:29 6 talk to me. All right. Claim 59 starts out with
14:19:34 7 the words "an apparatus for." Do you see that?

14:19:37 8 A Yes.

14:19:38 9 Q So the claims 1 and 59 in the patent cover
14:19:45 10 real-world membrane gas separation apparatuses,
14:19:48 11 right?

14:19:49 12 A Yes.

14:19:50 13 Q Okay. And the claims -- claims 1 and 59 do
14:19:55 14 not pertain to software simulations like Aspen
14:19:59 15 simulations, correct?

14:20:00 16 A My understanding is that, yeah, simulations
14:20:06 17 are not things that can be patented.

14:20:10 18 Q And even setting aside from that, the claims
14:20:14 19 require apparatuses, right?

14:20:18 20 A It does state apparatus in the claims.

14:20:20 21 Q Claims 1 and 59 require apparatuses and
14:20:24 22 those are different than simulations, correct?

14:20:28 23 A Yes, a physical apparatus is different than
14:20:31 24 the results of a simulation.

14:20:33 25 Q And the real-world utility of software

14:20:49 1 simulations can vary drastically depending on

14:20:53 2 various factors, correct?

14:20:56 3 A I'm sorry. Could you repeat that?

14:20:59 4 Q Yeah, I said the real-world utility of

14:21:02 5 software simulations can vary drastically depending

14:21:08 6 on various factors?

14:21:09 7 MR. LIPPERT: Object to the form.

14:21:11 8 A I mean, I think, you know, certainly --

14:21:14 9 certainly there's a wide range of ways that you

14:21:17 10 could go about using a simulation. So I suppose

14:21:19 11 yes.

14:21:20 12 Q The real-world utility of software

14:21:29 13 simulations can vary depending on the assumptions

14:21:33 14 made in the software, correct?

14:21:36 15 A That is true.

14:21:37 16 Q And it can -- the real-world utility of

14:21:40 17 software simulations can vary drastically depending

14:21:45 18 on the assumptions made by the user?

14:21:48 19 MR. LIPPERT: Object to the form.

14:21:53 20 Q Is that correct?

14:21:53 21 A It's certainly possible that a user could

14:21:56 22 make decisions that would invalidate the real-world

14:21:59 23 applicability of a simulation.

14:22:02 24 Q And the real-world utility of software

14:22:06 25 simulations can vary drastically depending on the

14:22:10 1 data used by the software, correct?

14:22:13 2 MR. LIPPERT: Object to the form.

14:22:14 3 A Yeah, the data that's being used to inform
14:22:22 4 the simulation will affect the outcome, yes.

14:22:26 5 Q And the real-world utility of software
14:22:29 6 simulations can vary drastically depending on the
14:22:31 7 computational methods used by the software, is that
14:22:35 8 correct?

14:22:35 9 MR. LIPPERT: Object to the form.

14:22:36 10 A I think that one depends a little bit more
14:22:44 11 on the context of the situation and what the -- what
14:22:47 12 is meant by, you know, sort of that underlying, you
14:22:54 13 know, computation that you're referring to.

14:22:55 14 Q Different software simulation -- different
14:23:01 15 simulation software may use different computational
14:23:04 16 methods, correct?

14:23:06 17 A That's certainly possible.

14:23:08 18 Q In May 2011, did different simulation
14:23:13 19 software use different computational methods?

14:23:16 20 A I can't say I'm explicitly familiar with the
14:23:20 21 computational methods used in those software
14:23:23 22 packages. I would imagine there were differences.
14:23:26 23 At the same time, the underlying principles of, you
14:23:30 24 know, conservation of, you know, mass or mols under
14:23:34 25 the appropriate circumstances suggests that there's

14:23:39 1 physics there as well that, you know, presumably
14:23:43 2 would be retained in all of those different
14:23:46 3 packages.

14:23:46 4 Q The real-world utility of software
14:23:49 5 simulations can vary drastically depending on the
14:23:52 6 user's sophistication, correct?

14:23:57 7 MR. LIPPERT: Object to the form.

14:23:58 8 A Well, similar to the other question, if a
14:24:06 9 user inputs -- you know, makes poor choices in the
14:24:10 10 input, that certainly could influence the outcome.

14:24:16 11 Q And are there other factors that we haven't
14:24:18 12 talked about or that haven't been brought up that
14:24:21 13 may affect the real-world utility of software
14:24:24 14 simulations?

14:24:24 15 MR. LIPPERT: Object to the form.

14:24:25 16 A Not that I'm thinking of as I sit here right
14:24:34 17 now.

14:24:34 18 Q And software simulations in some cases may
14:24:38 19 accurately predict how real-world apparatus is
14:24:41 20 performed, correct?

14:24:42 21 A Certainly possible, yes.

14:24:44 22 Q And in other instances, software simulations
14:24:47 23 may not accurately predict how real-world
14:24:51 24 apparatuses perform, correct?

14:24:53 25 A Certainly possible.

14:24:54 1 Q Have you ever heard of instances where a
14:24:57 2 software simulation did not accurately predict how a
14:25:04 3 real-world apparatus would perform?

14:25:08 4 A Well, I mean, we -- in some of the course
14:25:11 5 work that I teach, we actually purposefully create
14:25:14 6 those sorts of circumstances by making poor
14:25:17 7 decisions for educational purposes. So in that
14:25:21 8 sense, yes.

14:25:22 9 Q To run a software simulation in Aspen or in
14:25:28 10 some other software package for a membrane gas
14:25:32 11 separation apparatus, the user has to input certain
14:25:36 12 information like temperatures, pressures, flow
14:25:39 13 rates, compositions of stream, membrane
14:25:42 14 selectivities, other things, right?

14:25:45 15 A There's certainly a minimum amount of
14:25:50 16 information that has to be provided from a degree of
14:25:53 17 freedom perspective and there are -- there are
14:25:57 18 typically many different ways of doing that, but
14:26:00 19 there is some minimum amount of information that has
14:26:03 20 to be put in.

14:26:04 21 Q And if the minimum information is put in and
14:26:11 22 enough degrees of freedom are input, then the
14:26:14 23 software will predict or try to simulate the other
14:26:18 24 variables, correct?

14:26:18 25 A That's correct.

14:26:19 1 Q And a real-world membrane gas separation
14:26:28 2 apparatus may not operate at the exact conditions as
14:26:34 3 the conditions in the simulation of the apparatus,
14:26:37 4 correct?

14:26:38 5 A It's certainly possible that you could
14:26:41 6 operate differently.

14:26:43 7 Q And operating conditions in real-world
14:26:45 8 membrane gas separation apparatuses can vary over
14:26:49 9 time, correct?

14:26:50 10 A It's possible there could be variations,
14:26:55 11 yes.

14:26:56 12 Q If the operating conditions input into
14:27:10 13 simulation software are different than the
14:27:14 14 real-world apparatuses operating condition, the
14:27:17 15 simulation may not accurately predict how the
14:27:21 16 corresponding real-world apparatus operates, right?

14:27:25 17 A It's certainly possible.

14:27:26 18 Q And simulations -- software simulations like
14:27:31 19 in Aspen are based at least in part on certain
14:27:34 20 assumptions, correct?

14:27:41 21 A Yes, in the sense that, you know, you input
14:27:49 22 and make choices for essentially making assumptions
14:27:53 23 in the software. So yes.

14:27:54 24 Q Okay. And software simulations like in
14:27:58 25 Aspen are -- or include simplifications as opposed

14:28:05 1 to real-world membrane gas separation apparatuses,
14:28:09 2 correct?

14:28:14 3 A No, I think the specifics to that probably
14:28:17 4 depend on the way that the process is being modelled
14:28:19 5 and the specifics of what the process actually is.

14:28:25 6 Q All right. In paragraph 23 in your second
14:28:29 7 declaration, you said there in the middle that
14:28:37 8 volumetric -- let me go back.

14:28:40 9 "In simulation software such as Aspen,
14:28:43 10 volume would be specified, by default, as volumetric
14:28:46 11 flow rate and, as recognized by Dr. Freeman, is
14:28:48 12 often reported as a single number for an entire
14:28:51 13 stream."

14:28:51 14 Do you see that?

14:28:52 15 A Yes.

14:28:52 16 Q Okay. We talked about before though that
14:28:56 17 volumetric flow rate can often vary in a single
14:28:59 18 stream in a real-world apparatus, correct?

14:29:04 19 A In a real world, you know, we could do
14:29:06 20 things that would change that absolute volume like
14:29:09 21 we discussed previously, yes.

14:29:10 22 Q So that would be an example of a
14:29:14 23 simplification that the software is making, it's
14:29:17 24 assuming one volumetric flow rate in a stream where
14:29:20 25 in the real world, there could be different

14:29:23 1 volumetric flow rates in the stream?

14:29:26 2 MR. LIPPERT: Object to the form.

14:29:26 3 A So this -- this speaks to, you know, the
14:29:32 4 standard state component of things again because the
14:29:35 5 way that those volumetric flow rates are, you know,
14:29:39 6 output in Aspen is at the standard state conditions.
14:29:42 7 And so therefore, the simulation software is able to
14:29:47 8 side-step those issues of the absolute volume that
14:29:50 9 would exist in a real-world gas separation
14:29:54 10 apparatus. And so the software is able to tell you,
14:29:58 11 you know, this is what you would have going through
14:30:00 12 this particular stream at the standard conditions.
14:30:05 13 And then a person of ordinary skill in the art could
14:30:08 14 understand how to take that information and think
14:30:11 15 about what that might do if you translate it into,
14:30:17 16 you know, pipes of different diameters, T-junctions,
14:30:20 17 pressure reducing valves, and the sorts of things
14:30:23 18 we've talked about before.

14:30:24 19 Q Okay. And you said that Aspen can report
14:30:29 20 volumetric flow rates in standard conditions. Did I
14:30:33 21 understand that right?

14:30:33 22 A That's correct.

14:30:34 23 Q And that's a setting in Aspen, right? You
14:30:36 24 could change that so that the flow rates were
14:30:41 25 reported in different units, like, for example, mass

14:30:44 1 flow rate, correct?

14:30:45 2 A Yeah. So Aspen can -- can give you mass
14:30:50 3 flow rate. It will do the calculations to calculate
14:30:53 4 the -- you know, almost anything within the realm of
14:30:59 5 possibility. You know, it has that functionality to
14:31:02 6 calculate.

14:31:02 7 Q Including actual flow rates as opposed to
14:31:05 8 flow rates of standard conditions?

14:31:07 9 A It will -- it will take the, you know,
14:31:10 10 pressure and temperature into consideration and tell
14:31:13 11 you what the flow would be at those -- those
14:31:16 12 conditions.

14:31:16 13 Q And we've talked a little bit about standard
14:31:20 14 conditions. There's not just one set of standard
14:31:23 15 conditions, right? There's different sets of
14:31:26 16 standard conditions depending on what you're talking
14:31:29 17 about, right?

14:31:30 18 A That's correct. Different -- different --
14:31:34 19 regulators isn't the right word, but different
14:31:37 20 bodies have proposed different standard states that
14:31:41 21 are established.

14:31:41 22 Q And even within the United States, there
14:31:46 23 might be different standard conditions, right, in
14:31:48 24 different -- for different applications?

14:31:51 25 A That's certainly possible, yes.

14:31:52 1 Q And in paragraph 23, you said that volume
14:32:15 2 would be specified, by default, as volumetric flow
14:32:21 3 rates. I'll stop there. You see where you said
14:32:23 4 that?

14:32:23 5 A I do.

14:32:24 6 Q Okay. So Aspen has at least some default
14:32:29 7 settings, is that correct?

14:32:31 8 A So yeah, there are -- there are templates.
14:32:34 9 I mean, the software has to start from somewhere,
14:32:37 10 but there are templates, you know. There's a gas
14:32:41 11 processing template and if you open up that
14:32:44 12 template, the default is volumetric flow rate at
14:32:47 13 standard state conditions.

14:32:49 14 Q Was that the default or the version of Aspen
14:32:57 15 that was current in May 2011?

14:33:01 16 A I can't speak definitively to that.

14:33:05 17 Q And the default settings can be changed.
14:33:09 18 We've already talked about that, correct?

14:33:11 19 A Yes.

14:33:11 20 Q Aspen is really robust in that sense, right?
14:33:16 21 Like it's fairly dynamic, you can change a lot of
14:33:20 22 settings in Aspen?

14:33:21 23 A Yes, it's...

14:33:26 24 Q And if you change the default settings, that
14:33:29 25 can change the simulation results, correct?

14:33:34 1 A Well, changing the default settings is just
14:33:38 2 manipulating the way the program is showing the
14:33:41 3 information. The core truth of the simulation
14:33:45 4 remains the same. It's just a matter of perhaps
14:33:50 5 reanalyzing or presenting the information in a
14:33:55 6 different way, but the core information underlying
14:33:58 7 would be the same.

14:33:59 8 Q Have you ever used any simulation software
14:34:04 9 besides Aspen and HYSYS?

14:34:07 10 A I think a while back I evaluated a process
14:34:22 11 simulation software and I am -- I cannot remember
14:34:26 12 what the name was, but I evaluated it as an option
14:34:29 13 for us for teaching. But I'm sorry, I can't
14:34:36 14 remember what the name of that was off the top of my
14:34:38 15 head.

14:34:38 16 Q Have you ever used CHEMCAD?

14:34:41 17 A I don't believe so.

14:34:43 18 Q Simulation software like Aspen has certain
14:34:50 19 unit operations or modules that can be used in the
14:34:55 20 simulation like pumps, reactors, storage tanks,
14:34:59 21 right?

14:34:59 22 A Yes.

14:35:00 23 Q And what are some of the other ones? What
14:35:02 24 are some of the other unit operations in Aspen?

14:35:04 25 A Oh, I mean -- I forget if you said heat

14:35:11 1 exchangers, but you know, they have models for
14:35:14 2 running distillation columns that you can turn into
14:35:18 3 absorption or stripping columns, other sort of
14:35:24 4 heat-related unit operations, splitters, mixers,
14:35:28 5 things of that sort.

14:35:29 6 Q Was there a membrane gas separation module
14:35:34 7 in Aspen in the version available in May 2011?

14:35:38 8 A I don't know specifically.

14:35:41 9 Q Was there a membrane gas separation module
14:35:45 10 in CHEMCAD in the version available in May 2011?

14:35:49 11 A I don't know specifically.

14:35:51 12 Q Was there a membrane gas separation module
14:35:56 13 in HYSYS in the version that was available in
14:35:58 14 May 2011?

14:35:59 15 A I'm not sure specifically.

14:36:02 16 Q Are you aware of any simulation software
14:36:09 17 where there was a membrane gas separation module in
14:36:13 18 the version available in May 2011?

14:36:16 19 A As I sit here today, I can't speak
14:36:19 20 definitively to that.

14:36:21 21 Q To run a simulation of a membrane gas
14:36:30 22 separation apparatus in simulation software such as
14:36:33 23 Aspen, the software has to have certain properties
14:36:36 24 of the membrane like permeability and selectivity,
14:36:40 25 correct?

14:36:41 1 A Those would be important factors to, you
14:36:45 2 know, work into the simulation software.

14:36:47 3 Q And to do a simulation or to run a
14:36:51 4 simulation of a membrane gas separation apparatus in
14:36:55 5 simulation software such as Aspen, the software has
14:36:58 6 to have certain properties of the gasses and gas
14:37:03 7 mixtures, correct?

14:37:05 8 A It's typical that you would establish within
14:37:08 9 the software the physical properties package that
14:37:14 10 the software then uses to do the thermodynamic
14:37:18 11 pieces of the calculation.

14:37:19 12 Q Let me turn your attention back to
14:37:27 13 Exhibit 4, the '038 patent. And I want to turn you
14:37:31 14 to column 8 starting in about line 20. Do you see
14:37:45 15 there?

14:37:46 16 A Yes.

14:37:47 17 Q And I think in your declaration you actually
14:37:51 18 quoted this language I think in some other place,
14:37:53 19 but there's a sentence that says, "Useful polymers
14:37:58 20 in the separation-active layer are more preferably
14:38:04 21 polyimides, polyamides..." and then it goes on to
14:38:05 22 list a lot of other membrane -- or member materials.
14:38:09 23 Do you see that?

14:38:10 24 A Yes.

14:38:10 25 Q Did the current version of Aspen in May 2011

14:38:18 1 have the selectivities and permeances for membranes
14:38:22 2 made of all the materials listed in column 8 from
14:38:27 3 lines 20 to 27?

14:38:31 4 A I don't know specifically whether in 2011
14:38:34 5 that information would have been available in the
14:38:37 6 software.

14:38:37 7 Q Same question for CHEMCAD, the current
14:38:42 8 version in May 2011?

14:38:44 9 A I don't know whether that would have been --
14:38:47 10 been in that software package at that time.

14:38:49 11 Q Are you aware of any simulation software
14:38:52 12 that existed in May 2011 that had the selectivities
14:38:57 13 and permeances of membranes of the materials listed
14:39:04 14 in column 8 of the patent from lines 21 to 27?

14:39:10 15 A I'm not aware of any -- any software that
14:39:14 16 would have had that built into it explicitly. I
14:39:16 17 think, in general, that information would have been
14:39:21 18 input into the simulation by the user as opposed to
14:39:26 19 originating in the software natively itself. But I
14:39:34 20 can't speak definitively to whether or not that was
14:39:38 21 -- was the case in 2011.

14:39:40 22 Q So those membrane properties were not in the
14:39:43 23 default settings of Aspen in May 2011?

14:39:47 24 A Likely much like the kinetic parameters that
14:39:56 25 would go into the reactor modelling in Aspen or

14:40:00 1 perhaps mass transfer coefficients in other cases,
14:40:03 2 these likely would have been parameters that needed
14:40:05 3 to be user input as opposed to things that would
14:40:10 4 have been available in the software by default.

14:40:13 5 Q Do you believe that a POSITA would have been
14:41:17 6 able to input the selectivities and permeances for
14:41:22 7 all the types of membranes that are described -- let
14:41:28 8 me start that.

14:41:28 9 Do you believe that a POSITA would have been
14:41:30 10 able to input the selectivities and permeances into
14:41:35 11 the current version of Aspen in May 2011 for all the
14:41:39 12 types of membranes that are described from column 8
14:41:45 13 in the patent, line 20, through the end of column 8?

14:41:58 14 A So given the person of ordinary skill's
14:42:02 15 familiarity with the literature and the prior art
14:42:05 16 and the fact that they are operating under the
14:42:07 17 assumption that they could obtain those values from
14:42:11 18 manufacturers or other sources, putting those --
14:42:17 19 putting those values into a simulation in a system
14:42:20 20 like Aspen because of its underlying framework of
14:42:24 21 doing material balances and thermodynamics
14:42:28 22 calculations, I do believe that a person of ordinary
14:42:33 23 skill would have been able to obtain those values
14:42:37 24 and use them in conjunction with the software to
14:42:41 25 simulate a process.

14:42:45 1 Q Where would a person of ordinary skill in
14:42:48 2 the art have obtained those values in May 2011?

14:42:58 3 A Those would be the sorts of values that are
14:43:01 4 either reported by manufacturers or reported in the
14:43:05 5 literature. There are a number of reports for, you
14:43:10 6 know, polymers of -- of those described here.

14:43:14 7 Q So all the types of polymer membranes that
14:43:18 8 are described in column 8 from line 20 to line 67
14:43:23 9 were known by May 2011?

14:43:36 10 A Sorry. Which lines were you asking about?

14:43:39 11 Q Column 8 of the '038 patent, lines 20 to
14:43:43 12 line 67.

14:44:01 13 A I do believe there were examples of
14:44:05 14 certainly most, if not all of those materials at
14:44:10 15 that time.

14:44:10 16 Q All right. But I want to know for all.
14:44:12 17 Were the selectivities and permeances for all of
14:44:16 18 these types of membranes known in the art by
14:44:20 19 May 2011?

14:44:22 20 A Well, in preparing to testify for the claims
14:44:26 21 construction portion of this, I haven't, you know,
14:44:29 22 prepared explicitly to answer questions on all of
14:44:33 23 these -- these types of polymers. So again, I think
14:44:40 24 -- I think most potentially all, but I'm not
14:44:44 25 prepared to give a definitive answer on that.

14:44:47 1 Q Okay. So you don't know?

14:44:50 2 A I'm not prepared to give a definitive
14:44:52 3 answer.

14:44:52 4 Q Okay. So you can't say for certain then
14:44:56 5 whether a person of ordinary skill in the art would
14:44:59 6 have had the selectivities and permeances for all
14:45:02 7 these membranes to put in a software simulation at
14:45:05 8 that time, correct?

14:45:05 9 A I can say that, I mean, a person of ordinary
14:45:10 10 skill in the art would have known the literature and
14:45:14 11 the relevant information to be able to do so should
14:45:17 12 that information have been available.

14:45:20 13 Q I understand that. And thanks. But my
14:45:23 14 question is was it available in May 2011? Were the
14:45:28 15 selectivities and permeances available to a POSITA
14:45:32 16 for all of these types of membranes in May 2011?

14:45:35 17 A That falls outside the scope of what I've
14:45:38 18 prepared for in terms of testifying about the claims
14:45:41 19 construction process. So I'm not prepared to give a
14:45:44 20 definitive answer.

14:45:45 21 Q But you said that in your declarations that
14:45:49 22 somebody could do Aspen simulations of what is
14:45:53 23 covered by the claims, correct?

14:45:57 24 A Which -- is there a specific part that
14:46:01 25 you're looking at just so I can look at the same

14:46:03 1 thing.

14:46:10 2 Q Yeah. In paragraph 23, first sentence, it
14:46:17 3 says, "In my opinion, a person of ordinary skill in
14:46:20 4 the art would have known and would have been able to
14:46:23 5 determine the volumes required by the claims by
14:46:26 6 modelling the apparatuses using a computer
14:46:30 7 simulation tool (e.g., Aspen) based on the
14:46:33 8 information provided by the '038 patent."

14:46:53 9 A And yes, I think, you know, certainly a
14:46:56 10 person of ordinary skill could go and get-- you
14:47:00 11 know, permeances and selectivities are numbers. You
14:47:03 12 know, if that information is available, they could
14:47:06 13 certainly go take that information and put that in.
14:47:12 14 I -- you know, I don't understand -- or I don't
14:47:15 15 believe that statement to have any bearing on
14:47:19 16 whether or not all of the materials listed had those
14:47:25 17 data necessarily published at that time or not.

14:47:27 18 Q Okay. Well, I don't agree with that and I'm
14:47:31 19 allowed to ask you questions. You can't just say
14:47:35 20 you don't want to answer my questions.

14:47:37 21 MR. LIPPERT: Let's not get argumentative,
14:47:40 22 Mr. Lane. You can't make a statement on the record
14:47:42 23 like that. Ask him a question.

14:47:44 24 MR. LANE: But I think, Mr. Lippert, you
14:47:48 25 need to instruct the witness to answer my questions.

14:47:50 1 MR. LIPPERT: I'm going to instruct you to
14:47:52 2 ask proper questions. You got argumentative there
14:47:57 3 and started talking about what you think it is.
14:47:59 4 You're not the witness.

14:48:00 5 BY MR. LANE:

14:48:01 6 Q Dr. Geise, again -- let's go back.
14:48:06 7 Column 8, lines 17 to 67. You're with me there in
14:48:10 8 the patent?

14:48:11 9 A Yes.

14:48:11 10 Q And it lists that the information in those
14:48:15 11 lines identifies certain polymers or materials that
14:48:20 12 can be used in the membranes in the invention
14:48:25 13 claimed in the patent, correct?

14:48:28 14 A Yes.

14:48:28 15 Q And my question simply is were the
14:48:33 16 permeances and selectivities for membranes made of
14:48:38 17 all those materials known to POSITAs in May 2011?

14:49:00 18 A Well, the issue I have with, you know, the
14:49:02 19 answer is that -- is the language "or mixtures
14:49:06 20 thereof." Right. And so you know, I'm going to
14:49:11 21 come back to, you know, the specific polymers that
14:49:14 22 are listed there, I believe most, if not all of
14:49:17 23 those, had values that were listed. I do not know
14:49:23 24 whether all of the mixtures that are possible from
14:49:28 25 the combinations of that list would have been

14:49:29 1 reported. Probably some of those things, you know,
14:49:34 2 might not be something anybody had tried to make.

14:49:37 3 So I come back to my answer where I say I am
14:49:44 4 -- I know that many, if not all, were reported and
14:49:48 5 available in the literature, but I can't
14:49:51 6 definitively say that all possible combinations of
14:49:54 7 all of those materials were reported in 2011.

14:49:58 8 Q So it's possible that a person of ordinary
14:50:04 9 skill in the art could not have run a simulation
14:50:08 10 using all the materials identified -- membranes made
14:50:12 11 of all the materials identified in column 8,
14:50:15 12 lines --

14:50:19 13 A Well, the person of ordinary skill would
14:50:23 14 have -- would have had the skill, would have been
14:50:25 15 able to put in the values of permeance and
14:50:28 16 selectivity and run the simulation. And so, you
14:50:34 17 know, in that sense, the person of ordinary skill
14:50:40 18 would be able to leverage their knowledge of all of
14:50:46 19 the existing materials that were reported and would
14:50:48 20 be able to run the simulation with the data that are
14:50:53 21 available.

14:50:53 22 Q Right. But not with the data that wasn't
14:50:56 23 available, correct?

14:50:58 24 MR. LIPPERT: Object to the form.

14:50:59 25 A A person of ordinary skill could, in

14:51:02 1 principle, estimate parameters. You know, there are
14:51:07 2 approaches and models and ways to estimate these
14:51:10 3 sorts of parameters and so that could have been
14:51:13 4 another -- another strategy as well.

14:51:15 5 Q And claim 51 requires -- sorry. Claim 1 in
14:51:37 6 the patent, it requires using a membrane with a
14:51:43 7 selectivity over 30, correct?

14:51:49 8 A It does say the feed separation stage
14:51:52 9 comprises a gas separation membrane module having a
14:51:57 10 mixed gas selectivity of at least 30.

14:51:59 11 Q Were the selectivities and permeances of
14:52:02 12 every membrane covered by claim 1 known to POSITAs
14:52:08 13 in May 2011?

14:52:14 14 A I'm sorry. Could you repeat the question,
14:52:16 15 please?

14:52:16 16 Q Were the selectivities and permeances of
14:52:21 17 every membrane covered by claim 1 in the patent
14:52:26 18 known to POSITAs in May 2011?

14:52:30 19 A I'm not sure if I fully understand the
14:52:52 20 question. Are you asking if all membranes with a
14:52:57 21 mixed gas selectivity of at least 30 were known?

14:53:00 22 Q Right. Were the selectivities and
14:53:04 23 permeances of all membranes having a mixed gas
14:53:11 24 selectivity of at least 30 known to a POSITA in
14:53:15 25 May 2011?

14:53:19 1 MR. LIPPERT: I'm going to object to the
14:53:21 2 form. Ms. Reporter -- I think you repeated it,
14:53:25 3 John. I just want to make sure it's clear.

14:53:28 4 BY MR. LANE:

14:53:28 5 Q Were the selectivity and permeances of all
14:53:31 6 membranes having a mixed gas selectivity of at least
14:53:35 7 30 known to a POSITA in May 2011?

14:53:42 8 A I'd say if -- if they were -- if they were
14:53:47 9 made available, you know, either through
14:53:51 10 publications, reports, et cetera, then the -- then,
14:53:55 11 by definition, the person of ordinary skill would
14:53:57 12 have access to that information. You know, I can't
14:54:03 13 say with absolute certainty that every membrane that
14:54:08 14 had a mixed gas selectivity of at least 30 had an
14:54:13 15 associated permeance published along with it.

14:54:19 16 Q And I'll ask you the same question in
14:54:22 17 relation to claim 6. Were the selectivity and
14:54:30 18 permeances of all membranes having a mixed gas
14:54:34 19 selectivity of at least 35 known to a POSITA in
14:54:40 20 May 2011?

14:54:40 21 A Again, in this case I can't definitively say
14:54:44 22 that every membrane known with a mixed gas
14:54:47 23 selectivity of at least 35 had an associated
14:54:49 24 permeance published along with it.

14:54:54 25 Q Were the selectivity and permeance of all

14:54:57 1 membranes having a mixed gas selectivity of at least
14:55:00 2 40 known to a POSITA in May 2011?

14:55:02 3 A Again, I can't definitively say that all of
14:55:08 4 the membranes with a mixed gas selectivity of at
14:55:11 5 least 40 would have had a permeance value published
14:55:15 6 alongside those.

14:55:17 7 Q Do you see the examples that you referred to
14:55:38 8 earlier in your testimony, examples 1 through 4, in
14:55:42 9 the '038 patent?

14:55:44 10 A Yes.

14:55:50 11 Q Are the examples 1 through 4 based on
14:55:59 12 software simulations?

14:56:05 13 A I do not know.

14:56:07 14 Q Is the comparative Example 1 in column 10 of
14:56:15 15 the '038 patent, is it based on a software
14:56:19 16 simulation?

14:56:20 17 A I don't know for sure.

14:56:21 18 Q Did you review Examples 1 through 4 in
14:57:05 19 preparing for your deposition and in preparing your
14:57:07 20 declarations?

14:57:08 21 A Yes.

14:57:08 22 Q Do you agree with me that in each of
14:57:15 23 Examples 1 through 4, the crude gas stream flow rate
14:57:21 24 is specified as 1 meter cubed per hour?

14:57:26 25 A I'm sorry. In which examples?

14:57:28 1 Q 1 through 4. To help you out, I'll direct
14:57:40 2 you to column 11, line 14.

14:57:47 3 A I see that, yes.

14:57:49 4 Q So you agree with me. And you can look at
14:57:52 5 the other examples, but in all the examples, do you
14:57:56 6 agree that the crude gas volumetric flow rate is
14:58:00 7 identified as one meter cubed per hour?

14:58:03 8 A Yes, in Examples 1, 2, 3 and 4, yes.

14:58:07 9 Q And one meter cubed per hour, is that a
14:58:10 10 typical crude gas flow rate for a real-world
14:58:13 11 membrane gas separation apparatus?

14:58:15 12 A It would depend on the scale of the plant,
14:58:22 13 but it's probably on the lower side of things.

14:58:25 14 Q It's a pretty small flow rate, correct?

14:58:27 15 A Yes.

14:58:28 16 Q Can you explain why, for example, in the
14:58:50 17 membranes described in the '038 patent's examples,
14:58:55 18 carbon dioxide permeates through the membranes more
14:59:00 19 so than methane?

14:59:04 20 A Well, it has to do with the properties of
14:59:15 21 the gasses, things like gas size, condensability and
14:59:18 22 things like that, you know, and certainly that gives
14:59:24 23 rise to that sort of behavior.

14:59:29 24 Q That's all you can tell me?

14:59:33 25 A Well, you know, in the course of preparing

14:59:35 1 for, you know, this testimony on claims
14:59:38 2 construction, you know, I haven't explicitly
14:59:41 3 prepared testimony about that. And so that's --
14:59:48 4 those are some of the things that are important in
14:59:49 5 terms of informing that, but I'm not prepared to
14:59:53 6 give a more detailed testimony on that here today.

14:59:55 7 Q The claims in the '038 patent are not
15:00:04 8 limited to biogas separations, correct? They also
15:00:07 9 cover other gas mixtures?

15:00:10 10 A That is correct.

15:00:11 11 Q And so for example, people may want to
15:00:15 12 purify the methane and gas mixtures that come from
15:00:18 13 oil wells, right?

15:00:24 14 A I'm not sure if that's one of the things
15:00:27 15 that they specify in the specification, but the
15:00:30 16 claims are, you know, open-ended to some extent in
15:00:34 17 terms of the gasses that could be considered.

15:00:37 18 Q Let me turn you back to Exhibit 1, your
15:01:01 19 first declaration, paragraph 51.

15:01:08 20 A I'm sorry. That was the --

15:01:10 21 Q Your first one, Exhibit 1.

15:01:14 22 A And sorry. That was paragraph number...

15:01:17 23 Q 51.

15:01:23 24 A I'm there.

15:01:24 25 Q Okay. And in that paragraph, you offer your

15:01:33 1 view on the plain meaning of the disputed

15:01:36 2 concentration term in claim 1, right?

15:01:39 3 A Yes.

15:01:40 4 Q And your view or opinion is that the plain
15:01:44 5 and ordinary meaning of that term is "the apparatus
15:01:47 6 is configured such that the concentration of at
15:01:51 7 least one permeate gas is increased in the feed
15:01:55 8 stream at the feed stream separation stage, after
15:01:58 9 recycling of the second permeate stream and of the
15:02:01 10 third retentate stream, compared to a concentration
15:02:04 11 in the crude gas stream." Right?

15:02:12 12 A I think there might have been an additional
15:02:14 13 phrase in there, but as written in that quote in
15:02:18 14 paragraph 51, yes.

15:02:20 15 Q Okay. Maybe I'll make it easier. In
15:02:23 16 paragraphs 51 and 52, you give your opinion on the
15:02:27 17 plain and ordinary meaning of the disputed terms in
15:02:30 18 claims 51 and 59 that are related to the
15:02:33 19 concentrations, right?

15:02:34 20 A Yes.

15:02:35 21 Q Okay. And what is the plain and ordinary
15:02:38 22 meaning of concentration to you?

15:02:40 23 A It's the amount of a particular component in
15:02:45 24 a mixture by some measure.

15:02:48 25 Q Would that have been the ordinary meaning --

15:02:51 1 the plain and ordinary meaning to a POSITA in

15:02:53 2 May 2011?

15:02:56 3 A I think the understanding of concentration

15:03:04 4 in 2011, you know, is essentially the same as it

15:03:10 5 would have been -- than now, yes.

15:03:11 6 Q And concentrations in gas mixtures can be

15:03:18 7 measured in different ways with different units,

15:03:20 8 right?

15:03:21 9 A That's true.

15:03:21 10 Q Do you know how many different concentration

15:03:26 11 units there are for measuring a gas's concentration

15:03:29 12 in a gas mixture?

15:03:30 13 A No, I don't know off the top of my head, but

15:03:33 14 it's probably a big number. And if you get into

15:03:37 15 permutations of the concept of parts per million

15:03:41 16 with different units, it could be large.

15:03:44 17 Q And some different concentration units are

15:03:50 18 measuring different things, right? Like you may be

15:03:53 19 measuring the number of mols? You may be measuring

15:03:57 20 the mass? You may be measuring the volume, for

15:04:00 21 example?

15:04:00 22 A Yeah, those are --

15:04:03 23 MR. LIPPERT: Object to the form. Go ahead.

15:04:04 24 A Yes, those are examples of different bases

15:04:08 25 for describing concentration.

15:04:10 1 Q And can you explain what is being measured
15:04:14 2 when mass fraction units are used?

15:04:18 3 A So a mass fraction, by definition, is the
15:04:23 4 mass of the component that you're considering
15:04:27 5 divided by the total amount of mass in the -- in the
15:04:32 6 mixture in the total system that you're trying to
15:04:36 7 describe the concentration of.

15:04:38 8 Q Is mass percent a different concentration
15:04:44 9 unit than mass fraction?

15:04:48 10 A My understanding of mass percent and mass
15:04:52 11 fraction is that it is the same underlying
15:04:55 12 principle, but just a difference as to whether
15:04:57 13 you're representing the number as a percent or as a
15:05:01 14 fraction bound from 0 to 1.

15:05:04 15 Q And what is being measured when mol fraction
15:05:10 16 concentration units are used?

15:05:12 17 A So mol fractions would be the mols of the
15:05:17 18 component of interest per the total number of mols
15:05:21 19 in the system.

15:05:21 20 Q Okay. And can you describe what the
15:05:27 21 difference is between mol fractions and mass
15:05:29 22 fractions?

15:05:30 23 A The difference between the two comes down to
15:05:34 24 a factor of molecular weight of the component and
15:05:39 25 average -- typically average molecular weight of the

15:05:43 1 mixture. And so you need information about the
15:05:47 2 chemical composition of the materials.

15:05:50 3 Q So when you're measuring concentrations of
15:05:55 4 mass fraction concentration units versus mol
15:05:58 5 fraction concentration units, you're measuring
15:06:01 6 different underlying things, right?

15:06:05 7 A Yes.

15:06:06 8 Q The particular -- well, a concentration of a
15:06:11 9 particular gas in a mixture of gasses would be
15:06:17 10 different if the concentration is measured in
15:06:19 11 different ways, right, with different units?

15:06:24 12 A Well, the actual number that would be used
15:06:28 13 to describe that would depend to some extent on the
15:06:31 14 units that are used to describe it.

15:06:34 15 Q So if you have a gas A in a mixture of A, B
15:06:38 16 and C, A's mass fraction is not always going to be
15:06:42 17 equal to its mol fraction, correct?

15:06:44 18 A That's correct.

15:06:45 19 Q And there's not always a linear relationship
15:06:49 20 between different concentration units, correct?

15:06:54 21 A That's correct.

15:06:55 22 Q It's not like feet to inches where there's
15:06:58 23 always a constant ratio of 12, right?

15:07:01 24 A Correct.

15:07:02 25 Q And especially when you're comparing mass

15:07:04 1 fractions to mol fractions because, as you said,
15:07:07 2 those conversions involve using molecular weights,
15:07:11 3 right?

15:07:11 4 A Yes.

15:07:13 5 Q In your second report, your January 15th
15:07:37 6 report, Exhibit 2, you see that, paragraph 30?

15:07:46 7 A Oh, I'm sorry. Paragraph 30.

15:07:48 8 Q Maybe I didn't say -- I direct you to the
15:07:51 9 paragraph, but paragraph 30.

15:07:55 10 A Yes, I'm at paragraph 30.

15:07:57 11 Q And there you say, "In my opinion, a person
15:08:00 12 of ordinary skill in the art would have known where
15:08:04 13 (see paragraph 16, supra) and how to measure the
15:08:08 14 concentrations."

15:08:09 15 Do you see that?

15:08:10 16 A Yes.

15:08:11 17 Q Okay. And then you say, "(e.g., by using
15:08:15 18 tools or software well known in the field at the
15:08:18 19 time of the invention)."

15:08:19 20 Do you see that?

15:08:19 21 A Yes.

15:08:20 22 Q What tools and software are you referring to
15:08:23 23 there?

15:08:23 24 A So you know, for example, gas compositions
15:08:31 25 can be measured using gas chromatography. So one

15:08:36 1 can take an amount of gas, pass it through the
15:08:41 2 system, and using both the equipment and also the
15:08:45 3 software, get out of that some measure of the
15:08:50 4 composition of the gas.

15:08:52 5 Q Any other examples?

15:08:55 6 A I know I'm familiar with, you know, other
15:08:59 7 types of gas detectors. I mean, there are -- you
15:09:03 8 know, CO2 and oxygen detectors are pretty common.
15:09:10 9 Flammable gas detectors are pretty common. So there
15:09:13 10 are other types of detectors that one could use to
15:09:17 11 determine gas composition. But similar to a flow
15:09:21 12 meter, right, there's some options.

15:09:23 13 Q And the claims of the '038 patent do not
15:09:29 14 specify what concentration units to use when
15:09:33 15 comparing the concentrations in the feed in crude
15:09:37 16 gas streams, correct?

15:09:44 17 A You're asking if that's specified in the
15:10:05 18 claims or more broadly?

15:10:07 19 Q In the claims?

15:10:09 20 A So the claims -- the claims do not
15:10:14 21 explicitly state that, no.

15:10:16 22 Q Do you think the claims in the '038 patent
15:10:22 23 would have been clearer to a person of ordinary
15:10:24 24 skill in the art if the concentration units were
15:10:27 25 specified in the claims?

15:10:29 1 MR. LIPPERT: Object to the form.

15:10:30 2 A I think that the way that -- I think the
15:10:36 3 claims would have been informed by the rest of the
15:10:39 4 specification in the combination of the way that
15:10:44 5 compositions and flow rates are reflected in the
15:10:48 6 examples. So it's my opinion that that would have
15:10:53 7 been something that a person of ordinary skill in
15:10:55 8 the art would have -- would have recognized from the
15:10:58 9 intrinsic record.

15:11:00 10 Q In paragraph 31 of your second declaration,
15:11:17 11 you say, "A person of ordinary skill in the art
15:11:21 12 reading the specification of the '038 patent would
15:11:24 13 further understand that based on reference to volume
15:11:27 14 flow rates, the concentrations referred to in the
15:11:30 15 claims would be measured and compared in molar
15:11:35 16 units."

15:11:35 17 Do you see that?

15:11:36 18 A Yes.

15:11:36 19 Q Okay. And then you cite to Dr. Freeman's
15:11:41 20 opening report at paragraph 118?

15:11:43 21 A Uh-huh, yes.

15:11:44 22 Q In that sentence, you say, "a person of
15:11:49 23 ordinary skill in the art reading the specification
15:11:51 24 of the '038 patent" but you don't have any citation
15:11:55 25 to the specification of the '038 patent supporting

15:11:59 1 that sentence, correct? It only cites to
 15:12:02 2 Dr. Freeman's first report at paragraph 118?
 15:12:06 3 A Right. There's no citation to something in
 15:12:09 4 the '038 patent in that sentence.
 15:12:11 5 Q And let's mark Freeman. I'm going to mark
 15:12:18 6 as Exhibit 10, Dr. Freeman's January 3rd report.
 15:12:18 7 (Geise Exhibit 10 marked for
 15:12:27 8 identification.)
 15:12:27 9 BY MR. LANE:
 15:12:42 10 Q Do you have that, Dr. Geise?
 15:12:43 11 A Oh.
 15:12:47 12 Q Sorry, you do or are you still --
 15:12:49 13 A I'm getting it. Sorry.
 15:12:50 14 Q No problem.
 15:12:58 15 A Okay, I have it open. Where would you like
 15:13:02 16 me to --
 15:13:02 17 Q I'd like you to go to paragraph 118 that you
 15:13:06 18 cite in paragraph 31 of your second declaration.
 15:13:15 19 A I'm there, yes.
 15:13:16 20 Q And that paragraph 118 in Dr. Freeman's
 15:13:21 21 first report, it doesn't have any citations to the
 15:13:24 22 specification either, does it?
 15:13:26 23 A No, it does not.
 15:13:28 24 Q Does the intrinsic evidence of the '038
 15:13:59 25 patent specify what concentrations to measure in the

15:14:03 1 claims when comparing the concentrations in the feed
15:14:08 2 and crude streams?

15:14:17 3 A It does not specify explicitly in the claims
15:14:21 4 what those concentrations would be, but the examples
15:14:25 5 provided in the specification do provide information
15:14:29 6 on how one would understand to consider those
15:14:33 7 concentrations.

15:14:34 8 Q And can you point me to what language you're
15:14:40 9 talking about in the examples?

15:14:42 10 A So if we go, for example, to Comparative
15:14:59 11 Example Number 1, so I'm looking at column 10 in the
15:15:04 12 '038 patent looking at line, I guess, 27, so you're
15:15:11 13 defining the crude gas mixture as one 1.78 meters
15:15:16 14 cubed per hour of a crude gas mixture of 50 percent
15:15:21 15 methane and 50 percent carbon dioxide. So I'm
15:15:26 16 referring to that in the sense that the 50 percent
15:15:29 17 methane and 50 percent carbon dioxide, paired up
15:15:33 18 with this volumetric flow rate that's specified in
15:15:38 19 the sentence, would suggest that those percentages
15:15:43 20 are taken as volume percents which, as the
15:15:47 21 paragraph 118 specifies, or Dr. Freeman specifies,
15:15:52 22 that for these types of gas mixtures, those volume
15:15:55 23 percentages would be equal to mol percentages. So
15:15:58 24 that's the -- that's the basis for that and the
15:16:02 25 citation that's in -- in my paragraph 31.

15:16:06 1 Q Does the intrinsic evidence of the '038
15:16:12 2 patent specify that the concentrations should be --
15:16:18 3 wait. Let me strike that.

15:16:19 4 Does the intrinsic evidence of the '038
15:16:22 5 patent specify using molar units when comparing the
15:16:28 6 concentrations in the feed and crude streams?

15:16:33 7 A The specification does not -- does not
15:16:37 8 explicitly say that in words. However, it's my
15:16:42 9 opinion that the way that the examples are
15:16:46 10 constructed, the information there would inform a
15:16:49 11 person of ordinary skill that that is, you know, how
15:16:54 12 the specification is looking at -- at these
15:16:57 13 concentrations.

15:16:58 14 Q Okay. And there are different kinds of
15:17:04 15 molar units for concentration, right? There's
15:17:08 16 molarity, molality, mol fraction, mol percent,
15:17:12 17 correct?

15:17:15 18 MR. LIPPERT: Object to the form.

15:17:15 19 A Yes.

15:17:17 20 Q And those are all -- mol fraction, mol
15:17:21 21 percent, molarity, molality, those are all molar
15:17:25 22 concentration units, correct?

15:17:29 23 A They're all concentration units that use
15:17:32 24 mols somewhere in the basis for them.

15:17:44 25 Q You talked earlier about some mass balances

15:18:15 1 you did for the examples in the patent.

15:18:17 2 A Yes.

15:18:18 3 Q Okay. Did you do those mass balances to
15:18:28 4 determine what concentration units are used in the
15:18:33 5 patent's examples?

15:18:42 6 A I would say I did those mass balances to
15:18:47 7 just check the numbers that were in the examples and
15:18:51 8 as a part of trying to better understand what's
15:18:55 9 written in the examples.

15:18:57 10 Q In a mixture of three gasses, A, B and C,
15:19:10 11 A's mol fraction and molality will not necessarily
15:19:12 12 be the same number, correct?

15:19:20 13 A I'm sorry. You said mol fraction and
15:19:23 14 molality?

15:19:24 15 MR. LIPPERT: Counsel, could you speak up a
15:19:26 16 little bit? I'm having a hard time hearing you, I
15:19:31 17 think.

15:19:31 18 BY MR. LANE:

15:19:31 19 Q Me? Sorry. Do you want me to read the
15:19:34 20 question back?

15:19:34 21 A That would be helpful. Thank you.

15:19:36 22 Q Sure. In a mixture of three gasses, A, B
15:19:41 23 and C, A's mol fraction and molality will not
15:19:45 24 necessarily be the same number, correct?

15:19:48 25 A To define the molality for the mixture of

15:19:52 1 three gasses, one would need to define what the --
15:19:57 2 what the solvent is or what the basis is because
15:20:00 3 molality generally is defined per unit mass of one
15:20:04 4 of the components.

15:20:06 5 Q Okay. Molality is a molar unit though,
15:20:12 6 correct?

15:20:14 7 A It is typically defined as -- mols of the
15:20:17 8 component of interest per kilogram of solvent is a
15:20:22 9 typical definition. So it does involve mols.

15:20:41 10 Q In your opinion, to determine if a
15:21:01 11 particular membrane gas separation apparatus meets
15:21:06 12 the claims of the '038 patent, should the
15:21:13 13 concentrations of the permeates in the crude and
15:21:15 14 feed stream be measured in molar units?

15:21:20 15 A Based on what the specification teaches in
15:21:40 16 the examples, you know, I would -- I would use the,
15:21:45 17 you know, volume percent or volume fraction
15:21:47 18 depending on how -- how one is looking at it which,
15:21:52 19 you know, in these cases, as Dr. Freeman noted, is
15:21:57 20 equivalent for these cases to mol fractions or mol
15:22:00 21 percentages.

15:22:01 22 Q In paragraph 31 of your second declaration
15:22:09 23 that's been marked as Exhibit 2 -- are you there?

15:22:14 24 A Yes.

15:22:15 25 Q Okay. In the second sentence it says,

15:22:18 1 "Tools and programs used by those of skill in the
15:22:22 2 art at the time of the invention would be able to,
15:22:24 3 and commonly by default, measure concentration in
15:22:28 4 molar units."

15:22:29 5 Do you see that?

15:22:30 6 A Yes.

15:22:30 7 Q And what tools and programs are you
15:22:32 8 referring to there?

15:22:32 9 A You know, again that's using -- you know,
15:22:39 10 gas chromatography would be, you know, another
15:22:43 11 example that, you know, could be used to measure
15:22:50 12 those sorts of concentrations. You know, I'm aware
15:22:54 13 that there are other sorts of gas detectors that are
15:22:59 14 commonly used in terms of processes that process gas
15:23:06 15 streams.

15:23:13 16 MR. LANE: Let's take a break there for
15:23:19 17 about ten minutes.

15:23:25 18 VIDEOGRAPHER: We are off the record. The
15:23:26 19 time is 3:23 p.m.

15:23:28 20 (Short recess.)

15:40:05 21 VIDEOGRAPHER: We are back on the record.
15:40:18 22 The time is 3:40 p.m.

15:40:21 23 BY MR. LANE:

15:40:22 24 Q Welcome back, Dr. Geise.

15:40:23 25 A Thank you.

15:40:24 1 Q Did you have any discussions with your
15:40:25 2 counsel at the break regarding your testimony or
15:40:28 3 anticipated testimony?

15:40:28 4 A I did not.

15:40:30 5 Q And so next let's go back to your second
15:40:34 6 exhibit, Exhibit 2, paragraph 32. Are you with me?

15:40:42 7 A Yes. Rebuttal report?

15:40:45 8 Q Yeah.

15:40:46 9 A Paragraph 32. Yes.

15:40:47 10 Q Let's see here. And there you talk about
15:40:54 11 two examples that Dr. Freeman provided in his
15:40:57 12 opening report. Do you see that?

15:40:59 13 A Yes.

15:40:59 14 Q And those examples had two permeating
15:41:08 15 gasses, hydrogen and carbon dioxide, right?

15:41:13 16 A So there were three gasses, so methane,
15:41:17 17 carbon dioxide, and hydrogen.

15:41:19 18 Q Right. But the permeates were the hydrogen
15:41:23 19 and the carbon dioxide, right?

15:41:25 20 A Those would have been the more permeating
15:41:28 21 gasses, but presumably some -- some methane, at
15:41:32 22 least to some extent, permeated in those systems as
15:41:35 23 well.

15:41:35 24 Q In Dr. Freeman's first example, which I
15:41:39 25 think you replicated in paragraph 34 of your second

15:41:43 1 report, the CO₂ concentration is higher in the feed
15:41:51 2 stream than in the crude stream using mass percent
15:41:55 3 concentration, but the CO₂ concentration is lower in
15:41:59 4 the feed stream than in the crude stream using mol
15:42:03 5 percent concentration, right?

15:42:10 6 A Just making sure. So yes, the feed mass
15:42:14 7 fraction of CO₂ is greater than the crude mass
15:42:20 8 fraction of CO₂. And then the mol fraction of CO₂ in
15:42:26 9 the crude is greater than the mol fraction of CO₂ in
15:42:30 10 the feed.

15:42:31 11 Q Okay. In that example, looking at the
15:42:34 12 hydrogen, its concentration is higher in the feed
15:42:38 13 than in the crude using either mass or mol
15:42:43 14 concentrations, right?

15:42:48 15 A That's correct.

15:42:49 16 Q Okay. And then in the -- in Dr. Freeman's
15:42:52 17 second example, which you reproduce in paragraph 36
15:42:58 18 of your second report, do you see that?

15:43:01 19 A Yes.

15:43:01 20 Q And in that example, the hydrogen
15:43:04 21 concentration is higher in the feed than in the
15:43:07 22 crude using mol percent, but the hydrogen
15:43:12 23 concentration is lower in the feed than in the crude
15:43:16 24 using mass percent?

15:43:18 25 A That's correct.

15:43:19 1 Q Okay. But in that example, the carbon
15:43:23 2 dioxide is higher in the feed than in the crude
15:43:26 3 using either mass or mol concentrations, right?

15:43:34 4 A Yes, that's correct.

15:43:35 5 Q And in Dr. Freeman's two examples, were you
15:44:00 6 generally able to follow his analysis, like how he
15:44:06 7 did the calculations and unit conversions?

15:44:08 8 A Yes.

15:44:09 9 Q Okay. Can you generally explain the unit
15:44:16 10 conversions in Dr. Freeman's examples?

15:44:20 11 A So I believe the unit conversion here is
15:44:23 12 being done by taking into account the molecular
15:44:29 13 weight of the particular gas divided by the average
15:44:36 14 molecular weight of the mixture, which then takes
15:44:38 15 into account the compositions and molecular weights
15:44:41 16 of all three gasses in the mixture.

15:44:44 17 Q And you've criticized Dr. Freeman's examples
15:44:49 18 in your rebuttal report, right?

15:44:59 19 A Well, I think in my declaration I pointed
15:45:02 20 out that, you know, no matter the units of
15:45:06 21 concentration used, the apparatus is configured to
15:45:11 22 increase a concentration of at least one permeate
15:45:14 23 gas at the feed separation stage.

15:45:17 24 Q Okay. Did you attempt to go through the
15:45:21 25 math in his examples in analyzing them?

15:45:26 1 A I ran the -- I looked through the Visual

15:45:31 2 Basic script and ran that.

15:45:34 3 Q So you don't have any criticisms or you
15:45:40 4 don't think there's any errors in his math per se,
15:45:44 5 is that correct?

15:45:45 6 A I think within the framework of the way the
15:45:49 7 calculations were outlined, it goes through and
15:45:53 8 populates a number of different cases for what
15:45:57 9 appears to be a mixing location where two streams
15:46:04 10 come together to form a third. And the script then
15:46:09 11 generates all sorts of combinations of -- of the
15:46:13 12 components that can go through and come together at
15:46:15 13 that mixing point and then does the material balance
15:46:19 14 to figure out, you know, what the -- what the feed
15:46:23 15 stream composition would be and then does some
15:46:26 16 analysis to downselect for specific cases of -- of
15:46:33 17 the resulting data. So within the construct of it's
15:46:37 18 a material balance for you bring two streams
15:46:40 19 together into a third stream, it struck me as
15:46:46 20 reasonable within that context.

15:46:47 21 Q Okay. So you're not saying any of the math
15:46:51 22 is wrong or he did any of the conversions between
15:46:56 23 the units incorrectly, right?

15:46:58 24 A I don't believe so.

15:47:00 25 Q Can we mark as Exhibit 11, the PDF. Okay.

15:47:07 1 I'm going to bring up Exhibit 11, Dr. Freeman --

15:47:10 2 sorry, Dr. Geise.

15:47:10 3 (Geise Exhibit 11 marked for

15:47:30 4 identification.)

15:47:30 5 A Okay, I have that.

15:47:31 6 Q One second here. And these are examples

15:47:50 7 similar to the examples, but different examples than

15:47:54 8 in Dr. Freeman's report -- initial report. In this

15:47:59 9 example, the first Example A, do you have that in

15:48:03 10 front of you?

15:48:05 11 A I'm looking at it, yes.

15:48:06 12 Q Example A, do you see there that using the

15:48:10 13 mol percentages that the concentration of the CO₂ is

15:48:16 14 higher in the feed than in the crude, 62.41 versus

15:48:23 15 62.25?

15:48:24 16 A I see that, yes.

15:48:26 17 Q Okay. And the concentration of the CO₂ using

15:48:31 18 mass percentages is lower in the feed versus the

15:48:35 19 crude. Do you see that?

15:48:36 20 A Yes.

15:48:39 21 Q Okay. And then so for CO₂ at least, the

15:48:50 22 concentration in the feed versus the crude is higher

15:48:55 23 using mol percentages, but lower using mass

15:48:59 24 percentage concentration units. Do you see that?

15:49:01 25 A Yes, it's just summarizing the comparisons

15:49:06 1 we just made, yes.

15:49:07 2 Q And turning to Example B on the next page,
15:49:12 3 similarly if you look at the CO₂ there, using the
15:49:18 4 mol percentage units, the feed concentration is
15:49:23 5 higher than in the crude? Do you see that, 63.39
15:49:27 6 versus 63.10?

15:49:29 7 A Yes.

15:49:30 8 Q But if you use the mass percentage units,
15:49:34 9 the concentration of the CO₂ is lower in the feed
15:49:39 10 than in the crude. Do you see that?

15:49:40 11 A Yes.

15:49:41 12 Q Okay. So like with Example A for the CO₂,
15:49:45 13 you have this flipping depending on which
15:49:47 14 concentration you use. Do you see that?

15:49:50 15 A Yes, that's what the numbers are showing,
15:49:53 16 yes.

15:49:53 17 Q Okay. And do you agree that all -- well,
15:50:06 18 let me say it this way.

15:50:08 19 Going back to Exhibit 4, the '038 patent, do
15:50:15 20 you agree that claim 1 requires comparing
15:50:19 21 concentrations in the feed stream to concentrations
15:50:22 22 in the crude gas stream?

15:50:23 23 A It requires an increase in the concentration
15:50:40 24 of at least one permeate gas in the feed stream
15:50:46 25 separation stage after recycling of the second

15:50:48 1 permeate stream and of the third retentate stream in
15:50:50 2 the feed stream compared to a concentration in the
15:50:53 3 crude gas stream. So suggesting that comparison for
15:50:56 4 at least one permeate gas.

15:50:58 5 Q Okay. And claim 59 has a similar
15:51:01 6 requirement?

15:51:04 7 A It's worded differently, but there is a
15:51:29 8 suggestion there about making a comparison.

15:51:31 9 Q And you understand that in this case, the
15:51:37 10 only asserted independent claims of the '038 patent
15:51:43 11 are claims 1 and 59?

15:51:45 12 A I believe that's the case, yes.

15:51:46 13 Q Okay. And you understand that dependent
15:51:50 14 claims incorporate by reference the requirements of
15:51:53 15 the independent claims on which they depend?

15:51:54 16 A Yes.

15:51:55 17 Q Okay. So all the asserted claims in this
15:52:00 18 case require making the comparison of at least one
15:52:05 19 permeate stream's concentration in the feed stream
15:52:09 20 versus in the crude stream, correct?

15:52:11 21 MR. LIPPERT: Object to the form. Also
15:52:14 22 we're really getting off base here.

15:52:29 23 A I think just to clarify, you know, that
15:52:34 24 saying increasing the concentration of at least one
15:52:37 25 permeate gas -- I think you might have said one

15:52:41 1 permeate stream, but just clarifying, one permeate
15:52:44 2 gas.

15:52:45 3 Q Well, let me go on. Do you agree that all
15:52:55 4 of the asserted claims require that the second
15:52:58 5 permeate and third retentate stream are recycled?

15:53:36 6 A I don't believe that is required.

15:53:39 7 Q You don't?

15:53:40 8 A No.

15:53:41 9 Q Can I turn your attention to your rebuttal
15:54:02 10 report -- your rebuttal declaration, the
15:54:05 11 January 15th one at paragraph 15?

15:54:12 12 A Okay, I'm there.

15:54:13 13 Q Okay. And the second sentence there says,
15:54:18 14 "Claims 1 and 59 require the comparison of
15:54:22 15 concentration to be made only after recycling of the
15:54:27 16 second permeate stream and of the third retentate
15:54:31 17 stream."

15:54:31 18 Do you see that?

15:54:33 19 A I do see that.

15:54:34 20 Q Okay. And do you agree with that statement?

15:54:40 21 MR. LIPPERT: Can you repeat that? I
15:54:42 22 couldn't hear.

15:54:42 23 MR. LANE: I said, do you agree with that
15:54:45 24 statement.

15:54:47 25 A That is coming from the language of the

15:55:08 1 claim, so I agree with that statement.

15:55:12 2 Q Okay. So at least claims 1 and 59 require
15:55:17 3 that the second permeate stream and third retentate
15:55:21 4 stream are recycled, correct?

15:55:52 5 A Counsel, if you were running, say, like a
15:55:55 6 start-up operation or something of that sort, there
15:55:59 7 -- there might not yet be a second permeate or third
15:56:02 8 retentate stream or essentially those -- those
15:56:05 9 streams would have flow rates equal to zero. And so
15:56:09 10 from that standpoint, you know, you might look at it
15:56:12 11 and say you're making the comparison, you know,
15:56:17 12 across that space, but -- but you're ultimately
15:56:30 13 looking to -- looking to see that that change in
15:56:32 14 concentration once -- once those recycle streams are
15:56:37 15 operating back at -- in the operation of the
15:56:41 16 process.

15:56:41 17 Q Right.

15:56:42 18 A So I have the difference there. I mean, you
15:56:46 19 can make the comparison and see there's no
15:56:48 20 difference, but...

15:56:50 21 Q You emphasize in both places the word
15:56:52 22 "after," right, after recycling of the second
15:56:55 23 permeate stream and the third retentate stream in
15:56:58 24 paragraph 15?

15:56:59 25 A Yes.

15:56:59 1 Q Why did you emphasize the word "after"?

15:57:16 2 A It has to do with the nature of the way the
15:57:29 3 different combinations are described in the
15:57:34 4 specification for the feed stream and so just
15:57:38 5 highlighting language that was used in the -- in the
15:57:42 6 specification.

15:57:44 7 Q So again, just so we have a clear record, do
15:57:49 8 you agree that the claims require recycling of the
15:57:53 9 second permeate stream and of the third retentate
15:57:56 10 stream to the feed stream?

15:58:08 11 MR. LIPPERT: Object to the question,
15:58:12 12 format, form. And also, it's really beyond the
15:58:15 13 scope of what his testimony was, his declarations
15:58:20 14 are.

15:58:20 15 MR. LANE: I'm actually quoting. I'm
15:58:24 16 reading from his declaration, Nels. You need to
15:58:26 17 stop making speaking objections.

15:59:17 18 A I consider after to suggest the case where
15:59:21 19 those recycle streams are operative, so the
15:59:26 20 comparison -- suggesting that the comparison be made
15:59:31 21 at some point after those streams are being recycled
15:59:36 22 back in.

15:59:37 23 Q Okay. And in that case where we're talking
15:59:40 24 about after the recycling occurs, would it have been
15:59:46 25 important to a person of ordinary skill in the art

15:59:52 1 to have a clear understanding of what the feed
15:59:56 2 stream is versus what the crude stream is in the
16:00:01 3 patent's claims?

16:00:08 4 A Well, I think one -- it would be important
16:00:10 5 for one to know that and they would go to the
16:00:14 6 specification to learn about how that is defined.

16:00:19 7 Q In paragraph -- let's go back to your first
16:00:37 8 declaration, paragraph 32.

16:00:51 9 A I'm there.

16:00:52 10 Q You say there, "The specification of the
16:01:01 11 '038 patent consistently refers to the term 'feed
16:01:04 12 stream' in reference to the stream assigned
16:01:08 13 reference numeral 5 in the arrangement of the
16:01:11 14 Figure 11."

16:01:12 15 Do you see that?

16:01:13 16 A I do.

16:01:13 17 Q Okay. And you can turn your attention, if
16:01:25 18 you need to, to Figure 11, but it's also reproduced
16:01:28 19 on the next page of your declaration there also in
16:01:31 20 paragraph 32. Do you see that?

16:01:34 21 A Yes.

16:01:34 22 Q Okay. And do you agree that in Figure 11 of
16:01:39 23 the '038 patent, there is only one feed stream?

16:01:46 24 A There is one arrow that is drawn connecting
16:01:52 25 the compressor to the feed stream separation stage.

16:01:58 1 Q But I don't think that really responds or
16:02:00 2 maybe I'm not understanding.

16:02:02 3 My question is in Figure 11, is there more
16:02:05 4 than one feed stream in Figure 11?

16:02:08 5 A I think the material flow is being
16:02:11 6 represented by one arrow. I don't necessarily think
16:02:16 7 that means that there is only one pipe, if that
16:02:20 8 makes sense.

16:02:21 9 Q Okay. In Figure 11, do you agree that there
16:02:29 10 is only one feed stream?

16:02:41 11 A Going back to I think the way the process is
16:02:46 12 described is suggesting there's a material flow that
16:02:49 13 they're referring to as a feed stream. And that as
16:02:55 14 the -- as the specification alludes to elsewhere,
16:02:58 15 you know, not necessarily everything that is visibly
16:03:05 16 represented in Figure 11 translates exactly to what
16:03:10 17 would be built in the real-world apparatus. So I
16:03:12 18 would be careful about again specifying, you know,
16:03:17 19 exactly how many physical pipes are proceeding in a
16:03:21 20 the feed stream separation stage. But again,
16:03:26 21 they're showing in Figure 11 a feed stream being
16:03:32 22 represented by one arrow.

16:03:34 23 Q So you agree in Figure 11, there is only one
16:03:40 24 feed stream shown and only one crude stream shown?

16:03:47 25 A I think there's -- there's one arrow that

16:03:52 1 they're referring to as the material flow associated
16:03:55 2 with a feed stream.

16:03:57 3 Q But you're saying there could be more than
16:04:02 4 one pipe for the crude stream, correct?

16:04:09 5 A I'm saying that I think the -- you know,
16:04:13 6 there's language in the specification, you know,
16:04:17 7 that suggests that perhaps the -- you know, there
16:04:23 8 could be some features not visually accounted for in
16:04:29 9 Figure 11 that would be present in the actual
16:04:31 10 process. And so yes, I'm -- I'm not making a
16:04:35 11 definitive assessment as to, you know, perhaps how
16:04:39 12 many pipes or tubes, you know, move from the
16:04:42 13 compressor into the feed separation stage.

16:04:44 14 Q Okay. And before you testified, "I don't
16:04:47 15 necessarily think that means there is only one
16:04:51 16 pipe." Do you agree with that, for the crude gas
16:04:56 17 stream?

16:04:56 18 A I'm sorry. Can you -- I don't necessarily
16:05:00 19 -- I'm not sure I understand the question.

16:05:03 20 Q Well, this is your testimony I'm reading
16:05:05 21 back. You said -- I asked you -- my question is,
16:05:11 22 "In Figure 11, is there more than one feed stream."
16:05:14 23 So we'll talk about the feed stream first and you
16:05:16 24 said, "I don't necessarily think that means there is
16:05:18 25 only one pipe." Do you agree with that?

16:05:22 1 A That's correct.

16:05:23 2 Q And do you agree the same thing with respect
16:05:27 3 to the crude stream, there could be more than one
16:05:29 4 pipe?

16:05:29 5 A I think it could be possible.

16:05:37 6 Q Okay. If there's more than one pipe, where
16:05:45 7 would you put the flow meter you talked about before
16:05:47 8 to measure the crude gas flow?

16:05:51 9 A So there you'd have to -- you'd have to go
16:05:54 10 through and sample all of the different pipes and
16:05:57 11 add up the total flow because the way that the
16:06:01 12 specification is worded is centered around looking
16:06:05 13 at the aggregate of those. It's a little bit
16:06:10 14 similar to how some of the examples describe the
16:06:13 15 total recycle stream, for example, is adding
16:06:16 16 together the information from the two recycle
16:06:23 17 streams. So one would do essentially the same thing
16:06:26 18 whether there was one pipe or more. It's just you
16:06:30 19 would -- you would need more instrumentation in
16:06:34 20 order -- and a little bit more analysis to do that
16:06:36 21 comparison.

16:06:37 22 Q If there was more than one crude gas pipe,
16:06:43 23 how would you know how to measure the concentration
16:06:46 24 in the crude gas stream or how would a POSITA know?

16:06:52 25 A So the way that one would go about measuring

16:06:54 1 it would be the same in the physical sense of, you
16:07:01 2 know, instrumentation in the pipes. You're, you
16:07:03 3 know, putting in some sort of detector. You're
16:07:06 4 putting in a flow meter to measure that information.
16:07:09 5 You get that information for all of the flows that
16:07:13 6 are coming in and then you have the information
16:07:17 7 about everything that's going on there. And so it's
16:07:19 8 a material balance problem to go through and combine
16:07:24 9 those together into what would ultimately yield, you
16:07:29 10 know, a single flow rate and a single set of
16:07:34 11 compositional information.

16:07:35 12 Q Turning your attention to paragraph 14 in
16:07:47 13 your second declaration.

16:07:54 14 A Okay, I'm there.

16:07:56 15 Q The first sentence says, "Defendants'
16:07:58 16 construction improperly asserts that the 'feed
16:08:01 17 stream' of the apparatus disclosed in the '038
16:08:05 18 patent is always composed of the combination of the
16:08:08 19 gasses of the crude gas stream, of the second
16:08:11 20 permeate stream, and of the third retentate stream."

16:08:14 21 Do you see that?

16:08:15 22 A Yes.

16:08:15 23 Q And to be honest with you, I'm really
16:08:21 24 confused what you mean by that. Can you explain
16:08:23 25 what you mean by that?

16:08:24 1 A So the point here is that the Defendants'
16:08:34 2 construction builds in the inclusion of the second
16:08:39 3 permeate stream and of the third retentate stream.

16:08:44 4 Q Builds into what?

16:08:45 5 A Into the proposed construction. So it's
16:08:51 6 saying that, you know, the gasses -- the feed stream
16:08:55 7 contains the gasses of the crude gas stream of the
16:08:58 8 second permeate stream and of the third retentate
16:09:01 9 stream.

16:09:05 10 Q In the gas separation apparatuses that are
16:09:14 11 claimed in the '038 patent in the claims, does the
16:09:17 12 crude gas stream make up part of the feed stream?

16:09:23 13 A I don't believe the claims specify as
16:10:12 14 clearly as the specification does and particularly
16:10:18 15 the passage that I quoted on -- well, as part of
16:10:24 16 paragraph 14. I think the feed stream definition is
16:10:32 17 given in the specifications in that paragraph.

16:10:36 18 Q My question though was about the claims. In
16:10:44 19 the claimed apparatuses, does the crude gas stream
16:10:47 20 make up part of the feed stream?

16:10:52 21 A I don't believe that is explicitly required
16:12:22 22 in the claims.

16:12:23 23 Q Going back to Figure 11 which was reproduced
16:12:33 24 in your first report at paragraph 32 -- you with me?

16:12:44 25 A Yes, I'm there.

16:12:45 1 Q Okay. And on the bottom it says, Figure 11
16:12:49 2 is an illustrative connection arrangement of several
16:12:52 3 membrane modules according to the invention. Do you
16:12:55 4 see that?

16:12:55 5 A Yes.

16:12:56 6 Q And in Figure 11, the feed stream is
16:13:03 7 labeled 5. Do you agree with me on that?

16:13:06 8 A Yes, stream 5 is representing a feed stream,
16:13:10 9 yes.

16:13:10 10 Q And stream 17 is the crude stream, correct?

16:13:14 11 A Yes.

16:13:14 12 Q In Figure 11, where does the feed stream
16:13:18 13 begin?

16:13:37 14 A So the specification teaches us that, you
16:13:45 15 know, can be a combination of different things,
16:13:47 16 right. And so as I, you know, allude to in my
16:13:51 17 declaration, you know, the feed stream 5 is
16:13:54 18 referring to the gas stream or a gas stream which is
16:13:58 19 supplied to the feed stream separation stage 1.
16:14:01 20 This stream for the performance of the process may
16:14:03 21 correspond to the crude gas stream 17 or to the
16:14:06 22 crude gas stream compressed by a compressor. And
16:14:11 23 then after recycling of the second permeate stream
16:14:15 24 or of the third retentate stream, the feed stream 5
16:14:17 25 is composed of the gasses of the crude gas

16:14:21 1 stream 17, of the second permeate stream 9, and of
16:14:23 2 the third retentate stream 10. And it goes on to
16:14:27 3 describe some other permutations and mentioning that
16:14:31 4 combinations of the variants described above are
16:14:34 5 also encompassed by the present invitation.

16:14:37 6 And so the beginning of the stream can take
16:14:42 7 on -- you know, what constitutes the feed stream in
16:14:49 8 this case is being described in the specification,
16:14:51 9 but there are potentially multiple answers to -- to
16:14:55 10 that question.

16:14:56 11 Q Okay. And a similar question, in Figure 11,
16:15:01 12 where does the crude stream end?

16:15:16 13 A Well, it ends somewhere before material
16:15:41 14 enters the feed separation stage.

16:15:44 15 Q Can you be any more specific than that?

16:15:47 16 A Well, it depends on the other -- it depends
16:15:50 17 on the other combinations of the variants that are
16:15:54 18 going on within the system because as the
16:16:00 19 specification, you know, points out, the -- you
16:16:07 20 know, the feed stream could or may correspond to the
16:16:11 21 crude gas stream. So in that case, you know,
16:16:17 22 nothing else is being added in -- into the stream
16:16:20 23 from one to the other or the other variants and
16:16:27 24 combinations that are described in that passage
16:16:29 25 that's in paragraph 14.

16:16:32 1 Q In Figure 11, can you point to any specific
16:16:36 2 point in the figure where either the crude gas
16:16:40 3 stream ends or the feed stream begins?

16:16:42 4 A Well, Figure 11 is one, again, illustrative
16:16:51 5 connection arrangement, but the specification
16:16:55 6 describes that that illustrative connection
16:17:01 7 arrangement that's shown in Figure 11 is just one of
16:17:05 8 the possible variants that could be considered in
16:17:07 9 terms of thinking about the answer to those
16:17:10 10 questions. And so I think the answer is a little
16:17:17 11 more complicated than just looking at Figure 11.

16:17:20 12 Q Okay. So Figure 11 you've said describes
16:17:24 13 one variant of the invention, is that correct?

16:17:28 14 A It's one -- as they describe, it's an
16:17:33 15 illustrative connection arrangement. So they've put
16:17:37 16 together, you know, one example to look at what the
16:17:39 17 connections, you know, might be within the scope of
16:17:42 18 the patent.

16:17:42 19 Q Okay. And in that example, in that variant,
16:17:46 20 that specific one, can you point me to the specific
16:17:50 21 point where either the feed stream starts or the
16:17:54 22 crude stream ends?

16:17:56 23 A Well, in the specific example given in
16:18:20 24 Figure 11 -- and so this is, you know, sort of
16:18:22 25 taking into account, you know, a specific way that

16:18:27 1 all of the streams are being worked in, right. We
16:18:31 2 have a situation where we're depicting the recycle
16:18:35 3 streams coming in and being combined before being
16:18:39 4 mixed in with the crude stream. We have the
16:18:42 5 compressor in place.

16:18:44 6 So as drawn here for that particular case,
16:18:47 7 and not necessarily limited or not excluding the
16:18:52 8 other combinations and variants that the
16:18:54 9 specification allows for, you know, I would go in
16:19:00 10 and look at the crude gas stream as being, you know,
16:19:02 11 whatever's coming into the process from sort of
16:19:06 12 outside of the envelope, so before the recycle
16:19:10 13 streams come in. Then they come in. They go
16:19:14 14 through the compressor. All of that happens and you
16:19:18 15 end up with the feed gas stream which then enters
16:19:23 16 the feed separation stage. But again, that's one --
16:19:27 17 that's one way of looking at it. The specification
16:19:30 18 would suggest there are other -- other ways of
16:19:32 19 looking at that as well.

16:19:33 20 Q Okay. So I'll ask you just one more time,
16:19:38 21 Dr. Geise, tell the judge and the jury who are not
16:19:42 22 chemical engineers, is there some point in Figure 11
16:19:47 23 that you can point to where the crude gas stream
16:19:50 24 ends or the feed gas stream starts?

16:20:20 25 A So in Figure 11, again as, you know, one --

16:20:24 1 one specific example, I mean, I would -- if I were,
16:20:27 2 you know, going to go in and point, you know, I'd
16:20:31 3 say that the crude stream is starting, you know,
16:20:35 4 over to the left outside of the process.

16:20:41 5 I would say that, you know, a feed stream is
16:20:44 6 starting, you know, after the recycles come through
16:20:48 7 after the compressor. That's consistent with the
16:20:51 8 stream 5 as is identified in the specification. And
16:20:55 9 so at that point, you know, you're switching from
16:21:00 10 crude to feed, at least in this embodiment where
16:21:04 11 we're looking at just one of the combinations that
16:21:07 12 could possibly answer that question.

16:21:08 13 Q In Figure 11, is the compressor in the feed
16:21:13 14 stream or in the crude stream?

16:21:15 15 A I would not characterize the compressor as
16:21:21 16 being in a stream.

16:21:24 17 Q Is figure -- is the compressor upstream or
16:21:33 18 downstream of where the feed stream starts in
16:21:37 19 Figure 11?

16:21:37 20 A So as depicted, since the compressor is
16:21:55 21 there, you know, I would defer to the specification
16:21:59 22 in terms of saying that the feed stream -- it refers
16:22:04 23 to a gas stream which was supplied to the feed
16:22:06 24 stream separation stage. And this stream, for the
16:22:10 25 purpose or performance of the process, may

16:22:12 1 correspond to the crude gas stream or the crude gas
16:22:15 2 stream compressed by a compressor. So that would
16:22:17 3 suggest that the compressor is upstream of the feed
16:22:21 4 stream stage -- or sorry, feed stream.

16:22:24 5 Q Okay. So in Figure 11, your testimony is
16:22:28 6 the compressor marked 4 is upstream of the feed
16:22:33 7 stream, correct?

16:22:35 8 MR. LIPPERT: Object to the form.

16:22:37 9 A I think that is consistent with one of the
16:22:42 10 variants that's described in the specification
16:22:46 11 recognizing that Figure 11 is just one potential
16:22:51 12 arrangement.

16:22:52 13 Q Evonik's proposed construction of feed
16:23:23 14 stream in claims 1 and 59 is a gas stream which is
16:23:27 15 supplied to the feed stream separation stage, right?

16:23:30 16 A Yes.

16:23:31 17 Q Okay. Under Evonik's construction of feed
16:23:35 18 stream, can you describe where the feed stream
16:23:39 19 begins?

16:23:45 20 A Well, it begins somewhere before it's been
16:23:52 21 supplied to the feed stream separation stage.

16:23:54 22 Q Can you be any more specific than that?

16:23:57 23 A Well, that would get into the different
16:24:01 24 variants and combinations of things that the patent
16:24:04 25 specification allows for.

16:24:06 1 Q Okay. So just again, the jury and the judge
16:24:10 2 are not technical people necessarily. So under
16:24:15 3 Evonik's construction, can you describe where the
16:24:18 4 feed stream begins for the jury and the judge?

16:24:24 5 MR. LIPPERT: Object to the form. I'm not
16:24:27 6 sure there's a question there.

16:24:34 7 A I think I could work through a series of
16:24:37 8 examples informed by the specification language in
16:24:47 9 order to illustrate in very clear terms to a judge
16:24:51 10 and jury how that -- how that claim construction
16:24:55 11 plays out, but it would need to be multiple examples
16:24:59 12 taking into account the language in the
16:25:01 13 specification.

16:25:02 14 Q That's as clear an answer as you can give
16:25:06 15 the judge and the jury right now?

16:25:08 16 A At this point, yes.

16:25:10 17 Q Okay. And under Evonik's proposed
16:25:13 18 construction of feed stream, can you tell the judge
16:25:18 19 and the jury where the crude stream ends?

16:25:33 20 A Again, this is one where I would need to,
16:25:36 21 you know, work together the different examples or
16:25:39 22 cases from the way that the feed stream is described
16:25:43 23 in the specification to describe that, you know, for
16:25:49 24 a judge and jury. But it's my opinion that a person
16:25:52 25 of ordinary skill would look at the specification

16:25:56 1 and this construction and understand how to make
16:25:58 2 those decisions as to start and stop points.

16:26:02 3 Q That's the most clear answer you can give
16:26:05 4 the judge and the jury?

16:26:07 5 A Yes.

16:26:08 6 MR. LIPPERT: Objection. Question -- the
16:26:16 7 statement. Come on, John.

16:26:18 8 BY MR. LANE:

16:26:18 9 Q In paragraph 12 of your second report,
16:26:21 10 Dr. Geise -- are you with me?

16:26:27 11 A I'm there now.

16:26:29 12 Q You have a sentence there I think it's the
16:26:32 13 second sentence that says, "Indeed, in my opinion, a
16:26:35 14 person of ordinary skill in the art would understand
16:26:38 15 that there can be instances - e.g., at a point prior
16:26:43 16 to the recycling of the second permeate stream and
16:26:45 17 third retentate stream in the feed stream,
16:26:48 18 particularly during start-up of operation - where
16:26:51 19 the feed stream corresponds to the crude gas stream
16:26:56 20 entering the apparatus."

16:26:57 21 Do you see that?

16:26:58 22 A I do.

16:26:58 23 Q How is that statement relevant to the claims
16:27:04 24 of the '038 patent?

16:27:11 25 A Well, it's a -- it's a construction that

16:27:24 1 reflects the definition of the feed stream as given
16:27:27 2 in the specification. And so as one would look to
16:27:32 3 the claims and look to interpret what feed stream
16:27:35 4 means, it's important that the construction take
16:27:40 5 into consideration the fact that the specification,
16:27:44 6 you know, says that the stream for the performance
16:27:47 7 of the process may correspond to the crude gas
16:27:50 8 stream 17.

16:27:51 9 Q Is a situation prior to the recycling of the
16:27:58 10 second permeate stream and third retentate stream
16:28:03 11 relevant to the claims of the '038 patent in your
16:28:10 12 opinion?

16:28:10 13 MR. LIPPERT: Object to the form.

16:28:10 14 A I guess I can't speak specifically to --
16:28:22 15 within the framework of the claims, but from the
16:28:26 16 standpoint of the claim construction process and
16:28:30 17 understanding a construction for feed stream, I
16:28:34 18 think it's important that the construction reflect
16:28:38 19 the way it's described in the specification.

16:28:42 20 Q In the context of the apparatuses that are
16:28:55 21 claimed in the patent, does the specification say
16:28:59 22 where the feed stream starts?

16:29:05 23 A The specification gives a number of cases
16:29:09 24 and describes variants and then also, you know,
16:29:14 25 clearly specifies that combinations of the variants

16:29:18 1 described above are also encompassed by the
16:29:21 2 invention. But you know, provides in that
16:29:23 3 paragraph that's cited in paragraph 14 of my
16:29:26 4 declaration for a number of different cases and
16:29:30 5 situations where the feed stream, you know, could be
16:29:34 6 considered to start at different places.

16:29:36 7 Q So under Evonik's proposed construction of
16:29:44 8 the term "feed stream," the feed stream can start in
16:29:47 9 different places, is that correct?

16:29:53 10 A Well, the specification, you know, outlines
16:29:59 11 different aspects of the process that may or may not
16:30:01 12 be in play. And so as a result, that would -- that
16:30:07 13 would change the way, you know, one might point to a
16:30:10 14 specific place or the way one might draw up a
16:30:13 15 different illustrative connection arrangement
16:30:18 16 figure.

16:30:19 17 Q Okay. Under Evonik's proposed construction,
16:30:23 18 can the feed stream in the apparatuses claimed in
16:30:28 19 the '038 patent begin at different places?

16:30:32 20 A I think to define where it begins, you have
16:30:50 21 to look at which of the variants or which
16:30:53 22 combination of the variants we're talking about.
16:30:55 23 And then once that is fixed, then the feed stream
16:31:03 24 becomes more defined. But until -- until in a
16:31:08 25 specific case if you're looking at a specific, you

16:31:10 1 know, Dolt process and saying, go point at it, we
16:31:14 2 need to understand more about what's going on in
16:31:17 3 that specific example, combine that with what's
16:31:21 4 written in the specification and with that, a person
16:31:24 5 of ordinary skill could -- could go and point to it.
16:31:29 6 So the answer to where that pointing is could depend
16:31:31 7 on the combination of all those different factors.

16:31:37 8 Q Under Evonik's proposed construction of the
16:31:40 9 term "feed stream," in the apparatuses claimed in
16:31:45 10 the '038 patent, could the crude gas stream end at
16:31:51 11 different points?

16:31:56 12 A I think again it -- the where someone would
16:32:00 13 go and actually point on a real apparatus would
16:32:03 14 depend on, you know, what the details are of all the
16:32:08 15 variants that are, you know, encompassed by or are
16:32:12 16 described within this paragraph in the
16:32:15 17 specification.

16:32:17 18 Q Which paragraph in the specification?

16:32:18 19 A Sorry. Looking at the paragraph quoted in
16:32:23 20 paragraph 14 of my rebuttal declaration.

16:32:28 21 Q Under Evonik's proposed construction of the
16:32:32 22 term "feed stream" for the apparatuses in the claims
16:32:38 23 in the '038 patent, can the feed stream and the
16:32:41 24 crude stream be the same stream?

16:32:46 25 A So the specification does allow for the feed

16:32:52 1 stream for the performance of the process to

16:32:55 2 correspond to the crude gas stream.

16:33:00 3 Q So is that a yes?

16:33:02 4 A I think I'm just saying --

16:33:08 5 MR. LIPPERT: He answered the question.

16:33:13 6 BY MR. LANE:

16:33:13 7 Q I don't think he did.

16:33:17 8 Under Evonik's proposed construction of the

16:33:19 9 term "feed stream," can the feed stream and the

16:33:22 10 crude stream be overlapping?

16:33:36 11 A I'm not familiar with what overlapping means

16:33:41 12 in the context of streams, but you know, to guide me

16:33:44 13 on this, I'd go back to the specification, you know,

16:33:48 14 where it essentially says that the feed stream can

16:33:50 15 correspond to the crude gas stream, so it's

16:33:54 16 suggesting correspondence between those two streams.

16:33:57 17 Q So under Evonik's proposed construction,

16:34:03 18 there can be correspondence between the feed stream

16:34:06 19 and the crude gas stream?

16:34:22 20 A I mean, so part of the specification they

16:34:25 21 can correspond to one another and so long as that

16:34:28 22 stream is being supplied with the feed separation

16:34:32 23 stage, then that would be consistent with the

16:34:35 24 construction.

16:34:36 25 Q Under Evonik's proposed construction of the

16:34:41 1 term "feed stream," in the apparatuses claimed in
16:34:44 2 the '038 patent, can the feed stream and the crude
16:34:48 3 gas stream be the same stream?

16:34:49 4 A So they can correspond to each other per the
16:34:59 5 specification. And then if that stream is being
16:35:04 6 supplied to the feed stream separation stage, then
16:35:07 7 that would be consistent with the claim
16:35:11 8 construction.

16:35:11 9 Q Can we turn to paragraph 16 of your second
16:35:28 10 report?

16:35:33 11 A I'm there.

16:35:34 12 Q Okay. And there you wrote, "A person of
16:35:39 13 ordinary skill in the art would also have understood
16:35:42 14 from the plain language of the claims where to
16:35:45 15 measure the concentration of the 'at least one
16:35:49 16 permeate gas' in the feed stream and in the crude
16:35:52 17 gas stream in order to make the comparison claimed
16:35:55 18 in the '038 patent (e.g., in the feed stream at a
16:35:59 19 point after recycling and before the feed stream is
16:36:04 20 supplied to the feed stream separation stage, and in
16:36:07 21 the crude gas stream, before being combined with the
16:36:11 22 recycle stream)."

16:36:12 23 Do you see that?

16:36:13 24 A Yes.

16:36:13 25 Q Does any of the intrinsic evidence for the

16:36:17 1 '038 patent say to measure the concentration at the
16:36:23 2 points that you're saying they should be measured in
16:36:27 3 paragraph 16 in your second report?

16:36:30 4 A So there's not explicit mention in the
16:36:34 5 intrinsic record of where to do that in the explicit
16:36:40 6 language listed in the intrinsic record.

16:36:42 7 Q And you're not pointing to any extrinsic
16:36:49 8 evidence saying that those concentrations should be
16:36:51 9 measured at the points where you're saying they
16:36:53 10 should be measured in paragraph 16 of your second
16:36:56 11 report, right?

16:36:57 12 A I have not cited or pointed toward any
16:37:01 13 external evidence here. I'm basing that off of what
16:37:06 14 I believe a person of ordinary skill in the art
16:37:09 15 would understand about process operation and how to
16:37:11 16 measure compositions and flow rates in systems.

16:37:16 17 Q In paragraph 17, you say, "When asked to
16:37:25 18 compare concentration of at least one permeate gas
16:37:30 19 in a feed stream to a crude gas stream, a person of
16:37:34 20 ordinary skill in the art would likely have modelled
16:37:37 21 the apparatus disclosed in the '038 patent by
16:37:40 22 computer simulation."

16:37:41 23 Do you see that?

16:37:43 24 A Yes.

16:37:44 25 Q Okay. And you agree that the real-world

16:37:53 1 utility of software simulations can vary drastically
16:37:56 2 depending on various factors, correct?

16:38:02 3 A Yes, there are certainly things that can be
16:38:04 4 done in a simulation to make it not correspond to a
16:38:08 5 real-world process.

16:38:09 6 Q And we talked before about how the default
16:38:15 7 settings in software simulation can be changed,
16:38:18 8 correct?

16:38:19 9 A Yes.

16:38:19 10 Q Have you done any simulations in your work
16:38:23 11 in this case?

16:38:24 12 A Not -- not in the sense of Aspen. I guess,
16:38:33 13 if technically running the Visual Basic code from
16:38:38 14 Dr. Freeman's declaration constitutes a simulation,
16:38:41 15 then yes, in that context, but not outside of that.

16:38:44 16 Q Okay. No Aspen simulations, CHEMCAD, or
16:38:48 17 HYSYS simulations?

16:38:50 18 A No.

16:38:51 19 Q Did you look at any simulation software in
16:38:56 20 connection with your -- doing your work in this case
16:39:01 21 to form the opinions in your two declarations?

16:39:04 22 A I did not. My experience with using Aspen
16:39:11 23 in the classroom over the last decade was -- was my
16:39:15 24 basis for that.

16:39:17 25 Q And your experience using Aspen in the

16:39:23 1 classroom in the last ten years, what was the
16:39:25 2 earliest version of Aspen you used in that work?

16:39:30 3 A I don't recall off the top of my head.

16:39:34 4 Q Was it a version from before or after
16:39:37 5 May 2011?

16:39:38 6 A I can't speak definitively to that because I
16:39:43 7 don't know.

16:39:43 8 Q Are the versions of Aspen that you've been
16:39:47 9 using in your work since 2020, are they versions
16:39:54 10 from after May 2011?

16:39:57 11 A Yes, the more recent versions that we've
16:40:00 12 been using have certainly been updated over the
16:40:03 13 course of the last decade.

16:40:05 14 Q And how often do you update the versions
16:40:08 15 generally?

16:40:10 16 A I would say generally we have tried to
16:40:17 17 update it probably within a year of a new version
16:40:20 18 coming out, but I don't actually manage that, so I
16:40:25 19 don't remember exactly what the cadence has been.
16:40:27 20 But we've had a couple updates over the course of
16:40:30 21 the last decade.

16:40:31 22 Q In paragraph 5 of your first declaration...

16:41:24 23 A I'm there.

16:41:26 24 Q In the sentence that spans the bottom of
16:41:29 25 page 1 to top of page 2, you say, "I teach gas

16:41:36 1 separations via membranes in a Ph.D.-level chemical
16:41:40 2 engineering course on mass transfer."

16:41:42 3 Do you see that?

16:41:42 4 A Yes, I see that.

16:41:43 5 Q And what's the name of that course?

16:41:46 6 A I believe it is just Mass Transfer.

16:41:51 7 Sometimes I call it Graduate Mass Transfer, but I
16:41:54 8 think the actual catalog name is just Mass Transfer.

16:41:57 9 Q And is that the only course you're referring
16:41:59 10 to there when you talk about courses you teach in
16:42:02 11 gas separations via membranes?

16:42:06 12 A Yes.

16:42:07 13 Q And how many times have you taught that
16:42:09 14 course?

16:42:10 15 A I'd have to go back and count explicitly,
16:42:18 16 but it's probably -- I might be in my fifth time
16:42:23 17 teaching it this semester. It's probably four or
16:42:26 18 five. For some reason, the years all run together,
16:42:28 19 but thereabouts.

16:42:30 20 Q Okay. And I was going to ask if you're
16:42:32 21 still teaching it, but it sounds like you're
16:42:34 22 teaching it right now?

16:42:35 23 A I am, yes.

16:42:36 24 Q And can you generally describe what mass
16:42:40 25 transfer is to help the jury and the judge?

16:42:43 1 A So mass transfer is collectively the process
16:42:49 2 where you move material around in a system. So you
16:42:56 3 know, it becomes important in terms of separations,
16:43:01 4 but broadly speaking, it's thinking about how -- how
16:43:05 5 matter makes its way from one place to another.

16:43:07 6 Q Is that class entirely on membrane
16:43:11 7 separations?

16:43:12 8 A It is not.

16:43:13 9 Q And what other mass transfer topics other
16:43:16 10 than membrane separations does that class cover?

16:43:19 11 A We cover topics related to diffusion,
16:43:25 12 combinations of diffusive and convective transport.
16:43:29 13 We look at mass transfer coefficients. We think
16:43:35 14 about transport in electrolyte systems, just as some
16:43:40 15 examples.

16:43:41 16 Q And what percentage would you estimate of
16:43:44 17 that course is on membrane separations?

16:43:49 18 A So it's probably -- somewhere depending on
16:43:55 19 the year it's been somewhere between two and three
16:43:58 20 weeks out of a 15-week semester.

16:44:02 21 Q And of those two or three weeks, what
16:44:05 22 portion of that covers gas separations via
16:44:08 23 membranes?

16:44:09 24 A Probably about half of it.

16:44:13 25 Q Is there a textbook for that course?

16:44:18 1 A No.

16:44:19 2 Q Is there like a packet of information the
16:44:25 3 students get for the course, reading materials,
16:44:28 4 anything like that?

16:44:28 5 A So I have a collection of journal articles,
16:44:32 6 chapters from books, a whole assortment of things
16:44:36 7 that I use to support the lecture. So it's a --
16:44:42 8 there is information that's provided to the students
16:44:44 9 in lieu of a textbook, but it comes from all sorts
16:44:47 10 of different places.

16:44:48 11 Q Okay. And what percentage of that
16:44:50 12 information is on gas separations via membranes?

16:44:56 13 A I'd be hard pressed to put a number on it in
16:45:14 14 terms of percentage, but I think it's, you know,
16:45:17 15 roughly about one or two chapters from a book. I'd
16:45:23 16 have to -- I'd have to go back. And I don't
16:45:25 17 remember exactly off the top of my head what I've --
16:45:28 18 what I've assigned in every time I've offered the
16:45:31 19 course, but that's about the amount of material that
16:45:33 20 it would be.

16:45:38 21 MR. LANE: All right. Let's take a break
16:45:39 22 there.

16:45:40 23 VIDEOGRAPHER: We are off the record. The
16:45:42 24 time is 4:45 p.m.

16:45:45 25 (Short recess.)

16:59:10 1 VIDEOGRAPHER: We are back on the record.

17:01:46 2 The time is 5:01 p.m.

17:01:49 3 BY MR. LANE:

17:01:53 4 Q Welcome back, Dr. Geise. Did you have any
17:01:56 5 discussions with counsel about your previous or
17:01:59 6 anticipated testimony during the break?

17:02:00 7 A No.

17:02:02 8 Q And going back to our discussion about the
17:02:07 9 crude gas and the feed gas streams, how would a
17:02:14 10 person of ordinary skill in the art compare
17:02:19 11 concentrations in the crude gas and feed gas streams
17:02:24 12 if the streams are either the same or overlapping?

17:02:32 13 A Well, so I mean, you could consider -- you
17:02:37 14 know, consider an example case where you just have a
17:02:39 15 pipe and you have some liquid flowing through it, if
17:02:44 16 you put detectors or measurement devices in that --
17:02:49 17 in that pipe at two different locations, those
17:02:53 18 devices will give you a concentration and/or flow
17:02:57 19 rate information. And if the flow in that pipe is
17:03:03 20 the same and nothing else is happening, then the
17:03:05 21 values you would get there would -- would be very
17:03:09 22 close, if not identical, and that would -- that
17:03:12 23 would be what you would compare in the case where
17:03:16 24 you're, you know -- have the situation you suggest
17:03:20 25 where you have streams that are either the same or

17:03:23 1 overlapping.

17:03:24 2 Q And how would -- in that case, how would a
17:03:29 3 person of ordinary skill in the art know where to
17:03:31 4 measure the concentrations?

17:03:37 5 A So I think it depends on the -- I mean, in
17:03:48 6 the hypothetical example I gave, there's just a pipe
17:03:52 7 sitting there. And so -- but that's a hypothetical
17:03:57 8 example that doesn't map necessarily onto a
17:03:59 9 real-world process.

17:04:02 10 In the case of the real-world process,
17:04:04 11 right, you know, you'd have the process instrumented
17:04:09 12 to make those measurements at various points
17:04:12 13 throughout the process. And so a person of ordinary
17:04:17 14 skill in the art would look at the flow diagram and
17:04:22 15 would understand to put measurement devices, you
17:04:26 16 know, in strategic places given the flow sheet and
17:04:29 17 so depending on the -- you know, the combination --
17:04:36 18 the variant or the combinations of variants, as we
17:04:39 19 were talking about a little bit ago, the person of
17:04:41 20 ordinary skill would navigate that as they're
17:04:48 21 practicing the invention.

17:04:49 22 Q Under Evonik's proposed claim construction
17:05:00 23 of feed stream, could the concentration of the at
17:05:07 24 least one permeate in the feed gas stream change
17:05:12 25 depending on where it's measured in the feed gas

17:05:21 1 stream?

17:05:21 2 A So in my opinion, this is -- this is where,
17:05:44 3 you know, from the person of ordinary skill in the
17:05:47 4 art coming in and looking at this process and, you
17:05:52 5 know, essentially saying that this -- sorry, let me
17:06:04 6 -- you know, looking at the proposed construction as
17:06:08 7 a gas stream which is supplied to the feed stream
17:06:11 8 separation stage, that a person of ordinary skill
17:06:16 9 would recognize that looking at what's going into
17:06:19 10 the feed separation stage, you know, might be a
17:06:22 11 logical place to do that measurement.

17:06:26 12 And then depending on -- and so in that
17:06:30 13 sense, depending on whatever happens upstream of
17:06:33 14 that within the context of what the specifications
17:06:37 15 say could be happening, you would -- you would
17:06:40 16 capture whatever -- whatever compositional changes
17:06:47 17 occur due to the other variations of the process as
17:06:52 18 -- as the specification describes in that
17:06:55 19 paragraph that we were discussing in paragraph 14 of
17:06:57 20 my declaration.

17:06:59 21 Q Okay. I'm not sure I understand that. But
17:07:04 22 let me try to ask more clearly.

17:07:06 23 So under Evonik's proposed claim
17:07:10 24 construction of feed stream, could the concentration
17:07:16 25 of the at least one permeate be different at

17:07:22 1 different points in the feed stream?

17:07:38 2 A So for a given variant, for you know -- if
17:07:52 3 we take the space of combinations and variants that
17:07:56 4 the specification looks at and we just pick one of
17:08:00 5 those, that then, you know, defines things in a
17:08:06 6 manner which would make it less likely that you
17:08:08 7 would have the concentration varying if you moved
17:08:13 8 around within the context of that variant as applied
17:08:17 9 with the preliminary claim construction.

17:08:21 10 Q Under Evonik's proposed claim construction
17:08:25 11 of feed stream, could the concentration of the at
17:08:30 12 least one permeate gas be different depending on
17:08:34 13 where it's measured in the crude gas stream?

17:08:46 14 A I don't believe the proposed construction --
17:09:25 15 sorry, let me strike that. I think again it comes
17:09:37 16 back to the way that the specification is worded
17:09:41 17 with different variants and combinations. And
17:09:46 18 that's ultimately again sort of leading a person of
17:09:50 19 ordinary skill in the art to understand where to do
17:09:54 20 this measurement within the system. And so once
17:09:57 21 that's established, that sets up a situation where,
17:10:03 22 you know, those measurements should not depend on
17:10:07 23 where you go within the -- within the constraints of
17:10:11 24 how those streams are being understood by the person
17:10:15 25 of ordinary skill.

17:10:17 1 Q Okay. Going back, I wanted to follow up on
17:10:29 2 a few things from the beginning of your deposition.
17:10:32 3 We talked about before how you had not done any work
17:10:36 4 on membrane gas separation apparatuses for biogas,
17:10:44 5 right?

17:10:45 6 A That's correct.

17:10:46 7 Q Okay. And since I asked you some questions
17:10:50 8 about what you were doing before you got your Ph.D.
17:10:53 9 But I wanted to ask, after you got your Ph.D., have
17:10:56 10 you ever been hired to work on a membrane gas
17:10:58 11 separation apparatus?

17:11:03 12 A I've done work related to experimental
17:11:19 13 design or providing advice on setting up
17:11:22 14 particularly experimental apparatuses for gas
17:11:26 15 separation, but in terms of physically building such
17:11:31 16 a device, no.

17:11:33 17 Q So since you got your Ph.D., you haven't
17:11:37 18 worked on a membrane gas separation apparatus?

17:11:42 19 A I've not worked on a physical apparatus.

17:11:45 20 Q Have you ever visited an actual membrane gas
17:11:50 21 separation facility?

17:11:59 22 A Not that I can recall.

17:12:00 23 Q And again changing gears a little bit.
17:12:24 24 Evonik has raised -- or cited a document, a patent
17:12:29 25 document titled W0 2011/009919. Does that -- it's

17:12:37 1 not on your list of materials considered. Do you
17:12:39 2 ever recall reviewing that document?

17:12:41 3 A Not that I recall offhand.

17:12:43 4 Q And you didn't consider WO 2011/009919 in
17:12:52 5 informing your opinions expressed in your
17:12:54 6 declarations?

17:12:55 7 A I don't believe I've seen that document, but
17:12:59 8 -- so in that sense, I don't believe so.

17:13:01 9 Q I didn't mean to interrupt you. You're not
17:13:03 10 relying on that document in support of your opinion
17:13:06 11 on the claim construction of separation-active
17:13:09 12 layer?

17:13:10 13 A So as I'm sitting here right now, I'm not
17:13:15 14 sure what that document is so I don't believe so.

17:13:17 15 Q All right. And if you go back to your first
17:13:24 16 declaration, paragraph 36 -- sorry, 38. Are you
17:13:40 17 with me?

17:13:41 18 A Yes, I'm there.

17:13:42 19 Q Evonik's proposed claim construction for
17:13:45 20 separation-active layer is layer responsible for gas
17:13:49 21 separation. Do you see that?

17:13:50 22 A Yes.

17:13:50 23 Q And what does responsible for mean in that
17:13:56 24 claim construction?

17:13:57 25 A So it means the layer is involved in the

17:14:08 1 separation of the gasses or in executing the manner
17:14:14 2 by which the gasses are being separated.

17:14:16 3 Q How would a person of ordinary skill in the
17:14:21 4 art determine if a layer is responsible for gas
17:14:24 5 separation?

17:14:27 6 A So one of the ways to do it would be to
17:14:41 7 subject that layer to, you know, a gas permeation
17:14:45 8 study where you measure the permeabilities of gasses
17:14:48 9 through the layer and from that, you can determine
17:14:51 10 things like selectivity or the way in which the
17:14:54 11 layer is contributing to gas separation.

17:14:59 12 Q In Evonik's proposed construction of
17:15:02 13 separation-active layer, could there be more than
17:15:06 14 one membrane layer in a membrane that was
17:15:11 15 responsible for gas separation or is it just one
17:15:15 16 layer?

17:15:18 17 A So I would say that the -- you know, the --
17:15:26 18 sorry, strike that. So in the field, it is
17:15:40 19 generally discussed that these gas separation
17:15:43 20 membranes have, you know, a selective and active
17:15:47 21 layer, you know, this layer that is doing the
17:15:50 22 majority of the gas separation work. It is known in
17:15:56 23 some cases that there can be effects, particularly
17:16:02 24 on the way that a membrane functions, that are
17:16:07 25 attributed to the support layer for that. But

17:16:10 1 largely speaking, in terms of gas separations, the
17:16:15 2 dense layer or the separation-active layer, as we're
17:16:19 3 talking about it here, you know, is the layer that
17:16:24 4 accomplishes the separation in a manner that without
17:16:27 5 it, the membrane would not be considered viable.

17:16:31 6 Q Would membranes with support layers be
17:16:36 7 considered viable without the support layers?

17:16:49 8 A I would say that there are likely cases
17:16:52 9 where that is true. There are a host of other
17:16:54 10 reasons why those -- or I'm sorry. That would be
17:16:58 11 true from the standpoint of the gas separation
17:17:00 12 portion of things alone. There are a host of
17:17:03 13 reasons why eliminating the support would make the
17:17:07 14 use of the membrane in a practical application not
17:17:10 15 viable. But from the standpoint of the gas
17:17:14 16 separation, that layer is critical.

17:17:19 17 Q You agree there's no definition of
17:17:24 18 separation-active layer in the intrinsic evidence
17:17:28 19 for the '038 patent, correct?

17:17:30 20 A That's correct, the intrinsic record doesn't
17:17:34 21 have a definition of that.

17:17:35 22 Q And in your two declarations that you
17:17:38 23 submitted, you did not cite any extrinsic evidence
17:17:45 24 that uses the term "separation-active layer,"
17:17:48 25 correct?

17:17:48 1 A I believe that's correct.

17:17:49 2 Q Let me turn your attention to -- help if I

17:18:30 3 looked at the right one. It's your first

17:18:33 4 declaration at paragraph 38.

17:18:39 5 A Okay, I'm there.

17:18:40 6 Q You say there in the first sentence,

17:18:48 7 "Further, in my opinion, a person of ordinary skill

17:18:51 8 in the art would have understood that the term

17:18:53 9 'separation-active layer' is synonymous with the

17:18:58 10 terms 'active layer,' 'selective layer,' and/or

17:19:01 11 'separating layer' which are commonly used in the

17:19:04 12 field of membrane separation systems." See that?

17:19:07 13 A I do.

17:19:09 14 Q And I'm not sure I understand that sentence.

17:19:13 15 Are you saying that separation-active layer is

17:19:16 16 commonly used in the field of membrane separation

17:19:19 17 systems?

17:19:21 18 A No. I would not consider that to be a

17:19:24 19 common term in the field. However, in a

17:19:31 20 circumstance wherein I'm imagining, you know, going

17:19:37 21 to a technical presentation at the North American

17:19:40 22 Membrane Society meeting, I believe that if a

17:19:44 23 presenter used that term in giving a technical talk,

17:19:50 24 that the audience would understand that that term

17:19:54 25 was referring to a layer of the membrane that is

17:19:58 1 synonymous with the same as what would be referred
17:20:02 2 to if the presenter had said active layer, selective
17:20:05 3 layer, or separating layer.

17:20:11 4 Q In paragraph 37, second sentence, it says,
17:20:52 5 "For example, the specification states that 'the
17:20:55 6 inventive apparatus or the process according to the
17:20:58 7 invention can in principle be implemented with all
17:21:03 8 membranes which are capable of separating binary gas
17:21:08 9 mixtures or multi-gas mixtures... useful polymers in
17:21:14 10 the separation-active layer are more preferably
17:21:17 11 polyimides, polyamides" and it goes on to list other
17:21:23 12 membranes there.

17:21:24 13 Do you see that?

17:21:24 14 A Yes.

17:21:24 15 Q And then further down that paragraph you
17:21:29 16 say, "Indeed, in my opinion, a person of ordinary
17:21:32 17 skill in the art would understand that a membrane
17:21:34 18 layer comprised of such materials is commonly used."

17:21:39 19 Do you see that?

17:21:39 20 A Yes.

17:21:40 21 Q And the person of ordinary skill in the art
17:21:44 22 that you're referring to there, is that a person of
17:21:47 23 ordinary skill in the art in May 2011?

17:21:50 24 A Yes.

17:21:51 25 Q Okay. And so a person of ordinary skill in

17:21:54 1 the art in May 2011 would have understood that all
17:21:59 2 the polymers that are described in the specification
17:22:02 3 language that you cited there were commonly used as
17:22:07 4 of May 2011, is that correct?

17:22:09 5 A For the specific polymers that are listed
17:22:14 6 there, there were -- there were examples of forms of
17:22:19 7 those that had been reported I believe as early as
17:22:27 8 perhaps even 2008 or earlier for all -- for all of
17:22:32 9 the polymers that are listed there.

17:22:33 10 Q Okay. Before May 2011, did any of the
17:22:39 11 polymers that were listed there have mixed gas
17:22:41 12 selectivities over 35 for CH₄ over CO₂?

17:22:47 13 A It is likely that some did. There were
17:22:50 14 several materials that, you know, did have favorable
17:22:55 15 selectivity properties. However, I can't speak
17:22:58 16 specifically to, you know, an example of one that I
17:23:03 17 can point to right now.

17:23:04 18 Q In paragraph 38 in the first sentence you
17:23:39 19 state, "Further, in my opinion, a person of ordinary
17:23:41 20 skill in the art would have understood that the term
17:23:44 21 'separation-active layer' is synonymous with the
17:23:47 22 terms 'active layer,' 'selective layer' and/or
17:23:50 23 'separating layer' which are commonly used in the
17:23:52 24 field of membrane separation systems."

17:23:56 25 What are you relying on in support of that

17:23:59 1 because you don't have any citations for that

17:24:01 2 sentence?

17:24:02 3 A So that's based on my opinion of assessing
17:24:07 4 the field in the way that people talk about
17:24:11 5 membranes. It's associated with the broad knowledge
17:24:15 6 of the architectures of how membranes for not only
17:24:19 7 gas separations, but other applications as well, are
17:24:22 8 formed and this pervasive understanding that there
17:24:29 9 is this layer that is often referred to as the
17:24:32 10 active or selective or separating layer.

17:24:36 11 And so it's my opinion that given the
17:24:40 12 prevalence of that and sort of the ubiquitous way
17:24:44 13 that the people describe these systems, and the fact
17:24:46 14 that they describe this particular layer in a number
17:24:49 15 of different ways, that a person of ordinary skill
17:24:53 16 would understand in terms of reading the patent and
17:24:56 17 again, in the example I mentioned before, you know,
17:24:59 18 hearing a technical presentation at a meeting, would
17:25:07 19 naturally go to recognizing that this
17:25:10 20 separation-active layer term that is referred to in
17:25:15 21 the patent would almost in a sense just be simply,
17:25:20 22 you know, over -- perhaps over-specifying or
17:25:23 23 over-defining, you know, active layer or selective
17:25:26 24 layer or separating layer, these other concepts that
17:25:29 25 are so common within the field.

17:25:31 1 And so you know, I'm not citing extrinsic or
17:25:38 2 external evidence here from the standpoint that this
17:25:42 3 is -- is just based on something that I feel is
17:25:47 4 widely enough known that it would have been
17:25:50 5 straightforward for the person of ordinary skill.

17:25:54 6 Q And you agree that separation-active layer
17:25:57 7 was not a commonly used term in the field, right?
17:26:00 8 We talked about that.

17:26:01 9 A I agree, yep.

17:26:02 10 Q But you were saying the terms "active
17:26:05 11 layer," "selective layer," "separating layer" are
17:26:08 12 commonly used in the field?

17:26:09 13 A Yes.

17:26:09 14 Q And why do you think the inventors used the
17:26:15 15 term that was not commonly used in the field if
17:26:18 16 there were all these other terms that were commonly
17:26:21 17 used in the field? Why didn't they just use one of
17:26:23 18 those terms?

17:26:24 19 MR. LIPPERT: Object to the form.

17:26:24 20 A I mean, it's a good question and, you know,
17:26:30 21 whether it -- I'm speculating here. You know,
17:26:34 22 whether it's something in a translation, you know,
17:26:38 23 who knows. I'm not sure.

17:26:47 24 Q And you agree -- well, you can look in
17:26:52 25 paragraph 24 of your second declaration that's been

17:26:56 1 marked, you used the term "real-world" hyphenated,
17:27:01 2 right?

17:27:02 3 A Sorry. We're looking at paragraph --

17:27:05 4 Q 24 in your second declaration.

17:27:13 5 A Okay. So I'm there now. Where am I
17:27:16 6 looking?

17:27:16 7 Q Yes. It says, "Moreover, a person of
17:27:19 8 ordinary skill in the art would also have been able
17:27:22 9 to measure the required volumes in real-world
17:27:25 10 apparatuses," real-world, right?

17:27:27 11 A Yes.

17:27:27 12 Q And you agree that when two words are
17:27:31 13 hyphenated, they don't necessarily mean the same
17:27:34 14 thing as the two words themselves?

17:27:37 15 MR. LIPPERT: Object. Objection to the
17:27:40 16 form.

17:27:40 17 A Well, I don't think that's what I'm
17:27:46 18 necessarily implying here.

17:27:49 19 Q Well, back in paragraph 38 of your first
17:27:57 20 declaration, is it your opinion that
17:28:02 21 separation-active layer is synonymous with the terms
17:28:06 22 active layer and selective layer or separating layer
17:28:09 23 because it is a hyphenated version of some of those
17:28:13 24 terms or the conjugates of some of those terms?

17:28:17 25 MR. LIPPERT: Object to the form.

17:28:17 1 A I don't think my opinion on that is so much
17:28:24 2 related to I guess the use of punctuation in the
17:28:29 3 word as the fact that it's just using common phrases
17:28:35 4 that are used to describe these sorts of layers.
17:28:38 5 And so, much like in real-world apparatus, I think
17:28:44 6 -- I think, you know, most people would understand,
17:28:49 7 you know, what that means in its own context.

17:28:51 8 So I might -- my opinion is that in the, you
17:28:56 9 know, proposed construction term that that's being
17:28:59 10 considered within the context of what's known in gas
17:29:03 11 separations and what -- how people describe those
17:29:07 12 systems.

17:29:07 13 Q In paragraph 38 of your first declaration,
17:29:16 14 you talked about the support layers that we touched
17:29:19 15 on a few minutes ago.

17:29:22 16 A Yes.

17:29:22 17 Q What other layers besides support layers can
17:29:27 18 be in a membrane for gas separation?

17:29:30 19 A So one example is you can have a gutter
17:29:37 20 layer, for example, or you could have a top coat
17:29:42 21 layer on top of the membrane. Those are just two
17:29:46 22 examples of other things that sometimes are done.

17:29:49 23 Q And the permeate gas has to pass through all
17:29:53 24 the layers, correct?

17:29:55 25 A Assuming the layers are all defect-free,

17:30:00 1 then yes.

17:30:00 2 Q Okay. And all those layers can have some
17:30:08 3 effect on the gas separation, correct?

17:30:12 4 A Each layer can contribute a mass transfer
17:30:16 5 resistance to the total system.

17:30:18 6 Q So to some extent, the -- all the layers are
17:30:27 7 layers through which the separation of gas occurs?

17:30:36 8 A Well, each layer has the -- has the
17:30:39 9 opportunity, depending on the nature of the layer
17:30:42 10 and the nature of the gasses that are being
17:30:45 11 separated, to influence the mass transfer of both of
17:30:50 12 those gasses. Now, whether that affects a
17:30:52 13 separation or not depends on more details about what
17:30:57 14 the layer is actually made of and to some extent
17:30:59 15 what the gasses are.

17:31:01 16 Q And would a person of ordinary skill in the
17:31:04 17 art have understood all that?

17:31:05 18 A I believe so.

17:31:06 19 Q If you removed the support layer from the
17:31:20 20 membranes in a membrane gas separation apparatus,
17:31:24 21 would the apparatus still work?

17:31:26 22 A It would -- it would likely have mechanical
17:31:36 23 issues related to the fact that the support layer
17:31:41 24 provides mechanical strength for the membrane and
17:31:44 25 under operating conditions, without that mechanical

17:31:47 1 support, the membrane would likely fail to function.

17:31:53 2 Q Okay. And fail to function means it
17:31:55 3 wouldn't separate the gasses correctly, correct?

17:31:59 4 A Well, it would probably rupture, meaning
17:32:01 5 that not necessarily -- well, depends. The polymer
17:32:05 6 could still do the separations, but you would have a
17:32:08 7 compromised module. And so as a result, you would
17:32:11 8 not get separation out of the module.

17:32:25 9 MR. LIPPERT: While you're looking at that,
17:32:26 10 counselor, Mr. Phillips, can you tell us how much
17:32:32 11 more time we've got here?

17:32:32 12 VIDEOGRAPHER: We've been on the record for
17:32:34 13 6 hours and 27 minutes.

17:32:36 14 MR. LIPPERT: Okay. Thank you.

17:32:59 15 BY MR. LANE:

17:32:59 16 Q We're going to put up Exhibit 12 now,
17:33:01 17 Dr. Geise.

17:33:02 18 A Okay.

17:33:02 19 (Geise Exhibit 12 marked for
17:33:04 20 identification.)

17:33:04 21 BY MR. LANE:

17:33:17 22 Q Do you have that?

17:33:18 23 A I just pulled it up, yes.

17:33:20 24 Q Sorry. Is this Exhibit 13 -- 12. And did
17:33:31 25 you review this paper in preparing for your

17:33:33 1 deposition?

17:33:34 2 A I have not.

17:33:35 3 Q Okay. Do you understand this is one of the
17:33:37 4 papers that Dr. Freeman cited in his rebuttal report
17:33:42 5 in paragraph 35?

17:33:44 6 A I do seem to remember there was something
17:33:50 7 from Uwe, but I can confirm that.

17:34:00 8 Q Dr. Freeman's report is Exhibit 6.

17:34:10 9 A Yes, I see that cited in paragraph 35.

17:34:13 10 Q Okay. And you said Uwe. Do you know the
17:34:18 11 authors or one of the authors of this paper?

17:34:20 12 A The -- I do know the first author, yes.

17:34:23 13 Q And the support layers that are referred to
17:34:28 14 in the title here, are those the same support layers
17:34:31 15 that you discussed in your declarations?

17:34:34 16 A I'd need to take a look since I haven't
17:34:37 17 looked through this paper.

17:34:40 18 Q Sure.

17:36:35 19 A So it is considering a composite membrane.
17:36:38 20 I'm looking through and I haven't found yet a
17:36:42 21 description of what the support layer is in here, so
17:36:49 22 I -- you know, this mention of composite membranes
17:36:52 23 in the experimental section of this paper is
17:36:56 24 consistent with this type of membrane that would
17:36:58 25 have, you know, multiple layers involved.

17:37:03 1 I don't know if there's somewhere that I
17:37:06 2 should be looking specifically to see, but to your
17:37:09 3 question about whether this is the same type of
17:37:11 4 support that we'd be thinking about on the other
17:37:13 5 membranes is difficult to say without knowing what
17:37:16 6 that support is.

17:37:21 7 Q Is there some reason that you didn't review
17:37:23 8 this paper cited in Dr. Freeman's declaration after
17:37:26 9 you reviewed his report?

17:37:39 10 A Probably say nothing specific other than
17:37:43 11 perhaps just didn't have -- didn't have the time to.

17:37:47 12 Q So you don't then dispute anything that
17:37:51 13 Dr. Freeman said about this paper in his
17:37:55 14 declaration, is that correct?

17:37:58 15 A Well, since I haven't looked through it, I'm
17:38:03 16 not in a position to answer one way or the other as
17:38:07 17 to whether I dispute anything.

17:38:09 18 Q Sitting here today, you can't identify any
17:38:12 19 dispute you have with anything that Dr. Freeman has
17:38:15 20 said about this paper, correct?

17:38:18 21 A The only thing I would notice, having looked
17:38:26 22 at it just very quickly here, is this is mentioning
17:38:31 23 a PDMS coated layer. And so, you know, the
17:38:44 24 permeability properties and the thickness of the
17:38:47 25 PDMS coated layer could end up playing a role in

17:38:51 1 terms of how significant the support layer effects
17:38:55 2 are or not.

17:38:56 3 So I think the only -- the only potential
17:38:59 4 thing I would say, as I'm sitting here right now, is
17:39:01 5 this is one very specific case. And so I would -- I
17:39:09 6 would take any of the magnitudes by which this
17:39:14 7 support contributes to separations in this case with
17:39:18 8 a grain of salt without having had a chance -- or
17:39:22 9 suggesting that I'd want to take a closer look at
17:39:26 10 it. But that would be the potential issue that I
17:39:29 11 would have just from a very quick look at it here.

17:39:32 12 Q And you could have spent the time to review
17:39:37 13 this paper before your deposition, right? It was
17:39:40 14 identified to you on January 15th?

17:39:43 15 MR. LIPPERT: Object to the form.

17:39:43 16 A It was known to me.

17:39:45 17 Q Okay. In column 8 of the patent of the '038
17:40:09 18 patent, line about 24, it refers to polysiloxanes?

17:40:20 19 A Yes.

17:40:20 20 Q Sorry. Is that similar to the what you were
17:40:38 21 talking about, the PDMS?

17:40:41 22 A PDMS is a polysiloxane, yes.

17:40:47 23 Q Can we mark Exhibit -- as Exhibit 13, the
17:40:52 24 1999 paper?

17:40:54 25 ///

17:40:54 1 (Geise Exhibit 13 marked for
17:41:15 2 identification.)

17:41:15 3 BY MR. LANE:

17:41:15 4 Q Do you have that paper that's been marked
17:41:17 5 Exhibit 13?

17:41:17 6 A I have that.

17:41:18 7 Q And did you -- this is another paper that
17:41:22 8 Dr. Freeman referred to in his January 15th report
17:41:27 9 in paragraph 35. Do you recognize that fact?

17:41:32 10 A Yes.

17:41:33 11 Q Okay. And did you review this paper in
17:41:36 12 preparing for your deposition?

17:41:38 13 A I did not.

17:41:39 14 Q Okay. And the support layer that's referred
17:41:46 15 to in the title there, is that, in a general sense,
17:41:49 16 the same types of support layers that you were
17:41:51 17 talking about in your declaration?

17:41:56 18 A Let me take a look. It's at least similar
17:42:37 19 in the sense that it's, you know, still looking at,
17:42:40 20 you know, a composite membrane system that's similar
17:42:43 21 to what we've been talking about.

17:42:45 22 Q In your first declaration on paragraphs 38
17:42:52 23 and 40 --

17:43:01 24 A You said 38? Sorry.

17:43:03 25 Q Paragraphs 38 and 40, there's various

17:43:07 1 articles and patents you cite there. Do you see

17:43:10 2 those?

17:43:10 3 A Yes.

17:43:10 4 Q Okay. And those are all extrinsic evidence,

17:43:14 5 correct?

17:43:14 6 A I believe so.

17:43:19 7 Q And none of the extrinsic evidence

17:43:23 8 references you cite use the term "separation-active

17:43:27 9 layer," correct?

17:43:29 10 A I believe that's correct.

17:43:30 11 Q Okay. And the Wessling book that you cite

17:43:37 12 in paragraph 138, that was from 2015? Is that

17:43:42 13 accurate?

17:43:43 14 A What do you mean is that accurate?

17:43:48 15 Q Well, is the book from 2015?

17:43:53 16 A I believe so. I guess I'd have to go back

17:43:57 17 and double-check the title page to make sure that's

17:44:01 18 not a typo, but...

17:44:02 19 Q And if it was from 2015, it wouldn't have

17:44:06 20 been available to a POSITA in May of 2011, correct?

17:44:08 21 A That's true.

17:44:10 22 Q Turning to paragraph 42 in your first

17:44:42 23 declaration on separation area.

17:44:47 24 A Okay.

17:44:48 25 Q And Evonik's proposed construction is "area

17:44:51 1 contributing to gas separation." Do you see that?

17:44:53 2 A Yes.

17:44:54 3 Q Could phenomena such as gas concentration
17:45:03 4 polarization affect the membrane's area that
17:45:07 5 contributes to gas separation?

17:45:11 6 A I don't believe the polarization would
17:45:31 7 change the -- would change that area.

17:45:35 8 Q Okay. Have you ever read or heard about
17:45:42 9 separating natural gas from its -- from oil wells,
17:45:49 10 separating the methane out?

17:45:51 11 A I'm familiar at a high level with that.

17:45:54 12 Q And are you familiar with the fact that some
17:45:57 13 of those gasses contain hydrocarbons like propane,
17:46:02 14 butane, pentane?

17:46:04 15 A Yes.

17:46:04 16 Q Okay. And those hydrocarbons can foul
17:46:08 17 membranes, right, in that application?

17:46:11 18 A Yes.

17:46:12 19 Q Okay. And would that type of fouling affect
17:46:20 20 the area contributing to gas separation in a
17:46:22 21 membrane?

17:46:25 22 A So you can still have contributions in that
17:46:28 23 area coming through if, you know, the hydrocarbons
17:46:34 24 themselves could effectively have some permeability
17:46:39 25 to a smaller molecule. So it's possible to think

17:46:43 1 that the foulants essentially just create another
17:46:47 2 mass transfer resistance similar to the types of
17:46:51 3 things that we were discussing with regard to the
17:46:53 4 layers.

17:46:54 5 Q Could non-polar components in natural gas,
17:47:02 6 for example from oil wells, condense on the membrane
17:47:05 7 and dissolve parts of the membrane?

17:47:08 8 A It would depend on specifics of the
17:47:17 9 chemistry, but I suppose that's within the realm of
17:47:21 10 possibility.

17:47:21 11 Q And switching gears for a minute, Evonik's
17:47:27 12 contentions have referred to an Austrian patent
17:47:30 13 application A1164/2009. It's not on your list of
17:47:36 14 materials considered. Are you relying on that
17:47:41 15 Austrian application in any way in support of your
17:47:43 16 opinions on the claim construction of separation
17:47:46 17 area?

17:47:47 18 A I don't -- I don't believe I'm aware of that
17:47:49 19 document.

17:47:50 20 Q What does "contributing to" mean in Evonik's
17:47:55 21 claim construction? How much contribution is
17:47:59 22 required?

17:48:00 23 A So I view it similar to, you know, how we
17:48:15 24 might look at heat transfer area in a heat
17:48:20 25 exchanger, for example. So there's some -- some

17:48:22 1 area that's -- that's available to contribute, you
17:48:26 2 know, to the separation or to the transfer of mass,
17:48:29 3 you know, which might be distinguished from, you
17:48:35 4 know, area of the membrane or the hollow fiber, for
17:48:39 5 example, that's blocked, for example, in the process
17:48:42 6 of potting a hollow fiber module where some of that
17:48:46 7 area is, you know, encased in material such that it
17:48:52 8 is very clearly not contributing to the gas
17:48:54 9 separation. So I think the construction, you know,
17:49:00 10 suggests that it is, you know, area that's
17:49:02 11 contributing in some manner to the gas separation.

17:49:09 12 Q When fouling occurs in a heat exchanger, the
17:49:13 13 effective area of the exchanger is reduced, correct?

17:49:23 14 A I guess I would look at that case similarly.
17:49:26 15 I mean, as you foul, you add additional heat
17:49:30 16 transfer resistances. And so the way that the, you
17:49:35 17 know -- the area that's still there remains the
17:49:39 18 same, but perhaps the efficiency -- or I shouldn't
17:49:42 19 say efficiency, but the heat flux, you know, is
17:49:45 20 changed by the fact that you've added additional
17:49:47 21 resistances as the foulants come down.

17:49:51 22 Q You agree that there's no definition of
17:49:53 23 separation area in the '038 patent's intrinsic
17:49:59 24 evidence, correct?

17:50:00 25 A The intrinsic evidence doesn't explicitly

17:50:03 1 define that, no.

17:50:03 2 Q And in paragraph 45 of your first
17:50:06 3 declaration, you cite U.S. Patent 5,681,373 to
17:50:14 4 Taylor. Do you see that?

17:50:15 5 A Yes.

17:50:16 6 Q And that Taylor '373 patent is the only
17:50:21 7 extrinsic evidence you're relying on in support of
17:50:24 8 your opinions about Evonik's proposed construction
17:50:29 9 of the term "separation area," correct?

17:50:32 10 A I mean, that's the only extrinsic evidence
17:50:34 11 we -- or that I cite in the course of this
17:50:39 12 particular section. Again, this is -- this is one
17:50:42 13 of those terms where I'm -- I'm basing my opinions
17:50:47 14 also on, you know, what I think a person of ordinary
17:50:49 15 skill would have -- would have understood from just
17:50:51 16 the context of the way the information is being
17:50:55 17 presented.

17:50:58 18 MR. LANE: All right. Let's take a short
17:50:59 19 break there.

17:51:00 20 VIDEOGRAPHER: We are off the record. The
17:51:02 21 time is 5:51 p.m.

17:51:06 22 (Short recess.)

17:54:05 23 VIDEOGRAPHER: We are back on the record.
17:54:17 24 The time is 5:54 p.m.

17:54:20 25 MR. LANE: I don't have any more questions

17:54:22 1 for you now, Dr. Geise. If your counsel has
17:54:25 2 redirect questions, I may have some follow-up
17:54:28 3 questions to that. Thank you. And it was nice to
17:54:29 4 meet you.

17:54:29 5 REDIRECT EXAMINATION

17:54:29 6 BY MR. LIPPERT:

17:54:33 7 Q Dr. Geise, thank you. I just have one
17:54:36 8 series of just follow-up questions on your
17:54:40 9 background.

17:54:43 10 Do you teach other graduate students in your
17:54:46 11 position?

17:54:48 12 A Yes, I do that with some regularity. I'm
17:54:51 13 not currently doing that right now, but...

17:54:53 14 Q Have you taught courses in separations?

17:54:56 15 A I have, yes.

17:54:57 16 Q Over how many years have you taught courses
17:55:02 17 on separations?

17:55:04 18 A Going back to 2014, I think I've taught the
17:55:09 19 -- our, you know, undergraduate separations focused
17:55:12 20 course eight times during the last decade.

17:55:15 21 Q And did those courses include separation of
17:55:19 22 gasses?

17:55:20 23 A Yes. There were elements of gas separation
17:55:24 24 in those courses.

17:55:24 25 Q And did you -- in the elements of gas

17:55:28 1 separation, did you have teaching on membrane

17:55:34 2 separations?

17:55:35 3 MR. LANE: Objection, leading.

17:55:37 4 A So we did -- we did talk a little bit about
17:55:41 5 membrane separations at a high level in that course.
17:55:44 6 The way that course is sequenced in the curriculum
17:55:48 7 prevents a detailed analysis there, but based on my
17:55:51 8 background, we do mention it in the course of that
17:55:54 9 material.

17:55:56 10 MR. LIPPERT: Okay, that's all. Thank you.

17:55:58 11 MR. LANE: All right. Let us take a break
17:56:00 12 then and think if we want to have any follow-up to
17:56:03 13 that.

17:56:04 14 VIDEOGRAPHER: We are off the record. The
17:56:05 15 time is 5:56 p.m.

17:56:07 16 (Short recess.)

17:57:13 17 VIDEOGRAPHER: We are back on the record.

17:57:43 18 The time is 5:57 p.m.

17:57:43 19 RE CROSS EXAMINATION

17:57:43 20 BY MR. LANE:

17:57:47 21 Q I have one question, Dr. Geise. Did you
17:57:49 22 have any discussions with your counsel about your
17:57:51 23 redirect testimony?

17:57:53 24 A No, I did not.

17:57:55 25 MR. LANE: Okay. Thank you. That's all the

17:57:57 1 questions I have.

17:58:01 2 VIDEOGRAPHER: We are off the record. The

17:58:02 3 time is 5:58 p.m.

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5 (Time Noted: 5:58 p.m.)

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1 C E R T I F I C A T E

2

3 I, Sandra L. Rocca, CSR, RMR, RDR, CRR, a
4 Certified Court Reporter within and for the States
5 of Illinois, Florida, Washington and Georgia, do
6 hereby certify:

7 That GEOFFREY M. GEISE, Ph.D., the witness
8 whose deposition is hereinbefore set forth, was duly
9 sworn by me and that such deposition is a true
10 record of the testimony given by such witness.

11 I further certify that I am not related to
12 any of the parties to this action by blood or
13 marriage; and that I am in no way interested in the
14 outcome of this matter.

15 IN WITNESS WHEREOF, I have hereunto set my
16 hand this 22nd of January, 2025.

17

18

19



20

Sandra L. Rocca, CSR, RMR, RDR, CRR

21

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CERTIFICATE OF DEPONENT

I hereby certify that I have read the foregoing pages of my deposition testimony in this proceeding, and with the exception of changes and/or corrections, if any, find them to be a true and correct transcription thereof.

Deponent

Date

NOTARY PUBLIC

Subscribed and sworn to before me this _____ day of _____, 20__.

Notary Republic

My Commission Expires:_____

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2

3 Please read your deposition over carefully
4 and make any necessary corrections. You
5 should state the reason in the appropriate
6 space on the errata sheet for any corrections
7 that are made.

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9 sheet and date it.

10 You are signing same subject to the changes
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