

1 UNITED STATES PATENT AND TRADEMARK OFFICE

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3

4 BEFORE THE PATENT TRIAL AND APPEAL BOARD

5

6

7 AIR PRODUCTS and CHEMICALS, INC.,

8 Petitioner

9

v.

10 EVONIK OPERATIONS GMBH and

11 EVONIK CORPORATION,

12 Patent Owner

13

14 Case IPR2024-00611

15 Patent 10,471,380 B2

16

17

18 VIDEO RECORDED DEPOSITION

19 OF DR. RICHARD W. BAKER

20 May 6, 2025

21 12:35 p.m. PST

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25 REPORTED BY: SARA KILLIAN, RPR, RCR, CCR

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May 6, 2025
12:35 p.m. PST

VIDEO RECORDED DEPOSITION of DR. RICHARD W.
BAKER, held remotely via Zoom Videoconferencing,
before Sara K. Killian, a Registered
Professional Reporter, Realtime Certified
Reporter and Notary Public.

1 A P P E A R A N C E S :

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4 ON BEHALF OF THE PETITIONER, AIR PRODUCTS and

5 CHEMICALS, INC., AND THE WITNESS

6 FISH & RICHARDSON

7 909 Fannin Street, Suite 2100

8 Houston, Texas 77010

9 BY: JOHN R. LANE, ESQ.

10 GRACE KIM, ESQ.

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1 A P P E A R A N C E S:
2 (continued)

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4 ON BEHALF OF THE PATENT OWNER, EVONIK OPERATIONS
5 GMBH and EVONIK CORPORATION
6 WILMERHALE

7 2100 Pennsylvania Avenue NW
8 Washington DC 20037

9 BY: GREGORY LANTIER, ESQ.
10 SETH MILLER, ESQ.

11

12

13 - and -

14

15 TARTER KRINSKY & DROGIN

16 1350 Broadway

17 New York, New York 10018

18 BY: JANET B. LINN, ESQ.

19

20

21

22 ALSO PRESENT:

23 GUS PHILLIPS, Videographer

24 THUY V. TAITT, ESQ., Air Products

25 AMY C. TREXLER, ESQ., Air Products

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I N D E X

WITNESS	EXAMINATION BY	PAGE
Dr. Baker	Mr. Lantier	7

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E X H I B I T S

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THE VIDEOGRAPHER: We are now
on the record for the video deposition
of Dr. Richard Baker.

The time is 12:35 p.m.,
May 6th, 2025 in the matter of Air
Products and Chemicals Incorporated
versus Evonik Operations, GMBH, et al,
Case Number IPR2024-00611, being held
in the United States Patent and
Trademark Office before the Patent
Trial and Appeal Board.

The court reporter is Sara
Killian, the videographer is Gus
Phillips and both are representatives
of Gregory Edwards LLC.

Will counsel please state their
appearances for the record, beginning
with the petitioner?

MR. LANE: This is John Lane
from Fish & Richardson for petitioner
and with me is Grace Kim, also from
Fish & Richardson.

MR. LANTIER: Good afternoon.

This is Greg Lantier from the

1

2

law firm of Wilmer Cutler Pickering

3

Hale & Dorr LLP, here today on behalf

4

of the patent owner, Evonik.

5

I'm joined today by my

6

colleague from WilmerHale Seth Miller

7

and also from co-counsel from Tarter

8

Krinsky, Janet Linn.

9

R I C H A R D B A K E R, after having first

10

been duly sworn, was examined and testified

11

as follows:

12

EXAMINATION BY

13

MR. LANTIER:

14

Q. Good afternoon, Dr. Baker.

15

A. Good afternoon.

16

Q. It's nice to see you again.

17

Could you -- let me ask you this: Where are

18

you seated today?

19

A. I'm in the offices of Fish &

20

Richardson in Redwood City.

21

Q. Do you have any documents with

22

you?

23

A. We have some documents in front

24

of me, which are related to this case, but

25

they are from my colleague, John, John Lane.

1 R. Baker

2 Q. Could you identify for me each
3 of the documents that you have a copy of
4 there?

5 A. Okay. I have a supplementary
6 declaration by myself. I have a copy of the
7 Evonik Priske patent. I have the Scholz
8 paper. I have a paper of my own -- at least
9 I was the co-author of -- on pressure ratio
10 of general membrane science.

11 I have another paper which I'm
12 co-author on. It's a review in industrial
13 engineering chemistry review on natural gas
14 processing.

15 I have another paper, Journal
16 of Environmental Science. It's a review of
17 polymeric membranes by -- oh, I'm not
18 sure -- I don't know how to spell this --
19 pronounce this guy's name -- Inamullah
20 Bhatti and other authors. And I have a
21 paper by Claudia Staudt-Bickel and Bill
22 Koros.

23 Then I have the patent owner's
24 Evonik response. I have the declaration of
25 Jeffrey Geise and I have the transcript of

1 R. Baker

2 my own video recorded deposition of myself
3 from the last time we talked.

4 Q. Do you have a copy of the
5 Ungerank patent AP-1006 in front of you?

6 A. I don't know. I didn't open
7 it. I don't think so. Evonik -- Marcus
8 Priske, I have the Priske patent -- ahh,
9 yes. Sorry. They were stuck together.
10 I have the Ungerank patent,
11 too, yes.

12 Q. If you said this and I missed
13 it, I apologize.

14 Do you have a copy of AP-1007,
15 which is the Scholz article?

16 A. Yes, I do.

17 Q. Okay.

18 We have those documents as well
19 and if you want me to make any available to
20 you via the chat in the PDF form, just let
21 me know. But feel free to look at your
22 copies if that's easier as well.

23 Are there notes or highlighting
24 on any of the materials that you have?

25 A. I believe no, they are all

1 R. Baker

2 clean copies.

3 Q. If you could then, I'd like to
4 ask you some questions about your
5 supplemental declaration. Just let me know
6 when you have that in front of you.

7 A. I have it in front of me.

8 Q. The document that you're
9 looking at, is it labeled AP-1041 in the
10 bottom right-hand corner?

11 A. Yes.

12 Q. Okay.

13 Is it an 18-page document with
14 your signature on the 18th page?

15 A. It's got my signature on the
16 last page and it's 18 pages, yes.

17 Q. About how long did you spend
18 preparing your supplemental declaration?

19 A. I can't give you a precise
20 number, but probably two or three days over
21 a period of time, so maybe 20 hours over a
22 period of a week or a couple weeks.

23 Q. Just one point of process.

24 If you look at your
25 supplemental declaration, you'll see that

1 R. Baker

2 many of the pages have two different page
3 numbers on them in the bottom middle.

4 A. Yes.

5 Q. For purposes of today, what I'd
6 like to do is refer to the lower most page
7 number.

8 A. Okay.

9 Q. That's the one that says number
10 one on the first page and then it would be
11 ending in 18 on the last page.

12 Is that okay?

13 A. That's okay.

14 Q. If you could turn with me to
15 page two of the supplemental declaration --

16 A. I got it.

17 Q. -- do you see here that there's
18 a list of additional materials considered
19 that runs from page two to page three?

20 A. Yes.

21 Q. And one of the things that you
22 considered in preparing your supplemental
23 declaration is the December 12th, 2024
24 declaration of Jeffrey Geise.

25 Correct.

1 R. Baker

2 A. That's right, yes.

3 Q. That's Exhibit 2008?

4 A. Yes, it is.

5 Q. Now, if you look through the
6 remainder of your supplemental declaration,
7 there's no place in your supplemental
8 declaration where you criticize any portion
9 of Dr. Geise's declaration, correct?

10 A. I can't recall that, but I will
11 take your word for it, yes.

12 Q. So you agree that you reviewed
13 Dr. Geise's declaration, but your
14 supplemental declaration doesn't identify
15 any errors that he made in that declaration,
16 correct?

17 A. That's correct, I guess.

18 Q. And if you could look at the
19 list of materials — additional materials —
20 considered, AP-1038 is not in that list,
21 correct?

22 A. I don't see anything with that
23 number, no.

24 Q. Now, in your supplemental
25 declaration, you don't offer any opinion

1 R. Baker

2 that the Scholz article alone renders the
3 claims of the Priske patent obvious,
4 correct?

5 A. I don't do that. That's true.

6 Q. And you don't offer any
7 opinions on the cost of electricity and
8 whether a cost is high or low, correct?

9 A. I don't believe so, no.

10 Q. In preparing your supplemental
11 declaration, did you run any simulations
12 using Aspen, CHEMCAD or GAMS?

13 MR. LANE: I'm going to
14 instruct the witness not to answer.

15 To the extent you did that at
16 the direction of counsel, that's
17 privileged?

18 Q. Are you going to follow
19 counsel's instruction?

20 A. I think so, yes.

21 Q. Let me ask the question in a
22 different form then that I think will not
23 call for privileged information.

24 In your supplemental
25 declaration, you don't describe any

1 R. Baker

2 simulations that you performed using Aspen,
3 CHEMCAD or GAMS, correct?

4 A. That's correct.

5 Q. And in the supplemental
6 declaration, you don't do any cost analysis
7 comparing the relative cost of a system as
8 described and compared in example one in the
9 Ungerank patent as compared to the system
10 described in Scholz figure 7A, correct?

11 MR. LANE: Objection.
12 Form.

13 A. I don't do that, no.

14 Q. And likewise, you didn't
15 perform any profitability analysis in your
16 supplemental declaration, correct?

17 A. That's correct.

18 Q. If you could turn to AP-1006,
19 which is the Ungerank patent -- and let me
20 know when you have it. And again, I'm happy
21 to share copies of anything if it would be
22 helpful.

23 A. No. I have the Ungerank patent
24 in front of me.

25 Q. Just for the record purposes,

1 R. Baker

2 does your copy of that document have the
3 notation AP-1006 in the bottom right-hand
4 corner?

5 A. It does.

6 Q. I would ask that you please
7 turn to column 11 and example two in
8 particular. Just let me know when you're
9 there. It's about most of the way down the
10 page --

11 A. I have it.

12 Q. Do you see at line 62 and
13 following, it says "In order to satisfy
14 various legislators, it is necessary to
15 minimize the methane loss into the
16 atmosphere. The figure 11 shown connection
17 arrangement was used to lower the
18 concentration of methane in the third
19 permeate stream 11 to below one-half of a
20 percent by volume?

21 A. I do see that.

22 THE VIDEOGRAPHER: Mr. Lantier,
23 I apologize.

24 Is this a tab I should be
25 putting in the chat for others?

1 R. Baker

2 MR. LANTIER: I don't think so.

3 Thank you for asking, Mr.

4 Phillips.

5 If anybody would like me do
6 that, please let me know. But I think
7 for purposes of keeping it simple, I
8 have copies of the documents and the
9 witness does and I assume Mr. Lane does
10 as well and I think that's probably
11 sufficient.

12 THE VIDEOGRAPHER: Thank you,
13 sir.

14 BY MR. LANTIER:

15 Q. Then if you could turn back,
16 Doctor, to your supplemental declaration, in
17 particular, turn to paragraph 49.

18 A. You said 49?

19 Q. Yes. Paragraph 49, which is on
20 page 15.

21 A. Mm-hmm.

22 Q. And you may -- just for
23 context, you may want to start at paragraph
24 47. This is under your heading Responses to
25 Other Evonik Statements.

1 R. Baker

2 I was going to ask you a
3 question about paragraph 49 in particular.

4 A. Okay.

5 Q. Paragraph 49 of your
6 declaration, you say that if -- if the
7 output of the system has too much carbon
8 dioxide -- excuse me. Strike that. Let me
9 start over.

10 In paragraph 49 of your
11 declaration, you state that if the carbon
12 dioxide stream has too much methane in it,
13 then it would be routine in industrial
14 systems and relatively inexpensive to pass
15 streams containing small amounts of organic
16 compounds through a flare, thermal oxidizer
17 or other equipment to decrease the organic
18 concentration, correct?

19 A. That's correct, yes.

20 Q. And if you could then turn back
21 to the Ungerank patent, which is, again,
22 Exhibit 1006, then turn specifically to
23 column nine, line 44 --

24 A. Yes.

25 Q. -- do you see the paragraph

1 R. Baker

2 that begins at line line 44 with the words
3 in addition and then ends at about line 54?

4 A. Maybe -- did you say column
5 nine?

6 Q. Yes. I'm in the Ungerank
7 patent, which is AP-1006 --

8 A. Yes.

9 Q. -- beginning at about line 44
10 of --

11 A. Oh, 44. Okay.

12 Q. Apologies.

13 A. Okay. In addition. Mm-hmm.

14 Q. If you could read that
15 paragraph to yourself, just let me know when
16 you're done.

17 A. Got it.

18 Q. Do you see the paragraph
19 beginning at column nine, line 44, says that
20 using the invention in the inventive
21 apparatus, you avoid the need to treat the
22 CO2 stream with a flare or other
23 post-combustion techniques?

24 A. Yes.

25 Q. So the Ungerank patent says

1 R. Baker

2 that it's -- according to its invention,
3 you're able to avoid the use of a flare or
4 similar techniques, correct?

5 MR. LANE: Objection.

6 Form.

7 A. Well, it says if you -- if you
8 do, in fact, build the system with very low
9 methane content in the CO₂, you can avoid
10 such a thing, yeah.

11 I don't think it's part of the
12 patent, patent claim, but I -- I am no
13 lawyer.

14 Q. Now, if you could then turn
15 back to your supplemental declaration --

16 A. Got it.

17 Q. -- and go to paragraph 28 --

18 MR. LANE: Did you say 28?

19 MR. LANTIER: Yes.

20 MR. LANE: Thank you.

21 A. I have it.

22 Q. Okay.

23 In paragraph 28 and following
24 through 31, you offer an opinion that a
25 person of skill in the art would have

1 R. Baker

2 understood Ungerank's comparative example
3 one to be using a membrane at stage two with
4 a larger surface area than the membrane at
5 stage one.

6 Is that correct?

7 MR. LANE: Objection.

8 Form.

9 A. I give a rationale why a POSITA
10 would think that in most cases something
11 like this would be true if he wants to get
12 very pure CO₂, yes.

13 Q. And I don't think that you -- I
14 don't think that that was the position that
15 you offered in your first declaration where
16 you said that there's no information about
17 the surface areas in comparative example
18 one.

19 Do you recall that?

20 MR. LANE: Objection.

21 Form.

22 A. As in the example that we're
23 talking about in the Ungerank patent example
24 one, comparative example, there's no
25 membrane surface area, so it doesn't give

1 R. Baker

2 you any information about the surface area.

3 But a POSITA could probably --

4 he would have an idea what the relative

5 areas are, but he might be -- he wouldn't

6 have the -- any concrete value for them

7 because he is not the patent signer on it.

8 But he might have, in his own

9 mind, looking at the separations involved,

10 one would think that -- well, probably

11 separate unit one is, in fact, a smaller one

12 than unit two. But he wouldn't absolutely

13 know that as a fact and it would depend to

14 some extent on the process that he's

15 actually got in front of him.

16 Q. So your opinion is that there's

17 no information about the ratios of the

18 membrane surface areas at the different

19 stages in comparative example one of

20 Ungerank.

21 Correct?

22 A. That's right. There's no hard

23 numbers, no.

24 Q. What I'm trying to understand

25 is what is your opinion as to what you think

1 R. Baker

2 a POSITA would understand about those
3 relative surface areas when reading the
4 information in Ungerank?

5 A. Okay. Of course the procedure
6 comes into it and if this is a -- there were
7 two separations involved in this process.
8 One of them is to get very pure methane and
9 one of them is to get very pure CO₂.

10 Now, the POSITA would have
11 realized fairly easily because of past
12 experience that getting the high
13 concentration of CO₂ is going to be much
14 more difficult than getting high purity
15 methane.

16 That's because in the methane,
17 it's the retentant. So in order to get high
18 purity, all he has to do is put more and
19 more membrane area in units one and two.
20 Then, in the end, he could get whatever he
21 wants as the final quality of methane.

22 But the final quality of the
23 CO₂ has to go through membrane one and then
24 through membrane two, membrane three.

25 And in order to get high

1 R. Baker

2 quality CO2 in membrane three permeate, you
3 have to have high quality CO2 in the
4 membrane one permeate and that means that
5 the membrane one is -- has to be relatively
6 small compared to maybe membrane two because
7 in order to get high quality permeate -- and
8 by high quality, I mean 70 or 80% CO2 or
9 maybe more -- in the permeate for membrane
10 one, I have to make it relatively small so
11 that the average concentration of CO2 in the
12 feed to membrane one is high.

13 If I make membrane one too big,
14 then the CO2 concentration in the feed of
15 membrane one is going down and it gets
16 harder and harder to get high concentration
17 CO2 in the permeate.

18 So you're pushed towards
19 making -- if you had to make a guess, you
20 would say membrane one is likely to be
21 relatively small compared to membrane two
22 because -- because I need to get that
23 permeate fairly high concentration in order
24 to get 98, 99% pure CO2 in the final
25 permeate.

1 R. Baker

2 So that logic, depending on the
3 POSITA's level, but if he's a reasonably
4 competent POSITA with one or two years'
5 experience with these sorts of simulations,
6 he would -- he would think that.

7 Q. So that's why you offer the
8 opinion that the POSITA would have had a
9 "intuition" about the relative sizes of
10 Ungerank's comparative example ones, stage
11 two, stage one areas?

12 Do I have that right?

13 A. Yes. He would have an
14 intuition that -- yes, one or two.

15 Q. So your intuition, reading
16 Ungerank compared to example one, is that
17 the stage two membrane surface area is going
18 to be larger than stage one membrane surface
19 area, correct?

20 A. Yes.

21 And going back to your earlier
22 example, if you want very pure CO₂, very
23 high concentration CO₂, 99% CO₂, then you're
24 driven to have very high concentration of
25 CO₂ in permeate one, which pushes you more

1 R. Baker

2 and more to make the membrane area of unit
3 one relatively small and to do most of the
4 membrane methane separation with membrane
5 three.

6 Q. So you offer the opinion in
7 paragraph 31 of your supplemental
8 declaration that this intuition that you
9 have about Ungerank's comparative example
10 one would have given the person of skill in
11 the art reason to believe it was appropriate
12 to look at Scholz's figure seven to better
13 understand the relative surface areas of
14 stages one and two in Ungerank's comparative
15 example one, correct?

16 MR. LANE: Objection to form.

17 A. He would look at Scholz for
18 several reasons, but that would be one of
19 the reasons he might look at Scholz. It
20 would not be -- I think -- it depends why
21 he's going to do it -- but a POSITA normally
22 would be more interested in other things, I
23 think, but yes.

24 Q. When you say a POSITA is more
25 interested in other things, could you

1 R. Baker

2 explain what you mean?

3 A. Ungerank is silent on the
4 membrane area and he's silent on the
5 compression. He shows a very even
6 spectacular separation process. There may
7 be other people that did it before him,
8 but -- but okay. He does separation of
9 50/50 to 98/2 and 2/98. That's pretty good.

10 But he doesn't show the
11 membrane area and he doesn't show the
12 compression required. So someone looking at
13 that has got a very interesting process
14 design, but how much is it going to cost me?
15 Am I talking about millions of square
16 meters? Or how much compression?

17 If he goes to Scholz, Scholz
18 gives him the answers to those two
19 questions, which I think would be very much
20 in his mind.

21 He would also, in Scholz, get
22 some confirmation that yes, membrane one is
23 probably smaller than membrane two. That
24 would also be something he would get out of
25 Scholz.

1 R. Baker

2 Q. If we turn in your declaration
3 to page three, do you see that the Roman
4 numeral two there, it says the simulations
5 in the Priske '380, Scholz's figure seven
6 and Ungerank's, compared to example one?

7 A. When you said three -- can you
8 say again?

9 Q. Yes.
10 Are you on page three of your
11 surface area?

12 A. Yes.

13 Q. Do you see Roman numeral two in
14 bold?

15 A. I don't.

16 Q. Maybe it's a quarter of the way
17 down the page.

18 It says, in all capital, bold
19 letters: The simulations in Priske '380 --

20 A. Oh, yes. The simulations in
21 Priske '380, figure seven? Is this what
22 you're talking about?

23 Q. Yes.

24 A. Yes, I see it.

25 Q. And the Priske '380, that

1 R. Baker
2 refers to the challenged patent in these IPR
3 proceedings, correct?

4 A. That's correct.

5 Q. For record purposes, you have a
6 copy of you that in front of you and it says
7 AP-1001 in the bottom right-hand corner,
8 correct?

9 A. Yes, it is AP-1001.

10 Q. Before you offered your
11 original opinions in your first declaration
12 in these proceedings, did you study the
13 Priske '380 patent carefully?

14 A. Yes.

15 Q. Did you review the Priske '380
16 patent again before offering the opinions in
17 your reply or your supplemental declaration?

18 A. Yes, I certainly had the patent
19 in front of me and I read it at least --
20 yeah. Yes.

21 Q. About how many times do you
22 think over the course of your work in this
23 IPR have you reviewed the Priske '380
24 patent?

25 A. When I first got it, I read it

1 R. Baker

2 from top to bottom pretty much and on
3 subsequent occasions, I referred to -- I
4 read certain sections in more detail when I
5 was thinking about them, but I didn't
6 necessarily read the whole thing a second
7 time.

8 Q. When you reviewed the Priske
9 '380 patent, did you find any errors in it?

10 A. Nothing substantial that I
11 recall.

12 Q. If we turn in your declaration
13 then to page four and paragraph 11, do you
14 see the first sentence of paragraph 11 says:
15 For example, reference example one in the
16 '380 Priske patent states that the
17 comparative example of WO 2012/000727 A1 was
18 reproduced, which I understand is Ungerank's
19 comparative example one?

20 A. Yes.

21 Q. And so you understand that
22 reference example one in the Priske '380
23 patent is Ungerank's comparative example
24 one, correct?

25 A. That's my belief, yes.

1 R. Baker

2 Q. Now, if you turn back to the
3 Priske '380 patent, AP-1001 --

4 A. Got it.

5 Q. And you turn to column 16 --
6 just let me know when you're there.

7 A. I'm there. Got it.

8 Q. Do you see beginning at line 26
9 of column 16 there's a discussion of
10 reference example one?

11 A. Yes.

12 Q. And it says here
13 characteristics of this example are, first,
14 a recycled gas volume in sum of 86.7%.

15 Correct?

16 A. That's right.

17 Q. At lines 31 and 32, it says
18 that characteristics of Ungerank's
19 comparative example one include identical
20 membrane capacities in all three separation
21 stages, correct?

22 A. I see that. Mm-hmm.

23 Q. That means that under your
24 understanding of capacity, the surface areas
25 for the membranes of each of the three

1 R. Baker

2 separation stages is identical to one
3 another, correct?

4 A. That's correct.

5 Q. So that's contrary to the
6 intuition you had in reading Ungerank
7 compared to example one, correct?

8 MR. LANE: Objection.
9 Form.

10 A. Yes. I mean, I'm not saying
11 that -- that it's possible to make a process
12 where all three stages are equal and it will
13 converge and it will -- it may give you a
14 fairly pure CO₂ and fairly pure methane.

15 But if you want very high
16 quality CO₂, then the optimum process is
17 likely to be a higher -- a smaller -- one
18 being bigger than two -- one being smaller
19 than two.

20 That is to say it's not the
21 optimum or the best, but it's not impossible
22 to make one where all three of them are
23 equal apparently.

24 Q. And the statement here in the
25 Priske patent about reference example one is

1 R. Baker

2 that the membrane capacities in all three
3 separations stages were identical, correct?

4 A. That's correct.

5 Q. And if you look down at line 38
6 to 40, do you see that it states: Thus, the
7 reference example differs from the present
8 invention in that the membrane capacities
9 are identical in all three stages?

10 A. Yes.

11 Q. And again, that's inconsistent
12 with what your intuition was in reading
13 comparative example one as stated in your
14 supplemental declaration, correct?

15 MR. LANE: Objection.

16 Form.

17 Objection.

18 Asked and answered.

19 A. Let me -- I have a certain --
20 I'm looking at Ungerank and I'm trying to
21 figure out -- I wonder what the membrane --
22 relative membrane areas are and I think in
23 general that one is likely to be smaller
24 than two for the reasons I described to you
25 in order to get high purity CO₂, which is

1 R. Baker

2 one of the goals of the invention.

3 As you point out, you will need
4 very high quality CO2 that's going to drive
5 the optimum process to be one is smaller
6 than two.

7 Apparently, if Mr. Priske is
8 correct, than you can, in fact -- in the
9 Ungerank example, you can still make it work
10 in that particular case if you make all
11 three of them the same.

12 Q. According to this document, all
13 three of them are the same in Ungerank
14 compared to example one, correct?

15 MR. LANE: Objection.

16 Form.

17 Objection.

18 Asked and answered.

19 A. Yes.

20 Q. If you could turn back with me
21 then to AP-1006, which is the Ungerank
22 patent --

23 A. Got it.

24 Q. -- to column ten, comparative
25 example one --

1 R. Baker

2 A. Column ten, got it.

3 Q. Do you see that the first
4 sentence says: The figure 11 shown
5 connection arrangement was used.

6 And then the second sentence
7 says: Each stage consisted of a hollow
8 fiber membrane module consisting of hollow
9 polyimide fibers from UBE (NM B01 A type)?

10 A. I see that.

11 Q. Now, if you turn in your
12 supplemental declaration to paragraph 23,
13 which is on page seven --

14 A. Yes.

15 Q. You offer the opinion there
16 that a person of ordinary skill in the art
17 would have understood that with the crude
18 gas flow rate of 1.78 cubic meters per hour
19 in Ungerank's comparative example one, any
20 type of commercial membrane modules would
21 have been far too large for that system.

22 Do you see that?

23 A. Yes. There's -- there's some
24 confusion in the way the comparative example
25 one is described.

1 R. Baker

2 Is it a simulation or is it an
3 actual example?

4 So one of the examples of what
5 I said is if it's an experimental result,
6 then you could -- at these flow rates,
7 there's no membrane -- commercial
8 membrane -- available that has that small a
9 membrane area.

10 It's going to be -- the flow
11 rates are very low. They're centimeters key
12 per minute sort of thing. So that requires
13 a very small membrane area and there's no
14 commercially available modules that will --
15 they're all much bigger than that. They're
16 designed to treat much bigger flows than in
17 this example.

18 Q. Do you have any familiarity
19 with the UBE NM B01 membrane module?

20 A. I don't know about that
21 particular unit, but our company does, in
22 fact, buy and sell, resell UBE modules. Not
23 for this particular separation. For
24 hydrogen separations. So we're familiar
25 with the format of an UBE module.

1 R. Baker

2 Q. What is the surface area of the
3 membrane in the UBE NM B01 module?

4 A. I don't know and they don't
5 tell us. But it's of the order of a few
6 hundred square meters. Probably more than
7 100 square meters.

8 Q. You've never worked with that
9 module yourself, correct?

10 A. Worked? I'm in the research
11 department and this is -- we buy them when
12 we're building or getting built commercial
13 systems. So I've seen them. I know what
14 they look like, but I don't actually deal
15 with the UBE guys except if they turn up and
16 we sometimes have a little meeting or
17 something.

18 Q. In your supplemental
19 declaration, you don't offer any opinion as
20 to what the surface area of the membrane
21 module for the UBE NM B01 would be, correct?

22 A. Except to say that it's big.
23 It's much bigger. It's too big to be -- to
24 be used unmodified in this very small
25 system, this Ungerank comparative example

1 R. Baker

2 one.

3 Q. And the UBE module used in
4 comparative example one is a polyamide fiber
5 membrane, correct?

6 MR. LANE: Objection.

7 Form.

8 Objection.

9 Form.

10 A. It's a polyamide of some sort,
11 yes.

12 Q. And what is a polyamide?

13 A. You're getting into organic
14 chemistry, which isn't my forte. But it's a
15 class of polymer that is widely used in gas
16 separation technology and there are various
17 variants of slightly different chemistries
18 which give slightly different properties.

19 The particular chemistry of the
20 polyamide that the UBE is using, I'm not
21 familiar with and I don't know if -- it's
22 not a -- they don't -- they don't tell you
23 what it is. They keep that as a
24 confidential information. But it's a
25 polyamide in the category.

1 R. Baker

2 Q. So if you could turn back to
3 Ungerank -- sorry. If you could stay on
4 Ungerank, your Exhibit AP-1006, and turn
5 to -- we can stay on comparative example
6 one.

7 Do you see that reference is
8 made in the first sentence here to figure
9 11?

10 A. Yes.

11 Q. And if you turn back to page
12 seven of AP-1006, do you see figure 11
13 there?

14 A. Yes. Yes.

15 Wait a minute. Are we talking
16 about the Ungerank patent? You turn to page
17 one of the Ungerank patent?

18 Q. Page seven of the Ungerank
19 patent will have figure 11 on it.

20 A. Got it. Okay.

21 Q. And page one has the same
22 image, but it doesn't say figure 11 on it.

23 A. Yeah. Got it.

24 Q. You're familiar with figure 11
25 of the Ungerank reference, correct?

1 R. Baker

2 A. Yes.

3 Q. And then the description of
4 comparative example one begins at line 16 of
5 column ten and runs down to the very end of
6 that column at line 67, correct?

7 A. Here we go. It starts on line
8 21 and continues on to the bottom of the
9 page. Yes.

10 MR. LANTIER: So if I could ask
11 the technician to please drop into the
12 chat the document found at tab 11.

13 Dr. Baker, I'll ask that you
14 call up this document once you have the
15 opportunity to download it in the chat.

16 Do we have the ability to mark
17 this as Exhibit 1A?

18 THE VIDEOGRAPHER: I'll put
19 Exhibit 1A in the chat and then we'll
20 mark it post.

21 (Whereupon, Exhibit 1A was
22 marked for identification.)

23 THE WITNESS: Got it. I have
24 it on my screen.

25

1 R. Baker

2 BY MR. LANTIER:

3 Q. Dr. Baker, Exhibit 1A is a
4 reproduction of exhibit -- of figure 11 from
5 the Ungerank patent, correct?

6 A. That's correct.

7 Q. If we refer to the Ungerank
8 patent, we know that figure 11 shows the set
9 up or the arrangement that's used for
10 comparative example one, correct?

11 MR. LANE: Objection.

12 Form.

13 A. Yes.

14 Q. Now, if you look at Ungerank's
15 comparative example one, do you see that in
16 the third sentence it describes the -- the
17 crude gas mixture that is input into the
18 system in comparative example one?

19 A. Yes, I see it.

20 Q. And then if you look down that
21 paragraph further to the sentence beginning
22 at about -- or two sentences beginning at
23 about line 39, there's a description of the
24 retentate, of the retentate separation stage
25 two and then it has a content of 98.5%

1 R. Baker

2 methane and 1.5% carbon dioxide.

3 And then it says 0.895 cubic
4 meters per hour of this mixture leaves
5 retentate separation stage two?

6 A. Yes, I see that.

7 MR. LANTIER: If we could mark
8 as Exhibit 1B the document found at tab
9 12.

10 Mr. Phillips, you'll let us
11 know when that's in the chat?

12 THE VIDEOGRAPHER: Counsel,
13 which tab was that again?

14 MR. LANTIER: Should be tab 12.

15 THE VIDEOGRAPHER: Apologies.

16 MR. LANTIER: This will be
17 Exhibit 1B.

18 (Whereupon, Exhibit 1B was
19 marked for identification.)

20 THE WITNESS: I have this in
21 front of me.

22 MR. LANTIER: Okay.

23 BY MR. LANTIER:

24 Q. Do you see that I labeled here
25 based on the description in the Ungerank

1 R. Baker

2 patent the input mixed gas stream on the
3 left-hand side of the document and the
4 output on the right-hand side?

5 MR. LANE: Objection.

6 Form.

7 A. I do.

8 MR. LANE: This doesn't even
9 have -- it doesn't -- okay. Go ahead.
10 I object.

11 MR. LANTIER: I certainly don't
12 want you to not be able to make an
13 objection. Go ahead.

14 MR. LANE: I object to the
15 document. I object to form.

16 MR. LANTIER: Okay.

17 BY MR. LANTIER:

18 Q. I've done the calculation here
19 of the percent of the stream that is
20 methane. On the input side, it's 50%.

21 Do you see that?

22 A. I do.

23 Q. And on the output side, it's
24 98.5%, which is what Ungerank comparative
25 example one states that it will be.

1 R. Baker

2 Correct?

3 MR. LANE: Objection to form.

4 A. Correct.

5 Q. I'm sorry. Did you answer or
6 were you still looking at it, Dr. Baker?

7 A. No, I see it.

8 MR. LANTIER: Now if we could
9 mark as Exhibit 1C the document at tab
10 13.

11 (Whereupon, Exhibit 1C was
12 marked for identification.)

13 THE WITNESS: Thirteen?

14 MR. LANE: He hasn't put it up
15 yet.

16 THE WITNESS: Sorry. Okay.

17 It's come up on my screen.

18 BY MR. LANTIER:

19 Q. Do you see that the Exhibit 1C
20 is the same as Exhibit 1B, except I've
21 included some additional calculations at the
22 top in red?

23 A. Yes.

24 Q. You probably have already
25 figured this out, but the additional

1 R. Baker

2 information at the top is calculating the
3 total amount of methane entering the system
4 and the total amount leaving in stream
5 eight.

6 Do you see that?

7 MR. LANE: Objection.

8 Form.

9 A. Yes. Mm-hmm.

10 Q. Do you agree with how I've done
11 this calculation for the total amount of
12 methane coming into the system at 17 and the
13 total amount leaving the system at eight?

14 MR. LANE: Objection to form.

15 A. Yes. Yeah.

16 Q. Okay.

17 So coming into the system would
18 be 0.890 cubic meters per hour of methane
19 and leaving in stream eight would be
20 0.881575 cubic meters per hour of methane,
21 correct?

22 MR. LANE: Objection to form.

23 A. Correct.

24 Q. Sorry. There was some talking
25 over one another.

1 R. Baker

2 Doctor, did you agree with
3 that?

4 A. Yes. That's fine.

5 MR. LANTIER: Then finally, if
6 we could please mark as Exhibit 1D the
7 document at tab 14?

8 (Whereupon, Exhibit 1D was
9 marked for identification.)

10 THE WITNESS: Okay. Hold on.
11 I'm not familiar with the way you do
12 it, but I'll get better.

13 MR. LANTIER: It's taking me a
14 moment myself, so I just -- please let
15 me know once you have it open.

16 THE WITNESS: I have it.

17 BY MR. LANTIER:

18 Q. Do you see that in Exhibit 1D,
19 I've added one additional calculation?

20 A. Mm-hmm. The meth --

21 Q. Yes. That's the methane
22 recovery calculation, which I've calculated
23 as the methane in stream eight divided by
24 the methane in the feed.

25 Do you agree with that way of

1 R. Baker
2 calculating the methane recovery?

3 A. That's fine.

4 Q. And doing that math, I've
5 divided 0.881575 by 0.890 to get the
6 quotient 0.9905.

7 Do you see that?

8 A. Yes.

9 Q. Do you agree with that
10 calculation?

11 A. That's fine.

12 Q. And that would constitute a
13 99.05% methane recovery for comparative
14 example one, correct?

15 A. Yes.

16 MR. LANTIER: Now, if you -- we
17 could take that down and I was going to
18 ask you then to turn to Scholz, which
19 is AP-1007.

20 Just let me know when you have
21 it. I know you've got several
22 documents in front of you.

23 MR. LANE: Greg, while he's
24 finding that, I just want you to know
25 you're not on video, in case you didn't

1 R. Baker

2 know that.

3 MR. LANTIER: I did not know

4 that.

5 John, am I back on?

6 MR. LANE: You're back on now.

7 BY MR. LANTIER:

8 Q. Dr. Baker, let me know once you

9 have AP-1007, the Scholz article up.

10 A. I got it.

11 Q. If you could turn with me to

12 figure 7A, which is on page seven --

13 A. I have it.

14 Q. Scholz calculates that the

15 methane recovery in figure 7A is 98.7%.

16 Correct?

17 A. That's what he states. I

18 didn't check it, but -- mm-hmm.

19 Q. So the methane recovery using

20 Scholz's figure 7A would be lower than the

21 methane recovery just using comparative

22 example one of Ungerank as it already

23 exists, correct?

24 A. Yes. Yes.

25 Q. If you could then stay with --

1 R. Baker

2 stay with Scholz, but I wanted to ask you
3 about paragraph 31 of your supplemental
4 declaration.

5 A. Okay. Got it.

6 Q. Here, you're offering your
7 opinion that it was appropriate to look to
8 Scholz's figure seven to understand the
9 relative surface areas of stages one and two
10 in Ungerank's comparative example one,
11 correct?

12 A. That's right.

13 Q. In your supplemental
14 declaration, you don't provide any analysis
15 of what the percentage of methane in the
16 third permeate stream would be if one were
17 to use the Scholz figure seven ratios in
18 comparative example one, correct?

19 MR. LANE: Objection.

20 Form.

21 A. I didn't do that calculation,
22 no.

23 Q. Now, one difference between the
24 membranes used in comparative example one of
25 Ungerank and Scholz figure 7A is that the

1 R. Baker

2 Ungerank membranes are polyamide fibers and
3 the figure 7A of Scholz membranes are
4 cellulose acetate, correct?

5 MR. LANE: Objection.

6 Form.

7 A. That's correct.

8 Q. And in your declaration, you
9 don't provide any analysis of the impact of
10 the difference between using polyamide
11 membranes in comparative example one versus
12 using cellulos acetate membranes, correct?

13 MR. LANE: Objection to form.

14 A. That's correct, but they both
15 have the same selectivity or nominal
16 selectivity. So in fact, as far as these
17 calculations are concerned, they're
18 equivalent.

19 Q. A polyamide membrane with a
20 particular cell activity won't necessarily
21 have the same surface area as a cellulose
22 acetate membrane with that same cell
23 activity, correct?

24 MR. LANE: Objection.

25 Form.

1 R. Baker

2 A. The same throughput of gas
3 would have probably a different permeance.
4 The permeance might be slightly different.

5 Q. Just to make sure I have it
6 right, when you were just answering, you
7 said their permeances might be slightly
8 different.

9 Are you saying for the same
10 surface area of membrane, the permeance of a
11 polyamide membrane might be different from
12 the permanence of a cellulose acetate
13 membrane?

14 MR. LANE: Objection.

15 Form.

16 A. We don't normally talk about
17 membrane area here in this context. The
18 selectivity of cellulose acetate and the
19 selectivity of polyamide membranes in these
20 examples are both 20.

21 There's no -- in the Ungerank
22 patent, there no discussion about what the
23 permeance of the membrane is and in the
24 Scholz patent, they actually give us a
25 permeance number.

1 R. Baker

2 So the relative areas of the
3 polyamide and the Scholz membrane -- of the
4 CA membrane -- may be different because
5 their permeances may be different.

6 There's no information here on
7 the permeance of the polyamide membrane.

8 Q. Now, if we go back in your
9 declaration to page three, at paragraphs
10 five and six, you talk about computer
11 simulations with programs like Aspen and
12 CHEMCAD being commonly used in the gas
13 membrane separation field.

14 Do you see that?

15 A. I do.

16 Q. And you say in paragraph six
17 that a person of skill in the art would have
18 understood the simulations could be set up
19 in different ways with different
20 assumptions, data and inputs.

21 Correct?

22 A. That's correct.

23 Q. Can you use a simulation to
24 calculate optimum membrane sizes?

25 MR. LANE: Objection.

1 R. Baker

2 Form.

3 A. You can.

4 Q. So if you input the membrane
5 materials and the cell activity and you
6 input what you wanted the output to be and
7 what the input would be, can a simulator
8 then just calculate for you what the
9 membrane sizes should be?

10 MR. LANE: Objection.

11 Form.

12 A. You need a little more
13 information, but -- more than what you just
14 said -- but you could do it.

15 Q. What additional information do
16 you need?

17 A. Here, you've got -- normally,
18 the computer will ask you what is the
19 properties of the membrane in one, two and
20 three, so what the permeance and selectivity
21 of the membrane you're using is.

22 Then the computer will also ask
23 you what is the pressure in each of these
24 membrane stages in both the feed and the
25 permeate side.

1 R. Baker

2 Now, in a more simple -- if you
3 are only looking at one stage, that would be
4 enough information. But here, you have
5 three stages, so you have to put in one more
6 piece of information.

7 Well, you have already said I
8 want to get this concentration in the
9 permeate number, permeate eight and I need
10 another concentration or another
11 concentration in permeate 11. So you told
12 it this is the separation I want to do.

13 You need one more piece of
14 information. We either have the
15 intermediate pressure between one and three
16 or maybe the intermediate concentration
17 between one and two. You put in that
18 piece -- that's the last piece of
19 information you need and now the machine has
20 enough information to calculate.

21 If you put more information in,
22 for instance, if you said the membrane area
23 of unit one is -- is a certain size or
24 something like that, the machine has too
25 much information and it can't -- it can't --

1 R. Baker

2 you've overdefined the problem and the
3 machine can't do it.

4 But if you put the right amount
5 of information, it will then spit out an
6 answer. But it won't give you -- it will
7 give you the areas of number one and number
8 two and number three, but they may --
9 depending on what assumptions you made, they
10 won't be the same.

11 In order to get them to be the
12 same, you will have to -- you will have to
13 optimize a thing, you will have to keep
14 changing the intermediate pressure or the
15 concentration in stream seven.

16 If you keep changing those
17 numbers a little bit, you can, in fact, by
18 doing it five or six simulations, one after
19 the other, you can gradually approach the
20 system, one is equal to two is equal to
21 three. And then you've got it, if that's
22 your goal.

23 Q. And conversely --

24 A. You can't just do it in a
25 single simulation.

1 R. Baker

2 Q. And conversely, you could enter
3 the -- you could enter numbers for the
4 surface areas of the membranes and then the
5 simulation would tell you what pressures you
6 would need to use in order to achieve the
7 results you'd like.

8 Is that correct?

9 A. Not quite like that. You could
10 put the areas in, whatever the areas you
11 wanted. You could put the other information
12 on pressures and whatever and it would give
13 you what -- the quality of the gas coming
14 out in stream eight and stream 11, but it
15 wouldn't necessarily be what you want.

16 It will -- you put in the --
17 you define the problem, it will give you the
18 output of the problem, those concentrations.

19 If you want them to be a
20 particular concentration, then you will have
21 to go back and change your input, input
22 values and gradually move. In one
23 simulation you'll get a little bit closer.
24 You change it a bit more, you get a little
25 bit closer. In the end, you will get to

1 R. Baker

2 the -- you've got the right input that's
3 going to give you the right output or the
4 output you want. You can't do it in a
5 single calculation, though.

6 Q. If you turn to the -- let me
7 ask you first.

8 Have you used simulations to
9 calculate surface areas of membranes before?

10 A. Yes.

11 Q. And you didn't report on any
12 such simulations in your declarations in
13 this IPR, correct?

14 MR. LANE: Objection.

15 A. I didn't report them, no.

16 Q. Now, if you turn back to the
17 Priske patent, AP-1001, I'm going to ask you
18 a question or two at column one, which is on
19 page four of AP-1001.

20 A. Page four?

21 Q. It's four at the bottom, column
22 one.

23 A. Got it.

24 Q. Do you see that the first
25 sentence in column one says: The invention

1 R. Baker

2 relates to a specific process and apparatus
3 for separation of gas mixtures with reduced
4 maintenance costs?

5 A. Yes.

6 Q. So the Priske '380 patent, it
7 relates to gas separations, correct?

8 A. Yes.

9 Q. It relates to separating any
10 combination of gases, not just bio gas,
11 correct?

12 A. It is more general than just
13 bio gas, yes.

14 Q. And the claims of the '380
15 patent, the independent claim, claim one, is
16 not limited to bio gas, correct?

17 A. I'd have to look --

18 Q. I'm sorry. Please do. It's at
19 page 18.

20 A. It says there's two components.
21 Mm-hmm.

22 Q. So it's any gas with two
23 components, correct?

24 A. That's right.

25 MR. LANTIER: Why don't we take

1 R. Baker

2 a ten-minute break and then we'll come
3 back?

4 Let's go off the record.

5 THE WITNESS: Okay.

6 THE VIDEOGRAPHER: We are off
7 the record.

8 The time is 1:45 p.m.

9 (Recess taken)

10 THE VIDEOGRAPHER: We are back
11 on the record.

12 The time is 1:57 p.m.

13 MR. LANTIER: Dr. Baker, I
14 don't have any further questions and
15 would just like to say thank you for
16 your time this afternoon.

17 THE WITNESS: Okay. Thank you.

18 MR. LANE: We don't have any
19 questions for Dr. Baker.

20 THE VIDEOGRAPHER: We are off
21 the record.

22 The time is 1:57 p.m.

23

24

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A C K N O W L E D G M E N T

I, DR. RICHARD W. BAKER, hereby
certify that I have read the transcript of my
testimony taken under oath in my examination of
May 6, 2025; that the transcript is a true,
complete and correct record of what was asked,
answered and said during this deposition, and
that the answers on the record as given by me
are true and correct.

DR. RICHARD W. BAKER

Signed and subscribed to
before me, this day of
2025.

Notary Public

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CERTIFICATION

I, SARA K. KILLIAN, RPR, RCR,
CCR, do hereby certify that DR. RICHARD W.
BAKER, the witness whose examination under oath
is hereinbefore set forth, was duly sworn,
and that such deposition is a true record
of the testimony given by such witness.

I FURTHER CERTIFY that I am not
related to any of the parties to this
action by blood or marriage, and that
I am in no way interested in the
outcome of this matter.

IN WITNESS WHEREOF, I have
hereunto set my hand this 6th day of
May, 2025.



SARA K. KILLIAN, RPR, RCR, CCR

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CASE NAME: Air Products & Chemicals Inc v.
Evonik Operations GMBH and Evonik Corp.
DATE OF DEPOSITION: 5/6/2025
WITNESS' NAME: DR. RICHARD W. BAKER

[illegible]

