In the Matter Of:

PROFAC HOLDING CORPORATION v

HALLIBURTON ENERGY SERVICES

DR. MICHAEL NIKOLAOU

June 06, 2024

LEXITAS™

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

IPR2023-01319 Patent No. 7,841,394

PROFAC HOLDING CORPORATION AND U.S. WELL SERVICES, LLC,

Petitioners,

-vs-

HALLIBURTON ENERGY SERVICES, INC.,

Patent Owner.

REMOTE TESTIMONY OF DR. MICHAEL NIKOLAOU

JUNE 6, 2024 - 10:00 A.M. ET

JOB NO. 2024-944727

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JUNE 6, 2024

10:00 A.M. ET

DEPOSITION of DR. MICHAEL NIKOLAOU, before S. Arielle Santos, Certified Court Reporter, Certified LiveNote Reporter and Notary Public.

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MICHAEL NIKOLAOU, Affirmed, Testifies as Follows:

EXAMINATION

BY CHAD C. WALTERS:

Q Good morning, Dr. Nikolaou. How are you?

A Great. Thank you.

Q You are here today to testify in IPR 2023-01319 concerning the '394 patent; is that correct?

A That's correct.

Q Okay.

You have been deposed before?

A Yes, I have.

Q About how many times?

A Definitely single digit number. Less than ten, fewer than ten.

Q You have given deposition testimony in PTAB proceedings, correct?

A PTAB -- could you explain this to me?

Q Patent Trial and Appeal Board.
A Yes.
Q So I will just ask, I know I have deposed you before but just like before, I will just ask that you wait until I finish and answer -- excuse me, you wait until I finish a question before answering.
A That's perfectly fine.
Q And just be sure that all your answers are audible so that they can be transcribed by the court reporter.
A Very good.
Q What did you do to prepare for today's deposition?
A I reviewed my declaration as well as documents that are cited in this declaration and I had discussions with people at Winston & Strawn.
Q Did you review any other documents other than documents that are cited in your declaration?

A No.

CHAD C. WALTERS: Could we go off the record just one second?

SCOTT BORDER: Sure.

(Whereupon a Recess Commenced at 10:00 and Testimony Recommenced at 10:01.)

BY CHAD C. WALTERS:

Q Back on the record.

You said you met with attorneys at Winston & Strawn?

A Yes, online.

Q Online. When did you meet?

A Yes. When? Yesterday.

Q For about how long?

A A few hours.

Q That is the only meeting you had to prepare for today's deposition?

A Yes, along with previews, very short communications to prepare about this meeting, when we set the dates and all that to finalize the meeting for this

deposition.

Q Who was at the meeting from Winston & Strawn?

A Scott Border and Matt Hopkins.

Q Anyone else?

A No.

Q Okay. I would like to turn to your declaration, Exhibit 1003 in this IPR, specifically paragraphs 2 and 3.

A Are you sharing your screen or should I open the declaration myself?

Q I am happy for you to open the declaration yourself.

A Okay.

Q I understand that you have access on your computer to exhibits that have been used in this IPR that have been filed in the IPR; is that fair?

A Yes. Yes. That's absolutely correct so let me make sure that I open this.

Q And the exhibits that you have

access to are clean copies without any notes; is that right?

A That's right. Yes. I put them all in the folder to make sure all of them are clean.

Q Where are you located today?

A I am in Houston, Texas at home. There is construction downstairs actually so I am temporarily using my daughter's room as my office.

Q You have your declaration up?

A Yes.

Q Okay.

So paragraphs 2 and 3 list materials that you considered in forming your opinion for this declaration, Exhibit 1003; is that fair?

A Yes indeed.

Q Did you rely on anything else other than the materials identified in paragraph 2 in forming your opinion?

A Well, my general knowledge of

the subject which covers years of experience, reading a number of books, papers, and all that but those were not cited explicitly in the declaration. Therefore, I would say paragraph 2 which has a description of those is a fairly good collection of items that I used to form my opinion and write this declaration.

Q Turn to Exhibit 1004 which is your CV. Can you pull that up?

A Exhibit 1004, my CV, yes. I am there.

Q You identify a number of -- in the professional experience section, you identify a number of academic positions.

A Hm-hm.

Q And then you identify one piece of industry experience; is that right?

A Hm-hm, yes.

Q And that industry experience was that Union Pacific Resources?

A That is a position that I had in summer of '91 full-time.

Other experience in industry includes consulting which I describe later on.

Q What did you do for Union Pacific Resources?

A Union Pacific had the natural gas plant in Bryan, Texas and at the time they were doing two things.

One, was to modernize the technology they were using in that plant. Natural gas plants are very common around production sites. There are hundreds of those, I would say, in the US. They clean the gas as it comes out of the ground so they can send it through pipelines to various destinations.

So what I did there was, A, help a little bit with the design of some improvements and modifications they were doing at the time.

And, B, later on through a consulting project with Bryan Research & Engineering, I helped develop an automatic control system for that plant.

Q There was no drilling going on at this plant?

A At this plant, no. No, there wasn't.

Q And you were there one summer?

A Yes, that's correct.

Q Your other industry experience is through consulting engagements; is that fair?

A That is correct, yes.

Q Do you have significant experience with drilling operations?

A Yes -- through my -- I would say perhaps -- I'm sorry to interrupt.

I was just saying that perhaps my most hands-on experience with drilling operations was with Noble Drilling. Noble is an umbrella company -- has Noble

Drilling Energy and so forth, but at the time it was early 2000 we were developing an automated horizontal drilling system and I was helping this project as a consultant.

Actually, that became very successful. A small company was eventually formed called Sliders -- Slider was bought eventually by Schlumberger.

If you go to slb.com today, you will see the product with the same name, Slider along with some details about how it works.

Q Is it fair to say most of your industry experience is on the drilling side as opposed to the fracturing or production operations side?

A On the fracturing side I have had experience on the research side through a number of publications about how to do the fracturing, how to do

certain calculations in automated way using various techniques. But in terms of actually helping do the fracturing, I haven't been present at the location.

Q Have you ever been to a producing well?

A Producing well, yes.

Q A well that's actually in the production stage?

A I am trying to think -- I believe so but that was quite sometime ago.

My role wasn't central there. Again, I was helping with automation aspects of production operations so that we could improve efficiency and safety.

Q Where was this well?

A That was actually an experimental well in Norway where the drilling was done and the assessment of production would be made so that people could develop various technologies.

Q Were you there for the drilling of that well?

A The well was drilled, like I said, an experimental well and it was onshore. Norway's wells are all offshore. That was for -- the well was for the Research Institute of Stavanger.

Stavanger is the Houston of Norway so to speak and they used that well at the actual scale so that they could draw conclusions about what happens when you implement various technologies in actual offshore wells which are out at sea, either platform involving different conditions but the essence of the experimental well was the same.

Q When was this?

A When was this; between late -- no, let me think. 2007 through 2017, something like that. Those were the dates.

Q Were you there?

A There where?
Q At the producing well in Norway, the experimental well.
A At the experimental well, yes. Yes.
Q How long were you there?
A A number of days on occasion depending on what kinds of experiments we had to conduct, depending on the technology being developed.
Again, my contribution was mostly on the drilling side as they said. The operation was -- the actual production was for a different group.
Q Did it have any involvement in the production operations at the experimental well in Norway?
A A production operations, no.
Q How many -- how many visits did you make to the well?
A A number of them. I don't remember.

Q I am just curious because you gave a wide range of dates between 2007 and 2017.

A Hm-hm. 2015, something like that. It was 8 to 10 years. I am trying to remember and that was always in June, not always but every summer during that period since 2007 -- from 2007 until 2015, I believe, or so.

I would spend June in Bergen, in Stavanger, working with that institute to develop technologies mainly for drilling and I would interact with people in production as well.

Q Other than this experimental well in Norway where you were focused on the drilling side, have you ever been to any other well in the production stage?

A A well in the production stage, no, not that I can remember.

Q You have never been to an offshore well in the production stage?

A No. No.
Q Have you ever been to an offshore well at all?
A Offshore well, no. You mean at the platform, no, I have never visited a platform.
Q Have you ever been to a hydraulic fracturing site?
A At the time of the fracturing, no.
Q I would like to turn to paragraph 4 of your declaration.
A Yes, sir. I am there.
Q In this paragraph you state your understanding of a POSITA for this IPR in this patent; is that fair?
A Correct.
Q And in that -- in the middle of that definition of a POSITA, you state that one would have had at least a bachelor of science in chemical engineering, mechanical engineering,

materials science or metallurgical engineering or an equivalent field and at least two years of academic or industry experience in the oil and gas industry including experience with process control systems.

Do you see that?

A Yes.

Q Why process control systems?

A Process control -- you mean why would that be relevant to this declaration?

Q Yes.

A Because the system looked at, in this patent, is a system that involves centralized -- centralized control of various elements that would be a nice piece of background for somebody to have to understand how commands are passed around in a system which involves several components interconnected and they all need to work in harmony.

Q Does the '394 patent describe how commands are passed around in various components?

A The '394 patent -- excuse me, can you repeat the question?

Q Sure.

Does the '394 patent describe how various commands are passed around to various components?

A I will have to check again in detail to see to what extent they provide specific information on this.

Q Okay. Go ahead if you would like to. It's Exhibit 1001.

A Very good. Give me just one second.

So paragraph, I'm sorry, column 3 or 4 in the patent talks, for example, in line 50 that this information can be transmitted to a controller or control area tanks.

Further down in line 65, it

1 talks about tanks that can have level
2 control systems.
3 Further down in column 4, line
4 10, there is a valve metering control
5 system.
6 Line 14 talks about fluid stream
7 can be controlled via adjustable
8 calibrated, et cetera, et cetera.
9 So there are several places
10 where this issue is mentioned in the
11 patent and that's why I thought that it
12 would be a good element in one's
13 background to understand how controls
14 work for these systems.
15 Q Are you familiar with the
16 Crossley reference Exhibit 1005, correct?
17 A Correct.
18 Q Does the Crossley reference
19 relate to process control systems?
20 A It does. Yeah, that I can tell.
21 Q In what way?
22 A In that there is reference to

how information is exchanged between various elements and how that can help control the process.

In fact, if I may open the Crossley -- what exhibit was that that you referred to again?

Q It's 1005.

A 1005. So even in the abstract it says in operations control system, there is reference to that early on.

Then further down there's quite a bit of discussion about the how information may ask to control various things from lines to fluids flowing and so forth.

Q You are familiar with the Albers reference, 1006?

A Yes, it is one of the two central references in my declaration.

Q Does the Albers reference refer to process control systems?

A Let me see to what extent it

1 explicitly refers to that.
2 Albers' declaration -- I mean,
3 the patent is about fracturing. Give me
4 just one second, please. (Reviewing.)
5 So even in the abstract it
6 refers to monitoring and flow control
7 equipment. And then other places in the
8 patent where the issue of control comes
9 up.
10 For example, let me find one,
11 column 2, line 41, it refers to
12 monitoring and control equipment.
13 Monitor and control equipment further
14 down. And there are other references to
15 control further down in the patent.
16 Q I would like to turn back to
17 your declaration and specifically the
18 steps of oil and gas extraction. And you
19 walk through some of these steps starting
20 at in Section 4 of your declaration
21 entitled, Background of the Technology,
22 which starts at paragraph 28.

A Section 4 of my declaration, yes, in paragraph 28. Give me just one second. (Reviewing.)

28, yes, sir, I am there.

Q So is it fair to say the first step in oil and gas extraction is drilling which you describe in paragraphs 29 and 30 of your declaration?

A Yeah, assuming where you wanted to do that after an exploration phase which is another story but, yes, assuming you made the decision that this is where I want to produce, you start with drilling a well, correct.

Q How would you describe the drilling stage?

A How would I describe how drilling is done or what is the role of drilling? Could you be a little bit more specific?

Q Sure. What goes on in the drilling step?

A Oh yes. So in the drilling step, the -- a site is selected and then equipment is brought in place so that the well can be drilled using a technology that these days is fairly advanced. And in all likelihood it will involve a vertical and directional part of the well.

There is equipment of the surface. There is a derrick, along with things that essentially turn the drill stream. That's a sequence of pipes, metal pipes, threaded to each other.

At at bottom there's a drill bit that is rotated so it can chew on the rock. The mud picks up the cuttings -- the mud flowing through the drill stream picks up the cutting and lifts them to the surface at the same time lubricates, it cools off the drill stream, and that in a nutshell is the basic operation.

Q When drilling is completed and

before the next stage, is the drilling equipment removed from the site?

A The drilling equipment is removed from -- from the specific spot so things can be done to the well to complete the well.

Q What do you mean remove from the specific spot?

A Well, there's a hole in the ground for which the drill stream goes. That has -- the stream thing that turns all that has to be removed so the completion equipment can be put in place so that the well can be completed.

Q As the well moves through various other stages, such as completion and fracturing and production, does the drilling equipment remain on site?

A Again -- on site, in the vicinity, depending on how much you will need the equipment or whether you anticipate using it for a nearby well or

using it to continue and so forth.

You realize that the well is drilled in stages. So you may drill and complete drill -- for example, drill in case, continue drilling in case and so forth.

SCOTT BORDER: Sorry, Mike, could you adjust your camera perhaps for the benefit of the court reporter and I guess for my own sanity, we were sort of staring at the ceiling for a moment.

THE WITNESS: Yes, I am sorry.

SCOTT BORDER: Great. Thank you.

CHAD C. WALTERS: Thanks.

SCOTT BORDER: No problem.

BY CHAD C. WALTERS:

Q So in your experience it's common for drilling equipment to remain

at a well-site during the completion, fracturing and production stages?

A I haven't dealt with that decision to that level of detail to be honest with you.

Q Do you know if it's common for drilling equipment to remain at the site during the completion, fracturing and production stages?

A Well, if that equipment is to be used again, yes. If not, then it's a decision that people make according to resources they have available, according to how easy it is to move the equipment and so forth.

Q Would you consider it expensive to keep the drilling equipment at the site unused during the completion, fracturing and production phases?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: It depends on a

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number of factors. I haven't looked into that.

BY CHAD C. WALTERS:

Q So you don't know if it would be expensive to keep the drilling equipment at the site unused during the completion, fracturing and production phases?

SCOTT BORDER: Same objection.

THE WITNESS: I can check for a specific situation given enough information to assess whether this would make sense or not but this wasn't central for this analysis so I didn't look into that.

BY CHAD C. WALTERS:

Q Okay.

The next phase of the drilling process is the casing or cementing or completion stage; is that fair?

A Yes.

Q Okay.

And you described casing at paragraph 31 of your declaration?

A Indeed.

Q What is casing?

A Well, when you build the well, you make a hole in the ground so that hole is compacted dirt or rocks. So to prevent that from collapsing when you start doing other things to the well, you put metal casing so that it can be there in place and hold that well in good shape.

Q Is this particular equipment needed for casing?

A Yes.

Q What equipment?

A Depends on how you do the casing and I will have to look it up to see what particular options may exist today in this technology.

Q Can you give me an example of what equipment would be used for casing?

A Equipment that would lower the metal casing to the ground and put it in place.

Q Is -- once the casing process is complete at the well, is it typical to remove the casing equipment from the site before proceeding to the fracturing or production stages?

A Again, this is an issue of available resources, economics, scheduling and planning. Those are decisions that I didn't look into in detail for this analysis.

Q Do you know if the casing equipment is typically kept at the site or removed at the site before proceeding to the fracturing or production stages?

A I would have to look at this case by case. No pun intended here.

Q I am talking about a typical well.

A In a typical -- well, again,

it's an issue of planning and scheduling.

Planning refers to what actions you want to do.

Scheduling is what equipment. This is a matter that there are experts for and they would optimize the planning and scheduling of the whole operation so you can have the most benefit with a minimum cost.

Q Is it common for the casing equipment to remain at the site once the well is cased and before proceeding to the fracturing or production stages?

A Again, I would have to do -- transfer this on a case-by-case basis. It depends on a number of factors.

Q Have you ever been to a well-site where the casing equipment remained at the site during the fracturing and production stages?

A I haven't been at a site when casing was actually performed -- done to

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the well.

Q You never been to a site where a well -- where fracturing was occurring, correct?

A The actual operation of fracturing, no.

Q In the experimental well in Norway during -- strike that.

After the casing step, the next stage for oil and gas extraction is the stimulation or fracturing stage; is that fair?

A Hm-hm.

BY CHAD C. WALTERS:

Q You described that at paragraphs 32 to 37 of your declaration?

A 32 through 37 indeed.

Q Fracturing requires large scale equipment and massive amounts of fluid components; is that right?

A Yes.

Q What is the large scale

equipment required by fracturing?

A The main idea of fracturing is that you have to inject large quantities of water plus other things, that's the fracturing fluid, into the well and pressurize it. So you need basically very strong pumps that will make sure that fluid is indeed injected to the well and the pressure can be raised to the point that the rock can fracture, and water then can be removed from the well so that the next step can commence.

Q You mentioned very strong pumps.

Is there any other large scale equipment required by fracturing?

A Yes, there is -- well, the pumps do the moving of the fluids. The fluids somehow have to be prepared.

Basically, like I said, it's water with other things. The other things may be chemical additives, may be sand which is the proppant that will keep

the fractures open. So of all these have to be prepared at the surface and these are large quantities, like I said, of fluids so they have to be facilities that can be used to prepare the fluids to do the blending and eventually the injection and pumping of the fluid into the well.

Q Do you think we need a mixer to prepare the fracturing fluid?

A A mixer, yeah, to -- I mean, you need to mix the water with the additives and the sand and everything that goes into the fracturing fluid.

Q You also need blenders?

A Yeah, blenders or mixers. There are various terms used for that but the idea, again, as I said, is to put together -- to put into the water the additional elements that are necessary for various properties of the fracturing fluid.

Q You need tanks as well?

A Yes.
Q You would need a manifold to direct the fracturing fluids to a wellbore?
A You would need a way, yes, to make a connection between the well -- fluid connection between the well and the source of these fluids indeed.
Q Do you know the footprint required for the fracturing equipment at the well-site?
A Footprint in terms of square footage?
Q Yes or size.
A Off the top of my head, no, I don't remember that number.
Q Can you take a guess?
A No, but it's -- I would have to look it up and think a little bit about it but it's an area that would be needed to put the tanks and the pumps and the equipment that connects it.

Q Can you think of the smallest area that might be needed for that?

A Again, I would have to look this up to see specifics. But, again, it is the area that would be taken for the number of pumps required, the fluid containers.

And then like I said, each job is -- fracturing job is different, so I would have to look at specifics to have a specific idea.

Q Is it considered a large area?

A Consider a large area required for putting the fracture equipment you mean?

Q Yes.

A Well, it depends on what you call large.

Q Okay. Okay.

Fracturing is performed at high pressure; is that right?

A That's correct, yes.

Q What type of pressures are we talking about to perform hydraulic fracturing?

A It's thousands of PSI and it depends on a number of things.

The basic idea is that you pressurize the water as you inject it enough to fracture the rock but for the fracture to remain within the bounds that you want. And there's a certain technology used there on how to actually do that well.

Q How many thousands of PSI?

A It depends on the rock. It depends on the stresses in the rock, the kind of rock. It depends on a number of things.

Q As high as 15,000 PSI?

A I don't remember off the top of my head but that number doesn't sound unreasonable.

Q What would be the low estimate

of a range of PSI needed for hydraulic fracturing?

A Again, it's in the range of thousands of PSI but specific, I would have to look it up. I would have to Google it basically.

Q You don't know off the top of your head?

A Off the top of my head, I can remember that it's thousands of PSI. It varies from rock-to-rock from stress-to-stress, from kind of fracture to kind of fracture and all that. There are various factors there that are important.

Beyond that, what is important is the principle that says pressure has to be high enough to fracture the rock but not too high so the fracture won't escape to areas that you don't want.

Q It requires a high fluid injection rate and a large volume of

stimulation fluids; is that fair?

A The large volume is typically correct, yes. Those are operations that require a lot of water.

The rate varies. And in fact, there is -- there is technology described in textbooks and various other sources on how actually you do the pumping, how the pressure increases and that it stabilizes as the fracture starts being formed and propagates. And then shutting the pumps and the pressure starts dropping and all that.

So it's a fairly nicely described operation which has qualitatively the pattern I just described and quantitatively the numbers vary depending on the particular situation.

Q -- range?

A I'm sorry, a range of what?

Q The rate -- injection rate.

A Injection rate, I don't remember off the top of my head.

Q Could it be as high as 100 barrels a minute?

A Again, I would have to look this up. I don't remember.

Q You don't know if it could be as high as 100 barrels a minute?

A I don't remember off the top of my head. I would have to look it up.

Q Fracturing requires high horsepower pumps; is that right?

A That's correct, yes.

Q What kind of horsepower are we talking about?

A I don't remember, again, off the top of my head but I can tell that those are massive pumps that require a lot of power. That's as much as I remember off the top of my head.

Q So you characterize them as high.

So what would be high in your mind?

A High, it wouldn't be like a pump that you would meet at say a distillation column that would have to pump fluid in the refinery tower so that it can go from the bottom to the top or things like that. Those are much bigger.

Q Can you give me a horsepower range that will be required of a high horsepower pump for fracturing?

A I don't remember off the top of my head.

Q Can you give me a minimum number?

A I cannot give that either. It -- I would have to look it up.

Q Okay.

Once fracturing of the well is completed and before moving to the production stage, is the fracturing equipment typically removed from the

well-site?

A Again, this is a decision related to planning and scheduling so it depends on how that equipment will be used in another job. There may be a job nearby, job elsewhere.

There may -- it's -- it's an issue about allocating resources so it's a planning and scheduling issue.

Q Would it be costly to keep fracturing equipment unused at the well-site during production operations?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: That depends on the situation and it's a planning and scheduling decision.

It can be influenced -- affected by a number of factors.

BY CHAD C. WALTERS:

Q In what situation would it not be costly to keep fracturing equipment

unused at the well-site during production operations?

SCOTT BORDER: Same objection.

THE WITNESS: Again, it depends on the situation.

That's not something I looked into in very much detail for this declaration.

BY CHAD C. WALTERS:

Q Have you ever been at a well bearing production operations where the fracturing equipment remained at the site?

SCOTT BORDER: Same objection.

THE WITNESS: I haven't been at a well during actual production operations so I cannot have an opinion on that.

BY CHAD C. WALTERS:

Q What are the differences between

onshore and offshore fracturing?

A Differences in terms of on how you actually do the fracturing or what is the function of the fracturing or -- can you be a bit more specific or is it all of the above?

Q All of the above?

A All of the above, okay.

So in terms of how you do the fracturing, obviously offshore there is a sizable amount of water. There is the sea above the ground, the rock where the well is drilled. So somehow the connection between the surface facilities at the surface of the sea would have to communicate with the equipment through the water and down to the rock so that's an obvious difference.

And in terms of function, fracturing has a basic function which is to improve the productivity of a well by creating pathways for the fluids, oil and

gas that this, to travel to a well through the rock easily and then to the surface through the well.

In land wells, fracturing can be done on both vertical and horizontal wells. So overwhelmingly these days, I would say fracturing is done on horizontal or directional wells in low permeability rocks, mostly shales which is an essential element actually. Otherwise production cannot proceed at reasonable rates without fracturing.

In offshore wells, those wells are usually in rocks that are a different nature so fracturing is important but it is not as critical as it is for low permeability, support unconventional wells and shales and such rocks offshore.

Q Does fracturing use different equipment onshore versus the fracturing equipment used offshore?

A The fracturing itself in the

well is done in the same way. It's only that the connection between the well and the surface may have -- not -- will have the additional distance to traverse from the bottom of the sea to the top in offshore wells.

Q So offshore fracturing uses the same equipment as onshore fracturing?

A It's the same idea, yes. Same technology.

Q Does it use the same equipment?

A Equipment -- again, differences in the equipment would have to do with how the well is connected to the surface. So in offshore, you will have to account for the sea water. In onshore, there is no need to do.

Q Is that the only difference in equipment that would be used in offshore fracturing versus onshore fracturing?

A That would be the main difference. The fracturing part, how you

actually pressurize the well, how you initiate the fracture, how you let the fracture propagate by pressurizing the fluid in the well and all that, the idea is the same.

Q Does onshore fracturing typically use trucks and trailers?

A Yes.

Q Does offshore fracturing typically use trucks and trailers?

A Well, to be honest with you, I would have to look that up but it's a different situation where you're on a platform so it wouldn't make much sense to do fracturing by using a truck on a platform. But what the truck helps with is to have the equipment that is actually used, it carries the equipment around, it carries the pump, it carries the material, it helps with mixing and all these things.

Q Fracturing step, we move to oil

and gas production --

A Hm-hm.

Q -- is that fair?

SCOTT BORDER: Objection.

Form.

THE WITNESS: Yes.

BY CHAD C. WALTERS:

Q Your technology background section does not address the production step; is that right?

A Because production wasn't central in this discussion. It is mentioned in '394 that some of the lines used there could be used for the fracturing fluids and for production fluids from the well to the surface, but the main issue addressed was fracturing so that's why I concentrated on that.

Q You don't think production operations is relevant to the '394 patent in this IPR?

A Production operations is

mentioned to the extent that a line can be used also to carry production fluids from the well to the surface.

Q Does -- do production operations use different equipment than stimulation operations?

SCOTT BORDER: Objection. Form.

THE WITNESS: Can you be more specific?

I mean, those are two different activities in sequence and related to each other, but what you use to fracture a well may have no bearing on what you would need to produce from that well, but I would need more specifics to offer a more focused answer to this.

BY CHAD C. WALTERS:

Q Is it fair to say production operations use different equipment than

stimulation operations?

A There is equipment in fracturing that would have no use -- no serious use for production operations.

For example, pumps that pressurize the production -- the fracturing fluid into the well are not going to be needed for production.

Production may need other pumps, such as electric submersible pumps that you throw into the well to help lift the fluid -- the oil, that is, to the top. But that's a different pump for a different job, different configuration, different function and all that.

Q Production operations typically use different pumps than fracturing operations?

A Yes.

SCOTT BORDER: Objection, foundation.

BY CHAD C. WALTERS:

Q What equipment is used for production operations?

A Well, that's -- it depends. It depends on how you do the production, whether it's oil or gas, gas -- it's a number of things.

Q Can you give me examples?

A Sure. You just let -- you just let the fluid go through the central pipe that goes from the bottom to the top of the well. The pressure of the reservoir pushes the fluids up, and the fluids are connected -- delivered to the top which is connected to the equipment downstream from there, separators for fluids, say liquids, gases, and then separators for oil and water, and maybe additional equipment further down.

Q You characterized hydraulic fracturing as requiring large scale equipment.

Would you characterize

production operations as requiring large scale equipment?

A It's a large scale operation but again, this is an old past term.

Could you be more specific as to what kind of equipment you are referring to for large scale?

For example, if I may give you an example of what I mean, a platform is needed for production operations. Okay. That's very large scale equipment. So you need the -- the platform you put it there and you use it for various things, including production operations so, yes, that's large scale.

Q Production operations are typically at much lower pressures than pressures for fracture stimulation operations; is that right?

A Pressure where? There is a long well that goes from top to the bottom and the pressure varies quite a lot there.

Actually, it depends on the depth of the well. There's the hydrostatic pressure. There's friction that needs to be overcome.

Can you be a bit more specific?

Q Sure.

What about the pressures of the pumps required?

A During production?

Q During production versus stimulation?

A Pressure is required from the pumps during production. If there is a pump, that would be a pump at the bottom of the well which would help pump fluids from the bottom to the top so it would have to overcome the hydrostatic pressure from the bottom to the top.

Q You would use the same high pressure pumps for production operations as in fracturing?

A Well, that's -- operation

pumps -- I mean, the operation of pumps for production in the design of these pumps and all that is based on similar principles of pushing a fluid in one direction but they have different design.

You know the principles are applied differently so that you have a different design that is suitable for the purpose.

For fracturing, you have large pumps at the top which pressurize fluid at the top and send it downward to the well for production. It's pressure -- it's a pump at the bottom which provides pressure at the bottom to the fluid for the fluid to be lifted and reach the top.

Q Are horsepower pumps used for production operations versus those for stimulation operations?

SCOTT BORDER: Objection. Form.

THE WITNESS: They would

typically be different.

BY CHAD C. WALTERS:

Q Would they be lower?

A For production?

Q Yes.

A I would say they would typically be lower but, again, I have to look up the numbers to see how high they can go and all these different parameters that affect the operation of the pumps in these two configurations -- production versus drilling and stimulation.

Q Are production chemicals typically used in much lower volumes and rates than fracture stimulation fluids?

A Again, that depends on what additional chemicals are used, either for production or for stimulation.

Q Can you think of a scenario where production chemicals would be used in higher volumes and rates than fracture stimulation fluids?

A It depends. There are so many things that one can look at here so -- you realize that the chemicals used in the slurries for fracturing.

Most of those are actually proprietary information. Although it's common knowledge of the principles that guide this selection of these chemicals.

Companies have their own secret sources. Each one of them suitable for a particular location, or for a particular kind of well, particular kind of job and so forth.

Same for production. There may be chemicals that are proprietary but -- and there are general principles that people understand.

For example, adding additives in production to prevent hydrate formation. That's common knowledge.

Now, how is that done, what kind of additive you put -- to what quantities

and to what extent, it depends on the job and the production site and the particular company, the technology used and so forth. So there is a wide range of these things.

Q Do you consider yourself an expert in fracturing and production operations; is that fair?

A Yes.

Q Okay.

Can you envision a scenario where production chemicals would be used in a higher volume and rate than fracture stimulation fluids?

SCOTT BORDER: Objection. Form.

THE WITNESS: I will have to research that.

This is not something I looked into in preparing this declaration. And it's something that needs careful consideration

of the sources so I can see the whole range of these numbers.

BY CHAD C. WALTERS:

Q Do you think it's possible at a producing well that production chemicals would be used in higher volumes and rates than the fracture stimulation fluids at that well?

SCOTT BORDER: Objection. Form.

THE WITNESS: I will have to research that looking at standard sources so I can have a more informed opinion.

BY CHAD C. WALTERS:

Q You don't know if it's possible or not?

SCOTT BORDER: Objection, foundation. Form.

THE WITNESS: I will have to look up the sources again to see what is the full range of values

that one has to consider.

CHAD C. WALTERS: Okay.

We have been going about an hour so do you want to take a break, maybe a ten-minute break?

THE WITNESS: Sure.

CHAD C. WALTERS: And Dr. Nikolaou, we had a deposition before but I think you are aware of the rules, to not discuss the substance of your testimony with your counsel during breaks.

THE WITNESS: Yes, absolutely.

CHAD C. WALTERS: Okay.

(Whereupon a Recess Commenced at 10:58 and Testimony Recommenced at 11:10.)

BY CHAD C. WALTERS:

Q Welcome back, Dr. Nikolaou.

I would like to turn to the Crossley reference which is Exhibit 1005.

A Yes.
Q Do you have it up?
A Yes.
Q Okay. Great. The title of Crossley is System and Vessel for Supporting Offshore Fields.
Do you see that?
A Yes. On the cover page, yes.
Q On that same page in the abstract, it describes the reference as, "A system for supporting multiple well-site, offshore, hydrocarbon-bearing fields. Each well-site has one or more wells."
A Yes.
Q Okay.
And then in paragraph 2, it states that "Embodiments of the present invention generally relate to a system for supporting a plurality of hydrocarbon-bearing wells, including systems for providing production

operations in multiple well-site, offshore fields."

A Correct.

Q These disclosures relate to production operations; is that fair?

A The Crossley patent, you mean?

Q Yes.

A Yes.

Q Does Crossley system perform well-stimulation?

A No.

Q Okay.

Crossley does not relate to drilling operations; does it?

A Does not relate -- well, it -- it's related to a well that has been drilled.

That operation has been completed so the only thing that may be done is perhaps to make modifications in those drilled wells but Crossley focuses on essential unit that oversees

production operations.

Q So in the system of Crossley, the drilling of the well has been completed, right?

A Yes, that assumes that you have wells that have been drilled and the concern is with a simultaneous control of the production --

(Reporter Clarification.)

THE WITNESS: -- operations.

BY CHAD C. WALTERS:

Q You would not characterize Crossley as directed to solving problems in drilling operations; would you?

A Drilling operations are indeed not the focus of Crossley.

Q Okay.

I would like to turn to the Albers reference which is Exhibit 1006.

A Yes.

Q The title of Albers is Method for Fracture Stimulating Wellbores.

Is that right?

A Yes, indeed. The cover page.

Q And in the abstract the first sentence of the abstract it states, "Disclosed is a method for fracture stimulating wellbores using gaseous nitrogen and/or liquid carbon dioxide combined with a partially dehydrated proppant."

Do you see that?

A Yes.

Q And then turning to column 1, lines 63 to 65 -- actually, lines 65 to 67.

A Yes.

Q It states, "This invention relates to a method for fracture stimulating wellbores using gaseous nitrogen and/or liquid carbon dioxide combined with substantially dehydrated proppant."

Do you see that?

A Indeed, yes.
Q Is it fair to say that Albers is directed to onshore well-stimulation?
SCOTT BORDER: Objection. Form.
THE WITNESS: I have to check to see if there is specific reference to that but his main concern is how you do the stimulation regardless of the particular configuration onshore or offshore.
BY CHAD C. WALTERS:
Q Albers does not relate to drilling operations, correct?
A Drilling, well, it's -- the focus is stimulation.
Q And you wouldn't characterize Albers as directed to solving problems and drilling operations, correct?
A His focus is on stimulation.
Q So is the answer to my question

yes?

A The question was whether Albers is concerned with drilling.

Q I will read my question again.

You would not characterize Albers as directed to solving problems with drilling operations, correct?

A Correct. He does not directly address drilling operations per se.

Q And Albers does not relate to production operations; is that right?

A Not directly. Again, this is something that you do before production to stimulate the well.

Q There's no mention of production in Albers; is that right?

A Well, the word is in the file but the focus is not production.

There's reference of production fluids or stimulating the production of oil and gas in column 1, for example, but the focus is on how you do the

stimulation.

Q I would like to turn to column 4, line 16 to 20.

A 16 to 20. Yes, sir.

Q There are a couple of sentences that state, "The specific number of trucks, trailers, tanks is illustrative in nature and is not meant to be limiting one of skill in the art will appreciate that additional trucks, trailers, tanks can be used to meet these specific requirements of a particular job design."

Do you see that?

A Yes, I do.

Q What are trucks, trailers and tanks used for in onshore fracturing?

A Well, it's described in this pattern actually. And in fact -- let's see, there are probably pictures of that, but in general those carry the equipment that is needed to perform the operations that we have been discussing for the

fracturing job.

For example, mixing various components to prepare the fracturing fluid or pumping the fracturing fluid into the well and the like.

Q Is it important that the fracturing equipment be portable?

A Again, it's an issue of convenience and how actually the fracturing equipment is moved around and how you minimize the cost of moving the equipment from place to place is subject to technology that has been under development for quite some time.

So is it important that this equipment should be portable? It will be -- the equipment will be portable because once you finish the job, then you can do anything you want with that equipment.

As I explained previously, it's a matter of planning and scheduling of

how you use the equipment for the purpose in a cost effective way.

Q Is it common to use trucks, trailers or tanks -- strike that.

Is it common to use trucks and trailers and tanks in fracturing sites so that the fracturing equipment can be moved around?

A That's how you move the equipment around. That's one way to do that, yes.

Q Is it common to use trucks, trailers and tanks in fracturing sites?

A It is quite common, yes.

Q In your opinion that the claims of the '394 patent are not patentable or invalid.

You rely on a combination of references for each claim; is that right?

A That is correct.

Q You don't have an opinion that any single reference discloses each

limitation of any single claim?

A I haven't found one.

Q Okay. I would like to turn back to your declaration, Exhibit 1003.

A Yes, I am there.

Q Specifically let me ask a question.

Crossley describes a vessel 150 with an operations control system 180; is that right?

You can look at your confirm -- at your paragraph 50 of your declaration.

A (Reviewing.) Yes.

Q I would like to ask some questions about your combination of Crossley and Albers.

A Yes.

Q So I will just ask that question again.

Crossley describes a vessel 150 that includes an operations control system 180?

A In paragraph 50 down in line 6 that's what -- 7, rather --

Q That's what you say about --

(Simultaneous Crosstalk.)

I'm sorry.

A Yeah.

Q That's what you say about Crossley, correct?

A Yeah.

Q And your combination relies on Albers' equipment to be the claimed well treatment operations factory that manufactures the first and second well-stimulation fluids of the claims; is that right?

A Excuse me, I had to cough and I missed the question. Could you repeat it?

Q Sure. Why don't we move to paragraph 67 of your declaration.

A Certainly, 67. Yes, sir.

Q I guess on the previous page at

paragraph 64, you include Limitation [1A] which requires a well treatment operations factory which manufactures and pumps a well-stimulation fluid.

Do you see that?

A Yes, sir.

Q So moving to paragraph 67, your combination of Crossley and Albers relies on Albers' equipment to be the well treatment operations factory that manufactures the first and second well-stimulation fluids of the claims --

A Yes.

Q -- is that right?

A Yes.

SCOTT BORDER: Objection.

Form.

BY CHAD C. WALTERS:

Q And going back to paragraph 48 of your declaration, you describe and illustrate that combination; is that fair?

A Page 29 of the declaration, yes.
Q Yes, paragraph 48.
A Hm-hm. Correct.
Q And in that paragraph you state that, In the Crossley system is modified by Albers, Albers' fractures stimulation -- excuse me -- fracture-stimulating equipment and associated dynamic fluid manufacturing and optimized oil well-stimulation fluid techniques, would be implemented on Crossley's vessel 150 -- depicted below in annotated Figure 1 of Crossley with an excerpt --
(Simultaneous Crosstalk.)
A Are you on paragraph 68 or --
Q Paragraph 48.
A 48. (Reviewing.)
Yes, go ahead, please.
Q Okay.
You described the manner in which Albers' fracture-stimulating equipment would be implemented on

Crossley's vessel 150?

A Yes.

Q Okay.

And you include annotated illustration of that at the end of paragraph 48?

A Yes, on page 29.

Q So in your combination, everything from Figure 1 of Albers would be included on Crossley's vessel; is that right?

A This would be an example of equipment that one could use to actually perform stimulation with a simultaneous control from a central facility which is the main theme of Crossley.

So Crossley lands the -- teaches the centralized control of operations.

Albers teaches the fracturing of the well. Combination of the two gives a centralized simultaneous operation for fracturing multiple wells.

Q Then in the illustration of your combination, you have the equipment of Albers Figure 1 on Crossley's vessel; is that right?

A Yes.

Q I would like to turn to column -- Albers reference, Exhibit 1006 at column 4.

A Yes, sir.

Q Starting at line 14, there's a sentence that states, "All of the above referenced equipment is of a conventional nature and is commonly used in the industry."

A Yes.

Q And that above referenced equipment is describing the equipment of Figure 1?

A Figure 1 -- you are referring to Figure 1 of Albers?

Q Yes.

A Yeah.

Q You agree that that equipment is conventional -- is of a conventional nature and commonly used?

A Yeah, that's what Albers states.

Q Okay.

What is the footprint size of that conventional equipment shown in Figure 1 of Albers?

A I don't know for a fact what that might be but there are trucks shown there. And this is shown as an example.

And Albers states that his purpose is to show the principle rather than the particular number of trucks or equipment needed or vessels needed for a job. His concern is with the principle how this is done and what kind of equipment one would need.

Q Can you give me an estimate of what footprint size might be given that this is conventional equipment?

SCOTT BORDER: Objection.

Form.

THE WITNESS: I would have to look it up to see what the area would be for the trucks shown and the vessels and so forth.

BY CHAD C. WALTERS:

Q Okay. I would like to move -- staying on Albers, looking at column 5, lines 5 to 11.

A Lines 5 to 11. Yes, sir, I am there.

Q Can you -- you can read this to yourself, but can you read the sentence that starts, "The high pressure" at column -- at line 5 of column 5?

A (Reviewing.) Okay.

Q That sentence states, "That slurry may be pumped at a pressure up to a design maximum of 70,000 kilopascals."

Do you see that?

A Yes.

Q Do you know how much 70,000

kilopascals is in PSI?

A I have to do the conversion. You want me to do it quickly.

Q Would it be fair to say it's about 10,000 PSI?

A Off the top of my head, yes, but I would use a web source to make sure I don't make a mistake.

Q That's what I got when I did the Google conversion.

A Okay. I trust that in good faith. I trust that you didn't make a mistake, neither did Google.

Q Sure.

You haven't provided any evidence in your declaration that Crossley's pumps or other equipment could withstand pressures of up to 10,000 PSI; have you?

A I don't believe I discussed that issue at all what pressure these pumps would be suitable for.

Q And you didn't provide any evidence in your declaration that Crossley's fluid delivery lines can support the high volume and rates required for stimulation fluids; did you?

A Regarding the volumes of these fluids, I didn't discuss that either.

Q Or the fluid rates?

A The fluid rates, no, I didn't discuss that.

Q Okay.

A I don't believe so.

Q I would like to go back to paragraph 48 of your declaration.

A Paragraph 48, yes.

Q This is where you stated that "Albers' fracture-stimulating equipment and associated dynamic fluid manufacturing and optimized oil well-stimulation fluid techniques would be implemented on Crossley's vessel 150."

Is that right?

A Correct.
Q You don't provide any explanation in your declaration as to how Albers' fracture stimulation equipment and associated dynamic fluid manufacturing and optimized oil well-stimulation fluid techniques would be implemented on the vessel; have you?
A How they would --
(Simultaneous Crosstalk.)
SCOTT BORDER: Objection. Form.
THE WITNESS: You mean using what technology or using what resources or what techniques?
Can you be more specific.
BY CHAD C. WALTERS:
Q Any of those?
A To the extent that the equipment described in Albers is standard, I didn't discuss this because I would submit that one would use whatever it takes to put

standard equipment on the spot.

Q You didn't identify what resources or what techniques would be used in order to implement Albers' fracture stimulating -- fracture-stimulating equipment on Crossley's vessel 150, correct?

A So the idea is that this is standard equipment as Albers explains and I didn't go to any more detail in the sense standard equipment can be handled in a standard way.

Q The control delivery system 158 of Crossley -- I referenced that because at the end of paragraph 48 at the last sentence of the text, it states that "Albers equipment would be implemented on Crossley's vessel 150 and in conjunction with the control delivery system 158."

Do you see that?

A Yes.

Q Okay.

To answer my question about what the control delivery system 158 is, you can look at paragraph 60 of Crossley Exhibit 1005, if you would like.

A Paragraph 60 of Crossley. Yes, sir, I am there.

Q Is it fair to say that the purpose of the control delivery system 158 of Crossley is to control subsea equipment located at the subsea well-sites 110, 120, 130?

SCOTT BORDER: Objection. Form.

THE WITNESS: That's what is stated in that paragraph, that the ship 150 optionally also includes a control delivery system.

BY CHAD C. WALTERS:

Q So your declaration though does not explain how Albers' fracture-stimulating equipment would connect to Crossley's control delivery

system 158; is that right?

A Crossley's system contains two communication elements.

One is -- that are related. One is communication of signals. And the other is communication in a fluid connection.

Figure 4 actually shows how things can be combined or how you can consider a possibility for delivering, A, signals and, B, fluids.

Fluids are shown in 428, 428 prime, 428 double prime in Figure 4 of Crossley. So it's in this context -- particularly, the fluid connection that I used as a capability that Crossley teaches for a centralized fluid connection and communication with the wells.

Q Figure 4 describes a line flowing from the vessel to the wells?

A Hm-hm.

Q Okay.

But in paragraph 48, you're talking about connecting Crossley's -- excuse me, Albers' fracture-stimulating equipment to Crossley's control delivery system 158 which is on the vessel, I believe; is that right?

SCOTT BORDER: Objection. Form.

THE WITNESS: So you are referring to my declaration again in the figure on page 29?

BY CHAD C. WALTERS:

Q Yes. And the preceding text.

A Yes. The question again is what again?

Q Sure.

So in the preceding text, you state that, "Albers' fracture-stimulating equipment would be implemented on Crossley's vessel 150 and in conjunction with the control delivery system 158?

A Yes, the idea is that there is a connection that can deliver fluids downhole.

And the fluids that would have to be delivered in a fracturing operation would be the fluids needed for fracturing which is why in the figure on page 29 of my declaration I am showing the fracturing-related equipment in that insert in the figure replacing an element of the Crossley configuration using the Albers equipment.

Q You do not explain how Albers' fractures stimulating equipment would connect to Crossley's control delivery system 158; is that right?

A I didn't go into that depth in the sense that this is standard equipment as Albers teaches so I didn't expound on how standard equipment would be connected to Crossley's configuration.

Q Can we turn to Albers again,

Exhibit 1006 specifically at column 5?
A Yes, sir.
Q Starting at line 63?
A Yes.
Q Is it fair to say that Albers relates to stimulating coal bed methane formations?
A (Reviewing.) That's what is stated in that sentence.
In the next one, that the method is particularly suited for this application as the introduction of blah, blah, blah and he continues on this.
Q And then reading on through column 6, line 3, Albers discusses introduction of water into these formations.
A This is -- he says water sensitive formation in the sense that he's his standard fracturing equipment with a particular twist that he describes in the abstract using the nitrogen in how

to handle the water situation so he can have that specific outcome for these kinds of wells. But his fracturing approach is fairly standard.

Q Was the industry stimulating coal bed methane formations or other water sensitive formations offshore as of December 2005?

A I haven't spent much time on coal bed methane formations to be honest with you.

My main application was on shales but the fracturing technology was used for essentially on wells that needed stimulation.

Q Is it fair to say you don't know the answer to my question?

SCOTT BORDER: Objection, foundation.

THE WITNESS: Again, I haven't spent much time working on coal bed methane formations and

1 their stimulation.
2 BY CHAD C. WALTERS:
3 Q So do you know if the industry
4 was stimulating coal bed methane
5 formations or other water sensitive
6 formations offshore as of December 2005?
7 A I would have to look that up.
8 Q Okay. I would like to go back
9 to your declaration, paragraph 60.
10 In paragraph 60, you discuss the
11 Lacy reference and the techniques of
12 Lacy.
13 A Yes.
14 Q You use that to support your
15 combination of Crossley and Albers?
16 A I am using that as corroborating
17 support, yes.
18 Q Okay.
19 So my question is, how would
20 Lacy's techniques be incorporated into
21 the combination with Crossley and Albers
22 to teach the claims?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I am not sure I can answer that question in a meaningful way.

Lacy has a specific focus and that would be relevant to the centralized oil field operations that Crossley teaches. So that's as much as I can say about that.

If there is something more specific, I would definitely be happy to address it.

BY CHAD C. WALTERS:

Q Are you proposing to use Lacy's techniques in the combination with Crossley and Albers?

A So Lacy is concerned with a particular configuration for vertical fracture growth control. This is the title of the patent.

And it has to do with

controlling fluid flow and having mixers and having various elements that can deliver the fluids to the well.

So this is just another reference that explains the technology for hydraulic fracturing was fairly well developed and known already at that date.

I am using it --

(Simultaneous Crosstalk.)

I'm sorry --

Q Go ahead.

A I am using this as corroborating evidence, not as a central element. But in case there is any doubt, that technology, you know, doing fracturing was fairly well understood at the time of Lacy's patent.

Q Looking at the next paragraph, paragraph 61, you discuss the Tolman reference.

A In my declaration?

Q Yes.

A Yes, sir. I am there.
Q You state that a "POSITA would have been motivated to incorporate Albers and Crossley based on the teachings of Tolman."
A Yes.
Q And by Tolman, you are referring to Exhibit 1008 which is a publication of a patent application; is that right?
A Yes.
Q I would like to look at Tolman for a bit.
A Okay. I have that reference open.
Q Okay.
Is it fair to say that Tolman is directed to stimulation treatment and not production operations?
A Yes, the title of the patent is "Method and Apparatus associated with Stimulation Treatments for Wells."
Q There's no suggestion in Tolman

of using production equipment for fracturing or vice-versa; is that right?

A I don't believe I saw anything to that extent in Tolman.

Q Okay. Can we look at Figure 3 of Tolman.

It's also described in paragraph 40, if you would like to look at paragraph 40 as well.

A (Reviewing.) Yes, sir.

Q I would like to focus on Step 320 of Figure 3 of Tolman?

A Figure 3 of Tolman, yes.

Q So this Step 320 states that you would move the stimulation equipment before proceeding with production operations, correct?

A Yes. Hm-hm.

Q It's fair to say that fracturing and production operations happen sequentially?

A Production will follow

stimulations I describe.

Q You have never seen fracturing and production equipment both in operation at the same well-site, right?

A Fracturing and producing at the same time, no.

Q Oil and gas production can last quite a long time, is that fair, when you reach the production phase of a well?

SCOTT BORDER: Objection. Form.

THE WITNESS: What do you mean does it take long to drill a well and start production?

Or are you asking whether after production commences, does it take years for it to be abandoned?

Which is it?

BY CHAD C. WALTERS:

Q Sure. My question probably wasn't accurate.

I am talking about production operations.

So once you start production operations, that can last quite a long time?

A That varies quite a lot depending on the well and how production is handled so you realize that production proceeds initially using the internal pressure of the reservoir. After some time the reservoir may have to be essentially forced to produce through secondary or maybe tertiary recovery techniques. And those varied depending on whether you have a horizontal or a vertical well, whether you have high permeability or low permeability of reservoir. There's a number of factors.

Shale oil or gas wells have short production spans from primary production. Conventional reservoirs may have longer production spans from

primary, secondary or even tertiary production.

So the short answer again, is the production period for a well varies and it varies quite a bit actually.

Q It can last as long as 15 to 30 years for an offshore well?

A With proper handling of the well, yes, it can last a long time. Say over a decade, yes.

Q Would you expect that the fracture-stimulating equipment would remain on an offshore vessel drilling production operations?

A If it's not needed or anticipated to be needed soon, there's no reason for that equipment to stay there.

Q Would it make business sense to keep the stimulating equipment on an offshore vessel during production operations?

A Again, that's a decision of

planning and scheduling, but typically I would say one uses equipment for a specific purpose. If the equipment is not needed, there may be an incentive not to use it anymore, and move it someplace else where it can be more useful.

Q I am in a spot we might want to take another short break if that makes sense.

A Yeah.

CHAD C. WALTERS: 10 minutes.

THE WITNESS: Yeah, 11:02; is that okay?

CHAD C. WALTERS: Sure.

(Whereupon a Recess Commenced at 11:52 and Testimony Recommenced at 12:02.)

BY CHAD C. WALTERS:

Q Claim 1 of the '394 patent, you may want to pull up the claims for a couple of questions.

"It requires flowing a first

stimulation fluid to the first well and not to the second well and flowing a second stimulation fluid to the second well and not to the first well."

A Yes.

Q Independent Claims 24, 25, 26 and 27 have a similar requirement but some of them require a pad or a plurality of wells instead of a well.

A Yes.

Q See that?

A Yes.

Q What is your understanding of a pad?

A A pad is a configuration that essentially makes it more efficient to have equipment in place for drilling or stimulation without having to move every single element one at a time but you move them all on the pad.

So pad drilling was a major development in technology for drilling

unconventional resources wells that substantially reduced costs and improved deficiency and effectiveness for these drilling operations.

Q Pads exist offshore?

A Offshore you can think of a pad but then it's -- it's of a different nature because you have the platform there and you have equipment at the bottom of the sea and all that so it's a different configuration.

Q Is it fair to say pads did not exist offshore?

A I don't know if I would call these pads, but the idea is, again, that you have equipment accumulated there in a small area. And so that's -- that is the configuration that people use on a platform.

Q When you say "I don't know if I would call these pads," you wouldn't call offshore platform a pad?

A Offshore platform, no, I would not call it a pad for a number of reasons, mainly because of size and function. A pad is something that you use typically for unconventional wells onshore. Platform is something that you use offshore. Although there is, again, there are multiple pieces of equipment in the same spot.

Q Turn back to the Crossley reference, Exhibit 1005, specifically paragraph 28.

A 28. (Reviewing.) Yes.

Q In the middle of that paragraph --

A Yes.

Q -- there's a sentence that starts, "The floating vessel may."

Do you see that?

A Crossley, paragraph 28?

Q Yes.

A Let me see if I have the right

1 document.
2 Q Just over halfway down the
3 paragraph.
4 A (Reviewing.) Yes, I'm sorry. I
5 was looking at the wrong place. Go
6 ahead, please.
7 Q Sure. So this sentence states,
8 "The floating vessel may have a surface
9 vessel control link selectively
10 connectible with the control module at
11 the first well-site and the control
12 module at a second well-site so that
13 control operations may be conducted for
14 both the first well-site and the second
15 well-site from either well-site."
16 Do you see that?
17 A Yes.
18 Q So is it fair to say that this
19 teaches that if you wanted to conduct
20 control operations at two well-sites, you
21 could connect a surface vessel control
22 link to the second well-site to conduct

operations at both the first and -- first and second site?

SCOTT BORDER: Objection. Form.

THE WITNESS: So are you just repeating what this is saying or are you asking something else?

I am reading this literally --

BY CHAD C. WALTERS:

Q Yes.

A -- it says there is control to the first well -- first well-site rather and control of operations in the second well-site.

BY CHAD C. WALTERS:

Q Yep.

So you would connect a surface vessel control link so that you could conduct operations at both the first and the second well-site; is that fair?

A Yes.

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Q This does not say that one control operation would occur at the first well-site while a second and different operation would occur at the second well-site; is that right?

A There is a second operation -- well, it says -- let me read again. "Selectively connectible with a control module at the first well-site and control module at the second well-site so that control operations may be conducted for both the first well-site and the second well-site from either well-site."

So I may not understood -- may not have understood the essence of your question.

Q Let me rephrase.

So you have a control link that is connected to both the first and the second well-sites?

A Yes.

Q And so what this is saying is

the control operation that goes to the control link is sent to both the first and second well-sites; is that fair?

A Yes.

Q So it does not say that one control operation would occur at the first well-site while a separate and different control operation would occur at the second well-site?

SCOTT BORDER: Objection. Form.

THE WITNESS: In this sentence it just explains that there's a capability for a centralized -- for control rather of both sides in the configuration that is discussed there.

BY CHAD C. WALTERS:

Q Okay. I would like to turn to paragraph 36 of Crossley.

A Paragraph 36, yes.

Q And perhaps it would be easier

if you just read this paragraph on your own.

A Yes. (Reviewing.) Okay.

Q Okay.

So in the middle of that paragraph there's a sentence that states, "This network enables control commands to be sent from the surface vessel through the surface vessel control link into a control module associated with a first offshore well-site, and then through the inter well-site control network to each control module associated with other offshore well-sites."

Do you see that?

A Yes.

Q Okay.

Then it states from there, "The control command is directed to a valve pump, line or sensor."

Do you see that?

A Yes.

Q So this teaches that the same control command is sent to each of the well-sites; is that right?

A It doesn't say that it's the same control command for all sites.

Q It does say, "The control command is directed to a valve pump, line or sensor."

A (Reviewing.) Well, it's the control command for each recipient well.

Let me read it again. (Reviewing.)

It says, "This network enables control commands to be sent from the surface vessel through the surface vessel control link."

That's line 4 and 5 of paragraph 36 so he's talking about commands.

Q Sentence says, "The control command is directed."

Do you see that?

A Well, it's for a valve, pump,

line or sensors. Each one of those, there's the control command, yes.

Q Okay.

There's not disclosure in Crossley that different control operations are conducted at each well-site at the same time; is that fair?

A As is stated here in this particular paragraph, each valve, pump, line or sensor, depending upon the desired controlled function, receives a control command. So he doesn't say that all of them receive the same command.

Q It doesn't say that a control command could be different for each well-site either; does it?

A I don't believe it states that this would be the same for all of them. It says commands. It's on line 4. It says, "Enables control commands."

It doesn't say a control command is sent to all of them.

"This network enables control commands." It's line 4.

Q Where does it say -- sure.

Where does it say that a different control command would be sent to each well-site?

A Well, it's sent -- it doesn't use the word "different" but it says, "This network enables control commands to be sent there to these various elements."

So it's commands that that are sent.

Q So you said it does not say that a different command is sent to each site?

A It says, "control commands" and those could be anything.

Q Okay.

The last sentence of that paragraph states that "The inner well-site control network thus provides a communication link between well-sites and may also include hydraulics, electrical

power and/or chemical distribution."

A Yes, sir.

Q Is it fair to say the control command described in paragraph 36 could include chemical distribution commands?

A The control network may be used for chemical distribution, yes.

Q Okay.

What is a collection manifold?

A Are you referring now to something else or in the same paragraph?

Q I'm sorry, not in the same paragraph.

I specifically would like to ask you about Crossley's collection manifolds.

A Okay. I want to answer this correctly.

I mean, in my mind a collection manifold is for production, for collection of production.

But are you referring to a

1 particular place in Crossley where the
2 term "collection manifold" is used so I
3 can answer that correctly?
4 Q I am not intending to but it is
5 used in paragraph 45, at least talks
6 about or introduces a tie-in to
7 collection manifold 115, 125, 135.
8 So my question is, what is the
9 purpose of Crossley's collection
10 manifolds?
11 A Crossley's -- again, which
12 exhibit to make sure I am in the right
13 one?
14 Q It's the same one we have been
15 looking at; 1005.
16 A Okay, 1005.
17 Again, what paragraph or what
18 place --
19 Q Paragraph 45.
20 A Paragraph 45. Give me just one
21 second. (Reviewing.)
22 Yeah, so in this context, the

collection manifold as explained in the next sentence says, "Production fluids from a well-site can be commingled for unitary transportation to another location."

So the collection manifold collects fluids -- production fluids.

Q Okay. I would like to go back to your declaration at paragraph 88.

In this paragraph you state that, As shown above -- in the annotated figure -- a POSITA would have understood such a configuration would direct a first stimulation fluid of Albers to flow to the first well and not to the second well. [As Read.]

Do you see that?

A Yes.

Q And then you have another annotated figure following that paragraph.

A On page 56, you mean?

Q Yes.
A Yes.
Q Exhibit page 57, yes.
A Page 57, yes.
Q Is it fair to say that -- so here you're talking about flowing stimulation fluid -- first fluid to one well and not to the second well. And then flowing a second stimulation fluid to the second well and not to the first well.
Right?
A Yeah.
Q That's not explicitly disclosed in Crossley, correct?
A As far as transportation of fluids is concerned, Crossley doesn't talk about stimulation fluids. Here he talks about delivery of fluids of -- different nature.
Q But Crossley doesn't talk about delivering any type of fluid to one well

and not to the second well while at the same time delivering another type of fluid to the second well and not to the first well?

A Crossley does talk about delivering fluids through the control network as we have already discussed.

He doesn't use that particular language because he doesn't talk about stimulation but he does talk about delivery of fluids adjusted from a central location.

Q I am not talking about stimulation fluids. I am talking about any type of fluids.

Crossley does not describe or discuss flowing one type of fluid to one well and not to another well while flowing a second type of fluid to the second well and not to the first well; is that fair?

SCOTT BORDER: Objection.

Form.

THE WITNESS: Doesn't -- I didn't recall whether he uses that particular language but he talks about controlling multiple wells and having control of fluids, transmission for multiple wells.

BY CHAD C. WALTERS:

Q Okay.

You start the paragraph by saying, "A POSITA would have understood that such a configuration would direct."

Right?

A Yes.

Q You are not citing to anything in Crossley that actually disclosed that --

SCOTT BORDER: Objection.

BY CHAD C. WALTERS:

Q -- that type of flow?

A I am -- in paragraph 88, I am trying to make the connection between the

language used in the limitation of '394 and make that connection with things described in Albers and Crossley.

So Albers is used to make the connection -- I mean, the stimulation fluids.

In Crossley it's used to explain there's central control that can deliver fluids to individual wells.

Q Crossley does not describe the configuration of any valves and their operation that would need to exist in order to flow a first fluid to a first well and not to a second well while simultaneously flowing a second fluid to the second well and not to the first well; is that right?

SCOTT BORDER: Objection. Form.

THE WITNESS: Crossley may not use that specific language but he certainly talks about valves

and he certainly talks about delivering fluids at various wells using central control.

BY CHAD C. WALTERS:

Q Does Crossley talk about particular configuration or number or type or placement of any of those valves?

SCOTT BORDER: Objection. Form.

THE WITNESS: Which valves in particular from '394 are you referring to?

BY CHAD C. WALTERS:

Q I am not referring to any valves of '394.

A So Crossley does talk about valves in various places needed to perform the standard function that the valve performs.

Q Does Crossley talk about what configuration of valves would be needed to flow a first fluid to a first well and

not to a second well while flowing a second well -- excuse me, a second fluid to the second well and not to the first well?

A Well, Crossley does talk about controlling multiple wells and he does talk about using valves to direct fluids where needed.

Q Where does Crossley specifically talk about the configuration of valves that would be needed from my previous question?

A So Crossley does talk about valves -- so he's talking about valves in paragraph 48.

And further down, paragraph 49, "Directing communication powers and/or fluids to subsea equipment. Control may be transmitted to valves, trees, et cetera."

So there are various places where Crossley talks about valves.

Q Does Crossley describe any configuration of any of its valves?

A Configuration of its valves, in what way --

(Simultaneous Crosstalk.)

-- in anyplace?

Q In any way?

A He says where needed, he uses the term "valves" several times in the document to explain these valves where they have a place, they can easily be put there as a standard piece of equipment.

Q You don't discuss in your declaration what valves would need to exist in Crossley for a first fluid to flow to a first well and not to a second well while a second fluid would flow to the second well and not to the first well; do you?

SCOTT BORDER: Objection. Form.

THE WITNESS: That is a

detail -- how you use valves to direct flow, that's a detail for a very standard piece of equipment that is used for the purpose.

BY CHAD C. WALTERS:

Q And you don't talk about in your declaration what control signals would be sent to those valves to enable that fluid flow, correct?

A That wasn't even the focus of this discussion.

Q Why not?

A These valves -- the discussion is whether you can have centralized control of this operation which is why the Crossley patent was used to indicate that indeed centralized control of these operations would be something that people have considered before.

Q Do the valves need to receive control signals?

A Valves need to be open or closed

depending on the situation so somehow there has to be a signal sent to them to let the valve do its function to the extent the human cannot be there to actually manually open or close that.

Q So earlier I asked you, you don't talk about in your declaration what control signals would be sent to those valves to enable the fluid flow we have been discussing, and you said that wasn't even the focus of this discussion.

So that's what puzzled me.

A Well, what kind of signal is sent to a valve wasn't the focus of that discussion.

To the extent that a valve actually can be -- various technologies, it can be hydraulic valve. It can be electric valve. It can receive signals in many ways. This is not what we are focusing on.

Q In both of these figures on just

before paragraph 88 and at the conclusion of 88, you have highlighted --

A In my declaration?

Q Yes, in your declaration.

A Okay.

Q -- you have highlighted the same control link 182 from the vessel to the manifold.

Do you see that?

A On what page again?

Q Exhibit page 56 and 57 of your declaration.

A Yes, I am highlighting again -- which one?

Q 182.

A 182, yes.

Q In both figures.

A 182 in both figures, yes. (Reviewing.)

Yes, I see that.

Q That control link continues to manifold 125 in the second figure which

is on exhibit page 57 of your declaration.

Do you see that?

A I have it on page 56. The one highlighted in green on 125?

Q Yes.

A Yeah, page 56, right.

Q Yes. So that same fluid that comes down control link 182 would go to both manifold 115 and manifold 125; is that right?

A There will be a connection, yes, between --

(Reporter Clarification.)

THE WITNESS: Between the surface and 125 as shown in that green line highlighted there.

BY CHAD C. WALTERS:

Q But the same fluid that comes down 182 that goes to manifold 115 would also go to manifold 125?

A There's an option -- there are

valves in 115 and 125 to direct fluids as needed.

Q Is it possible that manifold 125 would get a different fluid than the fluid coming down line 182 to manifold 115?

A 115 would get fluids that would be used in that collection of wells and manifold 125 would receive fluids that would be needed in that collection of wells.

So the first collection of wells is numbered 10 in the lower left-hand corner. The second collection of wells is number 20 below that schematic. So 115 and 125, we have the ability to receive whatever fluids they are supposed to receive.

Q 125 would get the fluid that flows down line 182; is that fair?

A Somehow -- somehow that fluid would have to flow down 182 along with

whatever other fluids are needed to be passed down to 115 and 125. And then a decision would be made or a valve would be activated to direct those fluids accordingly, either to the wells -- to each well, the collection number 10 or each well collection number 20.

Q Manifold 115 would also receive the fluid that flows down line 182; is that right?

A That fluid would be directed there, yes, and then it would have to be passed down to each well according to the decisions made.

Q I would like to turn to paragraph 79 of your declaration.

A Yes sir.

Q This describes an alternative theory that you have.

And at the last line of that page, it mentions a flowline jumper 116.

Do you see that?

A Yes.

Q What is a flowline jumper?

A It's a connection line, a short connection line, basically so that you can connect one spot with another spot and ensure continuous flow.

Q Just one second. I am trying to pull up my color version and I will have a color copy.

So in this paragraph -- it's 79 extending to the next page.

You state, "Alternatively Crossley discloses that each well-site includes a plurality of wells clustered together. Accordingly, any of the other wells at well-site 110, and their connection through flowline jumper 116 and associated tree, would alternatively disclose a second connection between a second well and the well operations factory."

Do you see that?

A Yes.
Q What is the second connection?
A What do you mean what is the meaning of the term second connection or what is the second connection?
Q No.
In this theory, what are you relying on as the second connection between a second well and a well operations factory?
A Yeah. So the '394 patent explains that you can deliver fluids to the first well and then you can deliver fluids separately to a second well.
And they explain, of course, that they use first, second just as a starting point in an operation that may include third, fourth, fifth well and so forth as they go further down in '394.
Now, in Crossley, as is explained in the declaration further down in paragraph 84, Crossley states that you

can have simultaneous control of operations from the central surface facility.

And then control lines, that's in paragraph 84, one, two, three, four, five, six, seven, eight -- eighth line, paragraph 84, it states -- we claim control lines also allowing for one or more power lines or chemical delivery lines to be delivered from the ocean surface, downward to the cluster wells. [As Read.]

And it continues to give details about the many of these aspects of this delivery.

So it's in this context that first, second well or subsequent wells may be accessed from the surface.

Q So my question is, what connection in Crossley are you reading as the second connection of limitation of 1(c)?

A So let me look at the declaration again to be more specific.

So paragraph 85 states -- Crossley explains, "The floating vessel may have a surface vessel control link selectively connectible with the control module at the first well-site and the control module of the second well-site so that control operations may be conducted for both the first well-site and the second well-site from either well-site."

Q This section that you are discussing is referring to limitation 1 --

(Reporter Clarification.)

CHAD C. WALTERS: -- D as in dog.

THE WITNESS: This is relevant to this discussion about accessing the first and second or third well.

BY CHAD C. WALTERS:

Q That's not my question.
My question centers on limitation 1(c) which appears on page 49 or exhibit page 50 of your declaration.
And that limitation states, "A second connection between a second well and the well operations factory."
A Yes. So there is connection between a first and a second well I just explained.
Q So in the theory where you're looking at a single well-site and multiple wells at the single well-site, so you illustrate that in green and pink and blue and yellow in the annotated figure?
A Yeah. You're on page 57?
Q No.
A My declaration, right.
Q No. I am on page 51, exhibit page 52.
A Oh yes, similar figure, yes.

Q Okay.

And the claim requires you to -- the claim requires a second connection between a second well and the well operations factory.

And in paragraph 79, you state, "Accordingly, any of the other well-sites at well-site 110 and their connection through flowline jumper 116 and associated tree would alternatively disclose a second connection between a second well and the well operations factory."

And my question is very specific. It is, what is -- what satisfies the second connection there?

A Yeah, there --

Q Is it the flowline jumper 116?

Is it the flowline jumper 116 plus the control line 182, or is it something else?

A Well, I will read again what I

have in paragraph 85, that uses Exhibit 1005, "The floating vessel may have a surface vessel control link selectively connectible with a control module at the first well-site and the control module at the second well-site so that control operations may be conducted for both the first well-site and the second well-site from either well-site."

So both are accessed and then fluids may further be channeled down to each well as desired.

Q The paragraph you just quoted from does not use the word "second connection," right?

A Yes.

Q But in paragraph 79, you state, "Any of the other well-sites at well-site 110 and their connection through flowline jumper 116 and associated tree, would alternatively disclose a second connection."

And so my question again is very specific.

What is -- what satisfies the second connection in that alternative theory?

A So we are in paragraph 79 again?

Q Yes.

A So from 115 -- yes, 116 (Reading) -- yeah, so from 115, as highlighted in the next page, you have various lines highlighted in different colors.

So each one is first -- let's say purple is first, green is second, blue is third and yellow is fourth.

Q What is the second connection?

A Take your numbering any way you want. If you want to start from purple this is one, then green is the second connection.

Q So if green is the second connection, what specific components are

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part of that second connection?
Is it 116 alone or is it 116 plus 182?
SCOTT BORDER: Objection. Form.
THE WITNESS: There is a connection between that well and the surface. Everything in between is in that connection.
BY CHAD C. WALTERS:
Q So the second connection is 182 plus 116?
A 182 plus 116 allows connection of that well with the surface.
Q And that is the second connection?
A You can call it the second connection. It's another connection.
Q I'm asking what you're calling the second connection in your read of Crossley onto the claim limitation?
A A second connection could be any

of the lines highlighted there in different colors.

Q So the second connection, you are saying it would be 116 plus 182 in green?

A Again, that would be a connection between the surface centralized control of the surface and that well, well 112, through the highlighted line.

Q The fluid that comes down line 182 would go to each of the wells at well-site 110?

A It would go wherever it would be needed as indicated there in these lines.

Q Could the blue well get a different fluid from 182 than the green well?

A Crossley states those can be handled per well.

Q Where does Crossley state that?

A In the paragraph I mention --

it's Exhibit 1005 -- paragraph 28 in the end, "Control operations may be conducted for both the first well-site and the second well-site, from either well-site."

Q We are talking about one well-site though, right, well-site -- well-site 110?

A Yeah, but what can be done in two well-sites can also be done in one.

Q I would like to look at Figure 4 of Crossley.

Are you familiar with this figure?

A Yes, sir. I am looking at it right now.

Q What diameter would a POSITA have understood line 420 to have?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I haven't thought about that.

BY CHAD C. WALTERS:

Q What is line 420?
A What is line 420? It's a line that enables control from the surface to everything underneath and it can convey -- it can transmit signals and fluids chemicals as described by Crossley.
Q Can you give me an estimated range of a diameter that a POSITA would expect this line 420 to have?
SCOTT BORDER: Objection. Form.
Objection. Outside the scope.
THE WITNESS: I haven't thought much about that. I would have to research this a little bit.
BY CHAD C. WALTERS:
Q What diameter would you expect line 428 to have?
SCOTT BORDER: Same

1 objection.
2 THE WITNESS: I would have to
3 research that again.
4 BY CHAD C. WALTERS:
5 Q What about line 428 prime?
6 SCOTT BORDER: Same
7 objection.
8 THE WITNESS: Same answer. I
9 would have to research that.
10 BY CHAD C. WALTERS:
11 Q Can you give me an estimated
12 range of a diameter that a POSITA would
13 expect lines 428 or line 428 prime to
14 have?
15 SCOTT BORDER: Objection.
16 Outside the scope.
17 THE WITNESS: Again, I would
18 have to research that to give an
19 informed answer.
20 BY CHAD C. WALTERS:
21 Q Are we talking on order of
22 inches?

SCOTT BORDER: Same objection.

THE WITNESS: Again, I would have to research that.

BY CHAD C. WALTERS:

Q You have no idea without -- without being able to research it?

A Well, Figure 4 shows the capability of delivering signals and fluids, and it's an instance of how this can be done.

So this capability is feasible according to that configuration shown there by Crossley and that's where I would leave things.

Q What do you mean that's where you would leave things?

A As far as estimating the size of that line.

Q You don't know if it would be beyond the order of inches of the diameter of lines 428 and 428 prime

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without having to do additional research?
A I would have to do some additional research to have an informed opinion and make sure that I don't use arbitrary numbers.
Q Could it be on the order of miles in diameter?
SCOTT BORDER: Objection. Outside the scope.
THE WITNESS: Whether miles in diameter, no, it would be completely unrealistic.
BY CHAD C. WALTERS:
Q Could it be on the order of yards in diameter?
SCOTT BORDER: Objection. Outside the scope.
THE WITNESS: Again, now we are getting into yards.
No. I would say my gut feeling is no. It would be orders of magnitude larger than what

would be reasonable.

BY CHAD C. WALTERS:

Q Could it be on the order of feet in diameter?

SCOTT BORDER: Same objection.

THE WITNESS: Now we are getting into territory which needs more careful consideration.

BY CHAD C. WALTERS:

Q So somewhere between inches and feet; is that fair?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I wouldn't confine it to anything specific.

The main reason again being that the Crossley shows this as an example. It says here is an example.

Let me see if I can read -- what is that thing -- the patent

(Reviewing.)

So it says in paragraph 50 of Exhibit 1005 that an exemplary integrated liner shown in Figure 4. So this is an example.

It shows this could be done this way. It could be done perhaps another way that might be different in the specifics but similar in the spirit of delivering that control of the signals and fluids.

BY CHAD C. WALTERS:

Q Would the diameter of lines 428 and 428 prime typically be different for production operations versus stimulation operations?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: Again, I would have to know more specifics to offer an informed opinion.

BY CHAD C. WALTERS:

Q What specifics do you need?

A Whatever is associated with the production operation and the stimulation operation, what those lines would be used for.

Q Okay.

So you can't tell me as a POSITA reading Crossley whether the diameter of lines 428 and 428 prime would need to be different for sending fracturing fluid versus sending chemicals used in production operations?

SCOTT BORDER: Objection, form. Foundation.

THE WITNESS: Again, I would have to know specifics. This could be anything.

BY CHAD C. WALTERS:

Q They might be the same for both stimulation operations and production operations?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I would need to know specifics again.

BY CHAD C. WALTERS:

Q Are the requirements for production operations and stimulation operations different?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: Requirements from what?

BY CHAD C. WALTERS:

Q In terms of size of fluid flowlines?

SCOTT BORDER: Same objection.

THE WITNESS: Size is selected in a rational way to accomplish a certain task so it depends on the particular task, particular design and so forth.

BY CHAD C. WALTERS:
Q Crossley shows that lines 428 and 428 prime flow together, correct?
A Let me get to that figure. Remind me again, if you will, on what page that is.
Q It's Figure 4.
A Figure 4, yes. I'm sorry, your question was one more time, please.
Q Crossley shows that lines 428 and 428 prime flow together?
SCOTT BORDER: Objection. Form.
THE WITNESS: It shows them in the same basic line.
BY CHAD C. WALTERS:
Q Crossley does not show that line 428 goes to one well and line 428 prime goes to another well; is that right?
A It basically shows that those two lines have the capability of having two separate flows.

Q But not two different wells?
A It doesn't -- it's not concerned with that.
It simply wants -- this figure simply wants to show capability of delivering multiple fluids. In this case they show three, 428, 428 prime, 428 double prime.
Q I would like to go to the text of Crossley at paragraph 50.
A 50, yes, sir.
Q In this paragraph it discusses 428 -- excuse me, Figure 4 and specifically lines 428 and 428 prime.
A Hm-hm.
Q At the top of the next page, staying in paragraph 50, Crossley states that, "Lines 428 and 428 prime are preserved for the delivery of chemicals such as hydrate inhibition fluids."
Do you see that?
A Yes.

Q So keeping that in mind, I would also like to go back to paragraph 33.
A In Crossley?
Q Yes.
A Yes. Hm-hm.
Q And towards the bottom of that paragraph, the second to last sentence --
A Hm-hm.
Q -- states, "Control operations may further include the injection of chemicals such as paraffin or wax inhibitors into flowlines."
A Yes.
Q I would like to look at paragraph 9.
A Paragraph 9, yes, sir.
Q Second to last sentence of that paragraph states, "Such operation lines may also provide electrical power, hydraulic fluid or production chemicals."
Do you see that?
A Yes.

Q So each of these sections is discussing production chemicals such as hydrate paraffin or wax inhibitors?

A Hm-hm.

Q What is the purpose of production chemicals such as hydrate paraffin or wax inhibitors?

A Yeah, so when you produce hydrocarbons, specifically when you produce oil, there is a possibility that you may have solids formed in the line that carries these fluids, oil in particular, from the bottom to the top.

What may happen is that the oil comes out hot -- actually, the oil comes out of the rock, I should say, at the bottom. And as it goes up, it cools off. So there is a chance that the flowlines may plug because, A, because of lower temperature you may have wax is formed, or, B, if you have in those lines, particularly if you are in low

temperatures, if you have the possibility of hydrate formation -- hydrates are methane trapped in water crystals basically. So if you have that possibility, your line will be plugged.

To prevent that, people inject chemicals that prevent -- that make sure that your flowline avoids this kind of plugging, either rocks formation or hydrate formation or anything that would impede flow.

Q These production chemicals such as hydrate paraffin wax inhibitors, they are not used in stimulation operations; are they?

A No.

Q Are they typically pumped at much lower pressures and rates than fracture stimulation fluids?

A Fracture stimulation fluids are pumped at pressure high enough to fracture the rock. There would be no

such need when you pump these chemicals to production line.

So is the pressure lower, yes, it will be typically lower.

Q Would the rates, the production chemical rates, for these -- strike that.

Would the rates at which these production chemicals were used be on the order of quarts per day?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I wouldn't recall numbers off the top of my head.

BY CHAD C. WALTERS:

Q Okay.

Would you be surprised if a POSITA said that for production operations, such as in Crossley, that production chemical rates would be on the order of quarts per day?

A Repeat that if you will again.

If the --

Q Sure. I am talking about the production chemical rates -- strike that.

I am talking about the pumping or use of production chemicals --

A Yes.

Q -- in production operations such as Crossley.

A Yes.

Q Would you be surprised if a POSITA said that that would be on the order of quarts per day?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I would have to look at the numbers again, the specific situation.

BY CHAD C. WALTERS:

Q You don't know if you would be surprised or not?

A Again, I wouldn't remember -- recall specific numbers off the top of my

head.

Q Okay.

Would you be surprised if one said that for -- strike that.

Would you be surprised that if a POSITA said that for stimulation operations, such as an Albers, that stimulation fluid flow rates would be on the order of barrels per minute?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: Again, I would have to see specifics.

Are you asking me about orders of magnitude or -- I am trying to make sure I answer your question in the best possible way.

BY CHAD C. WALTERS:

Q That's a fair point.

So are the rates for stimulation fluid flow orders of magnitude different than the rates you would expect for use

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of production chemicals and production operations?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: Overall, production chemicals are injected into the production line to quantities that would be sufficient to do the job.

Same thing for injection of pumping of fluids in the fracturing operation, that would have to be enough to do the job.

So could those be different, yeah, they could be different.

BY CHAD C. WALTERS:

Q Would the orders of magnitude be different?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: It depends on the situation.

I would have to know specifics --

(Simultaneous Crosstalk.)

BY CHAD C. WALTERS:

Q You brought up the term -- I'm sorry to --

A Go ahead.

Q You brought up the term "orders of magnitude" and I take it you did it for a certain reason.

So my question is, would a POSITA expect that the rates at which stimulation fluid would flow in a stimulation operation be orders of magnitude higher than the rates for flow of production chemicals and production operations?

A Overall, I can tell that injection of stimulation fluids -- the volume injected would be higher because the stimulation fluid would have to fill the well. So that stimulation fluid

fills the whole well.

Now, production fluid would have to be pumped and the production needs to continue. So the volume of the fluid injected during production clearly wouldn't fill the whole well.

Again, remember there's production. So the production fluids are filling the well.

Therefore, the volume of the injection, the production-related injection, would definitely be lower than the volume of the stimulation fluid in the well. Now, at what rates those would be pumped? That's another question that I have to look at more carefully.

It's one thing how much volume of something you use, and it's another at what rate you're pumping that volume.

Q So is it fair to say the volume of stimulation fluids used for stimulation operations is orders of

magnitude higher than the volume of production chemicals used in production operations?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I would say -- I would say definitely higher, yes.

So the volume of fluid used in the stimulation in fracturing would definitely be higher than the volume of fluids injected during production, yes.

Because in the first case stimulation, the fluid fills the whole well.

In the second -- and fractures.

In the second case, the chemicals injected are only part of the fluid. The rest of the fluid is the production.

BY CHAD C. WALTERS:

Q Got a couple of questions about the claims.

SCOTT BORDER: Is this a good time to break for lunch or is this on the same topic?

CHAD C. WALTERS: It's just a couple of -- I am trying to find a good stopping point and I think I have. If I got like five, 10 minutes top --

THE WITNESS: I'm perfectly fine with that.

CHAD C. WALTERS: Okay. Thank you.

BY CHAD C. WALTERS:

Q So Claim 1 of the '394 patent requires the first stimulation fluid and the second stimulation fluid to have different compositions?

A Okay.

Q Claim 1 also has this well

treatment operations factory which manufactures stimulation fluid?

A Indeed.

Q Would you agree that the well treatment operations factory of Claim 1 must be capable of manufacturing two different well-stimulation fluids?

A Yes, if two different fluids need to be injected, yeah, they have to be manufactured.

Q And turning to your declaration at paragraph 67, I am talking about your Crossley-Albers combination.

In your combination, the claimed first and second stimulation fluids are fluids manufactured using Albers' fractures stimulation equipment; is that right?

A Yes.

Q In order to simultaneously flow the first and second stimulation fluids as required by the claims, those fluids

would need to be manufactured simultaneously; is that right?

A Makes sense.

SCOTT BORDER: Objection. Outside the scope.

CHAD C. WALTERS: I am good with a break now. I think it is a good time.

SCOTT BORDER: Okay. Should we do a little bit longer one so people can get something to eat?

CHAD C. WALTERS: Absolutely.

THE WITNESS: Come back at 1?

CHAD C. WALTERS: That sounds good to me.

THE WITNESS: Okay. Fair enough.

SCOTT BORDER: One central. All right.

(Whereupon a Recess Commenced at 1:11 and Testimony Recommenced at 2:01.)

BY CHAD C. WALTERS:

Q Welcome back, Dr. Nikolaou.

A Thank you.

Q So do you have Exhibit 1010 available? Also just --

(Simultaneous Crosstalk.)

I'm sorry. Go ahead.

A Yeah, were you saying --

Q I also just sent it in the chat.

I tried to e-mail it to the court reporter last night. She may already have it. It was quite large so I got a bunch of e-mails bounced back so I included it in the chat as well.

A Okay. Let me open the file. Give me one second to open it on my big screened computer. Okay.

It's file 394, space, 1010.pdf. Right. It was in the chat.

Q Yes.

A Okay. And you also said open which exhibit?

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Q Just that one.
A That one. Okay.
Q That's Exhibit 1010.
A That's Exhibit 1010. Okay.
"The Fundamentals of Oil and Gas Industry for Beginners."
Q Yes.
A Okay. Very good.
Q You are familiar with this exhibit?
A Yes, we use that as a general reference for basic ideas for the oil and gas industry.
Q Okay. I would like to turn to exhibit page 95.
When I refer to exhibit page, I am referring to the exhibit label at the bottom of the page so I think this is actually page 86.
A Okay.
Q Would you agree production wells commonly require maintenance in order to

1 continue the production of oil and gas
2 over several years?
3 A Yes.
4 Q And the purpose of maintenance
5 is to enhance the productive efficiency
6 of the well?
7 A To maintain or enhance, yes.
8 Q And there are wide range of
9 maintenance activities that may be
10 performed on the productive well?
11 A True.
12 Q In this section on exhibit page
13 95 is a section titled, "Maintenance of
14 the Well."
15 Do you see that?
16 A Yes, 4.4.
17 Q Is it fair to say that some
18 maintenance activities may be major
19 activities and some might be minor or
20 routine?
21 A Yes.
22 Q And turning to exhibit page

97 --

A Yes, I am here.

Q So at the top of this page, this exhibit is talking about maintenance activities. And there's a small section called, "Pumping of the Well."

A Hm-hm.

Q And so it describes that one minor maintenance activity might be pumping hydrate and scale inhibitors.

A I am just reading that right now (Reviewing.)

Okay.

Q Do you agree that a minor maintenance activity would include pumping hydrate and scale inhibitors?

A As described here, yes.

Q Okay.

Do you agree this is describing the state of the art as of 2005?

A When this book published.

Q I think it was published after

2005?

A Okay. Then it's fair to say it contains state of the art as of 2005.

Q The hydrate and scale inhibitors, those prevent buildup and ensure smooth flow of oil and gas to the well?

A Hm-hm.

Q Would an example of a major maintenance activity at a producing well be to replace the production casing?

A Replacing the casing, yeah, it would be -- of course, if there's major or minor it may be relevant but it would take substantial work, yes. I would definitely accept that.

Q Okay. I would like to move to page 102, exhibit page 102.

Is it fair to say that during the productive life of a well, it's possible that the formation loses its permeability?

A It may lose its permeability, yes, because of accumulation of debris and other things, yes.

Q And when that happens, less oil and gas is produced, right?

A Yeah, particularly in combination with the pressure being lowered.

Q Okay.

In order to increase the permeability of the well at that stage, reservoir stimulation is required?

A That's an option, yes.

Q And that is described on exhibit page 102 of Exhibit 1010?

A Reservoir simulation -- it actually says reservoir stimulation.

Is that a typo?

Q It may be.

A It's definitely a typo.

I am reading the third line. It says, To improve its productivity are

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called reservoir simulation -- they mean stimulation. It's a common typo.

Let's agree to interpret this as stimulation.

Q And moving to exhibit page 103 --

A Yes.

Q -- you see that reservoir stimulation includes acid fracturing?

A That's one way to do stimulation in rocks that are sensitive to acid such as carbonation rocks.

Q Acid fracturing is simply pumping 15 percent hydrochloric acid solution into a wellbore?

A Yes. Well, I don't know about the specifics because those may vary.

I guess in general you pumping acid is strong enough to eat up the rock and create those dendrites inside the rocks for the hydrocarbons to flow out.

Q For acid fracturing, you

essentially need the 15 percent hydrochloric acid solution in a pump; is that fair?

A Yes, that's indicated there. You need to deliver that solution downhole basically.

Q Reservoir stimulation also includes hydraulic fracturing?

A Correct.

Q And this involves pumping liquid, usually water containing chemicals and proppant down a wellbore at a very high pressure?

A Yes.

Q You would agree hydraulic fracturing is more complicated than acid fracturing?

A Complicated. I will have to think a little bit about that, but both have their challenges.

In what way would you say complicated?

For example, could it be that may be less predictable and may need more tweaking or involves additional -- one involves additional equipment compared to the other or is there something specific you have in mind?

Q Sure.

As an example, hydraulic fracturing certainly involves more equipment than acid fracturing, right?

A Acid fracturing involves the pumps that will pump the solution down, mixing tanks for the solution to be formed at the right acidity. And then you have to make sure that it is delivered where it is supposed to be delivered and go from there.

The hydraulic fracturing, we have the issue of creating a fracture, creating again the slurry, pumping the slurry down and through pressure to open up the fractures.

Essentially the -- what the acid does or acid fracturing, the increased pressure does for hydraulic fracturing.

In both cases, they open up the rock.

In acid fracturing, it's by chemical means.

In hydraulic fracturing, it's by mechanical means.

Q The hydraulic fracturing requires more equipment than acid fracturing?

A I would have to check that to be perfectly honest with you.

Q Hydraulic fracturing requires proppant, is that right?

A It does, yes. Yes.

Q It requires a high pressure pump?

A It does.

Q It requires a blender?

A It does.

Q Those aren't required of acid fracturing?

A The high pressure pump is not a necessity because you don't rely on high pressure to deliver this. Absolutely. You just have to prepare the solution and then send it downstream --

Q Okay.

A -- downhole rather.

Q Reservoir stimulation would also include the fracture stimulation that's disclosed in Albers that uses carbon dioxide and hydrogen; is that fair?

A Yes.

Q So is it fair to say the fracture stimulation of Albers is more complicated than acid fracturing?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I will have to check all the details.

BY CHAD C. WALTERS:

Q Certainly requires more equipment than acid fracturing?
A Yes.
SCOTT BORDER: Same objection.
BY CHAD C. WALTERS:
Q Okay. I would like to turn back to Crossley.
A Hm-hm.
Q We can look at Crossley perhaps with your declaration or not. It's up to you.
I want to -- you can figure out what you would like to look at but do you recall Crossley discloses both an operations control system and an intervention system?
A Yes, I do.
Q And you relied on Crossley's operations control system 180 in your invalidity analysis; is that right?
A Yeah, the control system that

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can deliver signals and fluids.

Q You did not rely on Crossley's intervention system; is that right?

A I didn't separate the two to be honest with you because the system, as explained in Crossley, could be used for both. So intervention basically has to do with the fact that there is already a well that may have been producing and then you need to do something to it because it needs fixing or you -- there is an incentive to improve production or something of that nature.

Q Okay.

Can you look at the abstract of Crossley on the first page, the title page?

A Yes. (Reviewing.)

Q You see in the middle, three lines down, there's a sentence that starts, "The system also comprises two separate systems. One, an operations

control system."

And then it says, "Two, an intervention system."

A Hm-hm.

Q So Crossley itself separates the systems, right?

SCOTT BORDER: Objection, foundation.

THE WITNESS: The idea is that for both one and two there can be a central control that can deliver the operations controller interventions -- intervention services with control from a central location.

BY CHAD C. WALTERS:

Q But you would agree that Crossley describes those two systems, the operations control system and the intervention system as separate systems?

A In the way it is formed -- as stated in the abstract, yes, it's an

operations system that has the operations control and intervention system that has intervention services for workover and maintenance.

Q You rely on the intervention system in your invalidity analysis?

SCOTT BORDER: Objection. Form.

THE WITNESS: Is there a specific place in the declaration where we discuss about intervention that is a concern or -- what exactly are you suggesting here?

BY CHAD C. WALTERS:

Q I think you mentioned Crossley's intervention system one time with respect to a dependent claim.

But for the independent claims, you have zero discussion of Crossley's intervention system, such as what it is or what it does.

My question is whether -- why that was the case and whether you thought that Crossley's intervention system was not relevant to the claims of the '394 patent?

SCOTT BORDER: Objection. Form.

THE WITNESS: Well, this is because the operations control system provides the idea of having a central unit for control of operations of multiple wells from a central location.

That was the element that was most relevant, particularly in combination with Albers' teachings about fracturing for the discussion in the declaration.

BY CHAD C. WALTERS:

Q Crossley describes its intervention system at paragraphs 53 to 56.

A 53 to 56, yes.
Q Do you have the Patent Owner Preliminary Response available to you?
A Which exhibit would that be?
Q It's not an exhibit. It's Paper number 6. If you don't have it, I could link it in the chat.
A Yes, please.
Q Okay.
A Would you like me to open the file?
Q Sure. Thank you.
A Yes, I have it in front of me.
Q I would like to look at page 9.
A Page 9, yes.
Q And this page, page 9 of the Patent Owner Preliminary Response includes an annotated figure that shows Crossley's intervention system in red and Crossley's operation control system in blue.
A Hm-hm.

Q Do you agree that what is shown in red is the intervention system?

A I will have to check again the numbers but I can take your assertion this is in indeed the intervention system.

Q I just want to make sure you agree with that.

Like I said, Crossley describes the intervention system at paragraphs 53 to 56 so you're welcome to look at those sections --

(Simultaneous Crosstalk.)

A Give me one second for a quick check.

Q Sure.

A (Reviewing.)

Yeah. Okay, yeah, 170 is clearly indicated to be the intervention system, yes.

Q What is shown in blue on that figure is the operations control

system --

(Simultaneous Crosstalk.)

A Yes.

Q Is that right?

A Yeah. Yes.

Q Looking at -- I would like to turn to paragraph 37 of Crossley.

A (Reviewing.)

Q In the middle of this paragraph, Crossley describes minor interventions.

Do you see that?

A Hm-hm. Yes.

Q One of the minor interventions that Crossley identifies as an example the injection of acid and other treating fluids and the like.

A Yeah.

Q We discussed earlier with respect to Exhibit 1010 that acid is used in acid fracturing?

A Yes, acid is used in acid fracturing. That's correct.

Q Which is a reservoir stimulation process, correct?
A Correct.
Q Wouldn't a POSITA have understood that Crossley's intervention system would be used for reservoir stimulation?
SCOTT BORDER: Objection. Outside the scope.
THE WITNESS: I haven't thought about that.
BY CHAD C. WALTERS:
Q Crossley's intervention system would be used for acid fracturing, correct? That's what Crossley says.
A For injection of acid in general.
Q That's what is done in acid fracturing?
A In acid fracturing you include acid in what you inject, yes.
Q Acid fracturing is a type of

reservoir stimulation?
A It is indeed.
Q I would like to look at paragraph 10 of Crossley.
A Yes.
Q The second sentence states, "The intervention system is placed on board the floating vessel for conducting intervention services to an individual well."
A Yes.
Q Why do you think Crossley describes its intervention system as conducting intervention services only to an individual well?
SCOTT BORDER: Objection. Outside the scope.
THE WITNESS: That is the language he uses.
BY CHAD C. WALTERS:
Q Do you have any thoughts as to why Crossley limits its intervention

system to a single well?

A That's how he chooses to explain what the system does.

Q Any thoughts as to why Crossley does not describe the intervention system as applying to multiple wells --

SCOTT BORDER: Objection to scope.

BY CHAD C. WALTERS:

Q -- at the time?

A I have not considered that.

Q I would like to turn back to your declaration, specifically at paragraph 132.

A Yes.

Q Let me ask one of my previous questions earlier. I don't think counsel -- I think I let my question linger while he was objecting.

My question was, any thoughts as to why Crossley does not describe the intervention system as applying to

multiple wells at a time?

SCOTT BORDER: Objection.

Outside the scope.

THE WITNESS: I haven't

considered that.

Crossley basically says that

the intervention system can access

any single well.

I don't use my own language

but it's described specifically in

the passage we just looked at.

BY CHAD C. WALTERS:

Q Could it be the reason -- could

the reason that Crossley limits its

intervention system to an individual well

be because the production lines described

in the operations system that applied to

multiple well-sites would not have the

right configuration to be able to

withstand the higher rates and pressures

required of stimulation in an

intervention system?

SCOTT BORDER: Objection, form. Outside the scope.

THE WITNESS: I haven't considered that question.

BY CHAD C. WALTERS:

Q Does that sound like a reasonable explanation?

SCOTT BORDER: Objection. Outside the scope.

THE WITNESS: I will have to think carefully about that.

BY CHAD C. WALTERS:

Q You can't say right now whether that sounds like a reasonable or unreasonable explanation?

SCOTT BORDER: Same objection.

THE WITNESS: I will have to think carefully before I offer an informed opinion.

BY CHAD C. WALTERS:

Q Is there anything wrong with the

explanation technically?

SCOTT BORDER: Same objection.

Sorry. Same objection.

THE WITNESS: Again, I would have to make sure I have thought about this before I answer.

BY CHAD C. WALTERS:

Q You can't give an answer, correct?

A I'm sorry?

Q You cannot give me an answer to the question; is that right?

A I have to think about this first before I give an informed answer to that.

Q I would like to turn to paragraph 132 of your declaration.

A 132. (Reviewing.) Yes.

Q Paragraph 132 is in the section where you address Dependent Claim 11.

You see that?

A Paragraph 132 you said?

Q Yes.
A Yes, sir. I see that.
Q And Claim 11 depends on Claim 10?
A Yes.
Q My question is whether Claim 11 is describing fluid flowback?
A Let me go back and read Claim 11. Can I have a second?
Q Yeah. Sure. You might want to read it in the context of Claim 10 as well.
A Yes, so let me go to the patent itself.
Q Your declaration actually on those pages we were looking at in the previous page show the language of Claims 10 and 11, if you want to look there too.
A Sure. (Reviewing.)
Yeah, so what about Claims 10 and 11 again?
Q So is it fair to say it's

talking about fluid flowback from the well to the manifold?

A It's talking about flow to the well -- sorry -- (Reviewing.) -- from the first well, yes, to the manifold.

Q The only fluid that Crossley describes as being flowed back --

A Hm-hm.

Q -- so from the well is production fluid; is that right?

A Indeed, Crossley is not concerning the stimulation explicitly.

Q Production fluid is not the same as the stimulation fluid?

A Production fluid is mainly hydrocarbons unless you have very high water content.

So there are wells that may be above 90 percent, 95 percent, 99 percent even water, but the rest is hydrocarbon. In general, that's a coincidence.

Overall, I would say that the

injection stimulation -- I mean, fracturing fluids are designed to have certain properties.

Production fluids are what they are from the well, and the two have the respective properties as I explained.

Q In paragraph 135, so we are still talking about Claim 11, you state, "A POSITA would also had been motivated to modify the Crossley-Albers system to include a flowback and reuse system to accommodate flowback of stimulation fluids."

Is that right?

A Yes.

Q And you rely on the Lehman reference, Exhibit 1009 to support that modification.

A First of all, I am relying on the general idea of how hydraulic fracturing works.

You inject the fluid and then

you pick it back up so that you can let the hydrocarbons be produced in the production line. So it's currently a standard feature, you inject and then you flow it back.

Q So you are not suggesting that anything in particular from Lehman would need to be used in Crossley's system to add a flowback and reuse system?

SCOTT BORDER: Objection, foundation.

THE WITNESS: So help me understand again what you're focusing on.

Are you referring to what Lehman describes and we cite it in the declaration or are you asking in general whether flowback line would be needed or whether we -- that would be conceived of by a POSITA or any of the above?

BY CHAD C. WALTERS:

Q So I'm asking about your particular combination that relies on Crossley and Albers.

And with respect to this claim, you relied on the Lehman reference, Exhibit 1009.

And in response to my question a few questions ago, you said you're relying on the general idea of how hydraulic fracturing works.

And what I am wondering is, in paragraph 135 you state that a POSITA would have been motivated to modify Crossley-Albers system to include a flowback and reuse system.

And my question is, is that flowback and reuse system coming from Lehman that you would add to Crossley-Albers system?

A Lehman is as a corroborating evidence, for example, use the passage at the bottom of page -- paragraph 135.

During the fracturing treatment, typically the well is shut in and then reopened, whereupon at least part of the fracturing fluid in the fracture is forced out by the fracture closure pressure.

So it's -- it's a fairly standard step of hydraulic fracturing.

Mainly as I explained a moment ago, you inject, you pressurize the injected fluid. And then after that, you pick back up whatever you can so that you can leave space for the production fluids.

Q Are you proposing to add any particular component or equipment from Lehman to the Crossley-Albers system so that you would include a flowback and reuse system?

SCOTT BORDER: Objection. Form.

THE WITNESS: I am saying

that this -- the flowback part would be in a standard part of how hydraulic fracturing is done as explained also in Albers --

(Simultaneous Crosstalk.)

Perhaps the element that Lehman also uses is their reuse of the water because that water contains expensive chemicals and other materials.

So paragraph 135 states that, "POSITA would also had been motivated to modify the Crossley-Albers system to include the flowback and reuse system because it is well known in the art that well-stimulation fluids can be recovered and reused from a prior" --

(Reporter Clarification.)

THE WITNESS: -- "from a prior treatment."

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BY CHAD C. WALTERS:

Q You don't describe the flowback and reuse system that would be added to Crossley-Albers system in your declaration, right?

A I am saying that there would be motivation to have such a system and that would be well understood for the reasons that are explained in 135, mainly to reuse fracturing fluid.

Q And you don't talk about how one would incorporate such a flowback and reuse system into your Crossley-Albers combination, right?

A I didn't go through that -- this is a standard and there is enough discussion of that in Lehman.

Q Can we look at Lehman Exhibit 1009 a bit?

A Certainly. Okay. I am there.

Q Specifically paragraph 5.

A (Reviewing.) The paragraph that

starts, "The fracturing fluids utilized,"
et cetera?
Q Yes.
So in paragraph 5 at that
sentence it talks about using water-based
liquids as the fracturing fluid.
Do you see that?
A Hm-hm. Yes.
Q Okay. I would like to turn to
paragraph 79.
A Of Lehman as well?
Q Yes.
A Okay. 79. Yes.
Q Is it fair at paragraph 79
Lehman discusses a foam-based fracturing
fluid?
A Let me read that real quickly
(Reviewing.) Yes.
Q One reason Lehman wants to
recover its treatment fluids is because
they are expensive; is that right?
A Yes.

Q Okay. I would like to turn back to Albers now, Exhibit 1006.
A Yes.
Q Specifically at column 1, line 6 to 12.
A 6 to 12, yes.
Q Here Albers is talking about, like we just saw in Lehman, a water-based fracturing fluid.
Do you see that?
A Yes.
Q Okay. This is in the background section of Albers.
And staying in the background section, if you go down to line 22, Albers discusses that another prior art technique involves using foam, using a foam-based fracturing fluid.
Do you see that?
A Yes.
Q And in lines 37 to 38, Albers states, "A more recent development

involves the use of gaseous nitrogen alone as a fracturing agent."

Do you see that?

A Yes.

Q And then at lines 52, Albers states that, "Although gaseous nitrogen has many advantages over traditional water-based and foam-based fracturing, there exists a need for a gaseous nitrogen fracturing technique that includes a simultaneous placement of an effective amount of profit within the fracturing formation surrounding the wellbore."

Do you see that?

A Yes.

Q It's fair to say Albers' system uses a gaseous nitrogen fracturing technique instead of the water or foam-based techniques used in Lehman?

A Yes.

Q Okay. I would like to turn to

paragraph 113.

A (Reviewing.) Paragraph 113 --

Q I'm sorry, of your declaration. Thank you.

A Sure. Yes.

Q This paragraph is in the context of your analysis of Dependent Claim 6?

A Hm-hm. Yes.

Q And Claim 6 requires a power unit operable to connect to the manifold, pumping grid, blending unit, the proppant storage system, the first well and the second well.

Do you see that?

A Yes.

Q In paragraph 113 you rely on Crossley's vessel and its power delivery system for the power unit of Claim 6?

A Yes.

Q Crossley does not disclose a blending unit or a proppant storage system; does it?

A Crossley is not concerned with fracturing operations, therefore, he doesn't include the proppant system or blending with proppant.

Q Would Crossley's power delivery system have sufficient power to power Crossley's components in addition to a blending unit and a proppant storage system?

A I would have to think about that.

Q You don't know either way?

A Well, power systems are designed to deliver the power required for a certain operation and it's something fairly standard. So how much that fairly standard amount of power would be, I would have to think about.

Q You didn't explain that in your declaration, correct?

A Because it's fairly standard.

Q Okay. I would like to move to

paragraph 120 which discusses Dependent Claim 8.

So Dependent Claim 8 states, "Where in the well operations factory comprises a chemical storage system where in the chemical storage system is operable to connect to the blending unit."

Do you see that?

A Hm-hm.

Q You're relying on Albers' fluid storage device for the chemical storage system?

A (Reviewing.) Where are you reading now?

Q Paragraph 120.

A What part of it?

Q The first sentence, it appears to me, you're relying on Albers' fluid storage devices for the claims chemical storage system of Dependent Claim 8.

A Hm-hm. So provide fluids to the

blender. Okay.

Q Is it fair that the fluid storage devices of Albers contain water with chemicals mixed in?

A Let me check again to see the full gamut of this.

Q You can look at the top of the next page of your declaration.

A The next page is 69, Dependent Claim 10?

Q Yes -- well, no, the page where in the middle it addresses Claim 9 --

A (Reviewing.

Q So my question is about what Albers' fluid storage device contains.

A I will have to check for a moment into the specifics of Albers to make sure I don't misspeak, but the basic idea is that Albers injects -- he's using chemicals and he delivers a fracturing fluid with proppant so he needs to somehow put together all that. And to do

that, he picks up materials from various storage places and he blends them so that he can deliver that fluid.

And I can look at Albers to see details, if necessary.

Q At the top of this page, exhibit page 69, page 68 at the bottom of the page, you state, "Further, Albers discloses that these stored fluids may be various chemicals such as clay-stabilized or gelled water, a methanol water or hydrocarbon-based fluid."

Do you see that?

A Yes.

Q So my question was, Albers' fluid storage device contains waters with chemicals mixed in; is that right?

A Let me check again to see what that particular -- (Reading) -- okay.

So I see that's stated in Section 120 of my declaration. The sentence before the last, that is

quoting, "The fluid storage device contains an uncomplexed fluid," et cetera, to the end of this sentence; is that what you are referring to?

Q Yeah, so I will just reset here.

Dependent Claim 8 requires a chemical storage system.

A Yes.

Q Okay. In paragraph 120 in the first sentence, you rely on Albers' fluid storage devices as the chemical storage system.

Do you see that?

A Yes.

Q Okay.

And then as we just discussed, the fluid storage devices of Albers contain water with chemicals mixed in; is that fair?

A Let me check with Albers again to be 100 percent sure. That's what I see in the declaration.

But to be a hundred percent sure -- (Reviewing.)

Yes, it is fair.

Summary of the invention, paragraph 2 in Albers, he says, "In the first embodiment of the present invention, a blender unit draws fluid from a fluid storage device, draws proppant from a sand trailer, and mixes the two in a blender tub to form a slurry."

He goes on to talk about storage and blending further down. Yes.

Q So Albers' fluid storage device that you are relying on in Claim 8 for the chemical storage system contains water with chemicals mixed in?

A Let me see what it contains. (Reviewing.)

Yeah, so I see column 4, lines 54 and 55 in the first embodiment of the method of the present invention. "The

fluid storage device contains an uncomplexed fluid, which in this embodiment is preferably clay-stabilizer or gelled water but can be any suitable fluid including a methanol water or a hydrocarbon-based fluid."

Q Let me ask the question a different way.

So for the chemical storage system of Claim 8, you are not relying on any separate storage system in Albers that contains chemicals before they are mixed with water?

A I don't believe I am even making that distinction.

Q I'm asking about that distinction.

It appears to me that for the chemical storage system of Claim 8, you're relying on Albers' fluid storage devices, and Albers and you describe those fluid storage devices as containing

water with chemicals mixed in. And so --

(Simultaneous Crosstalk.)

Go ahead.

A Yeah, Albers, again, mentions these things just for completeness but he explains, for example, 954, that can be any suitable fluid.

Q In your declaration, you don't point to any chemical storage system of Albers that contains chemicals before they are mixed with water to satisfy the chemical storage system requirement for Claim 8; is that fair?

A That, again, is an issue of semantics. So is clay-stabilized or gelled water, a chemical or not? It's not just pure water.

Q I would -- I would surmise that it's water -- it's chemicals mixed with water.

A Okay. That's not unfair.

But again, I considered that

issue to be secondary importance of the most since it certainly has to do with how you prepare the fluid to inject, how you store the materials needed for preparing that fluid.

So that's a decision based on whatever makes the most sense given the fluids that you have to prepare.

It's in that spirit that Albers explains how you prepare these fluids, using whatever storage and blending requirements needed.

Q I would like to turn to paragraph 158 of your declaration.

A Based on these disclosures, et cetera.

Q Yes. Yes.

And in this paragraph you address Dependent Claim 16.

When you say based on these disclosures in paragraph 158, are you referring to the disclosures that you

quote in paragraph 157 just above it?

A Yeah.

Q You quote in paragraph 157 -- you quote -- you have quotes from paragraph 44 -- and actually, I will rephrase that.

In paragraph 157, you quote paragraph 44 of Crossley twice. You see that?

The sentence starts, "It is also understood."

A Yes.

Q Okay.

That sentence says, "It is also understood that one or more strings of production tubing are provided in the wellbore of each well, 112, 122, 132, to provide a flow path for production fluids from the wellhead."

A It says to the wellhead. Yes. I see that.

Q Okay.

That sentence only discloses a singular flow path from a well to the manifold; is that fair?

A Let me see. (Reviewing.)

So it says, "One or more strings of production tubing are provided in the wellbore for each well to provide a flow path for production fluids to the wellhead." It gives numbers 112, 122, 132.

I need to go back and check all these to refresh my memory. (Reviewing.)

Okay. Are you with me or --

Q I am here.

Are you -- I thought you were checking --

(Simultaneous Crosstalk.)

A I'm sorry, my apologies. I misunderstood.

Q Okay.

My question is, so this talks about one or more strings provided in

each wellbore or in the wellbore of each well --

A Hm-hm.

Q -- to provide a flow path for production fluids. At one point -- the quote is to the wellhead.

Do you see that?

A Hm-hm. Yeah.

Q Okay.

And then from the wellhead to the manifolds is a jumper line --

A Yes.

Q -- flowline jumper?

A Hm-hm.

Q So my question is, these disclosures only describe for each well a singular flow path from the well to the manifold?

A So each well has a jumper line to the manifold. That's shown in Figure 1, yes.

Q And each well has a singular

flow path that includes one or more strings of production tubing, correct?

A That's what is stated there.

Q So it's fair to say that these disclosures only disclose a singular flow path from the well to the manifold?

A Well, the flow path is the -- is essentially what the tubing allows you to deliver. Tubing may assess -- may access rather -- different layers of the reservoir from which you are going to produce. So each one of those tubing lines can essentially go to the top and then from there through the jumper to the main manifold -- to the manifold.

Q But these disclosures that you quote only describe the strings of production tubing as forming or providing a flow path, so one flow path?

A Let me see the exact language (Reviewing.)

It was in paragraph 44, right?

Q Yes.
A (Reviewing.) Yeah, it's to the wellhead.
Q A singular flow path from the well to the manifold.
A (Reviewing.)
Yes, as stated there, in paragraph 44, there is no details given but it says that one or more strings of production tubing are provided in the wellbore before each well to provide a flow path for production to the wellhead.
That goes to the wellhead and from that point on, there's no discussion as to what happens in the jumper from there to the manifold.
Q Flowline jumper is just a short connection line, correct?
A That's correct, yes.
Q And it's fair to say that the strings of production in each well only extend to the wellhead, they do not

connect to the manifold directly based on Crossley's disclosure?

A Yeah, Crossley clearly says here there's a flow path for production fluids to the wellhead.

Q And then a jumper line between the wellhead and the manifold?

A He doesn't mention anything here so here he leaves that open.

Q But in the figure, it describes a jumper line between the wellhead and the manifold?

A The jumper line, but he doesn't show the multiple tubings in that figure either.

He uses just general single lines to indicate the well and the line.

There are multiple tubing in the wellhead he doesn't show in that figure.

Q Crossley's collection manifold is not located on a boat; is that fair?

A You are referring to that

manifold at the bottom, right?

Q Yes.

A Yes, at the bottom of the sea, yes.

Q I would like to look at paragraph 45 of Crossley.

A Yes. (Reviewing.)

Q This paragraph is describing the flowline jumpers.

And it states that they -- "For each respective well-site, they tie into a collection manifold."

And it states, "In this way, production fluids from a well-site can be commingled for unitary transportation to another location, such as a gathering facility seen at 190 in Figure 5."

Do you see that?

A Let me go to Figure 5 also (Reviewing.)

Yes.

Q Figure 5 of Crossley shows the

gathering facility at the surface?
A The 190, you mean?
Q Yes. That's what Crossley describes is the gathering facility, correct?
A Of the surface, yes.
Q And there's a single line going up to the surface to the gathering facility?
A You are referring to line 144, right?
Q Yes.
A Yes, I see it.
Q So if one was going to relocate the collection manifold to the boat, it would require multiple flowlines going up to the surface, correct?
A Repeat that, please. If one was to do what with the boat?
Q Relocate the collection manifold to the boat, it would require multiple flowlines going up to the surface?

A You mean the collection manifold say 115 in Figure 1?

Q Yes. Or 125.

A Or 125, yes, (Reviewing.)

I haven't thought about that. It's logical the collection manifolds are where they are, 115 and 125.

Q You wouldn't want to put them on the boat?

A I haven't thought about that.

Q You haven't thought about locating Crossley's manifold on a boat?

A That wasn't something that I understood I had to look into.

Q Okay.

CHAD C. WALTERS: I think I am done, but if we could take 5 minutes.

SCOTT BORDER: Sure.

THE WITNESS: Yeah, certainly.

(Whereupon a Recess Commenced

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at 3:14 and Testimony Recommenced at 3:21.)

BY CHAD C. WALTERS:

Q Dr. Nikolaou, I have a couple more questions.

A Go ahead, please.

Q In production operations, a site typically has a manifold to deliver production chemicals; is that fair?

A Well, there is delivery production chemicals. You are referring to an offshore platform that uses a manifold to deliver those.

Q Offshore or onshore?

A It depends but that's a possibility.

Q Okay.

And stimulation operations, you typically have a manifold used to deliver stimulation fluids?

A Yes, that's fair also.

Q Would a POSITA understand the

same manifold could be used for both stimulation operations and production operations?

A The role of manifold is essentially to integrate the circuitry of valves and pipes in a way that is convenient in one place, easy to control, easy to understand, check and all that so that the flow is channeled correctly to the right pipe at the right time.

So to the extent that need would exist, either in production operations or in fracturing operations, a manifold could be used for the purpose -- anyplace where it would make sense.

Q So would a POSITA understand that you could use the same manifold for both stimulation operations and production operations?

A The same as -- the same actual piece or the same design?

Q The same piece.

A The same piece. Well, production equipment and fracturing equipment are used for different purposes so I don't know if that would be the best use of equipment.

Q What about the same design?

A Same story. Although design is usually for the purpose, so if one would fit for both purposes, it may do the job. But this again is fairly standard issue that is addressed based on the particular situation using standard guidelines.

CHAD D. WALTERS: I will pass the witness. I don't have further questions.

SCOTT BORDER: I don't have any questions.

CHAD C. WALTERS: So I think we are done.

Thank you for your time, Dr. Nikolaou.

THE WITNESS: Thank you all

and thank you --

CHAD C. WALTERS: Just hold on one second.

See if she has any questions on references or anything and I have just one comment, Dr. Nikolaou.

THE REPORTER: I am good.

CHAD C. WALTERS: We are good. Okay.

So I know we have another deposition scheduled in July --

THE WITNESS: In July.

CHAD C. WALTERS: You are going to be in Greece?

THE WITNESS: That's correct, yes.

CHAD C. WALTERS: Okay.

So I am happy to work through whatever schedule you have got. I mean, schedule it early in the morning, our time, so when you

figure out -- when you guys figure out what makes sense for you guys. Just let us know and we will work something out here over the next couple of weeks.

SCOTT BORDER: That's great, Chad. Thanks.

THE WITNESS: I really appreciate that.

The good coincidence is the timing is favorable. It's 8 hours difference -- actually, with East Coast, it's 7 hours difference which is even nicer. So 8 or 9:00 a.m. East Coast time is early afternoon which is siesta time in Greece. I can use that to do some work. And by the time we are done, everybody is going to be ready to go out so I will go out with them.

CHAD C. WALTERS: Sure. Let

us know what works and we appreciate you being able to do it then as well. I know it's not the most convenient but it's certainly helpful for us to push it to July.

THE WITNESS: I appreciate your flexibility too.

(Concluded 3:25 p.m.)

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

STATE OF _____

COUNTY OF _____

I, the undersigned, hereby certify that I have read the transcript of my testimony taken under oath in my deposition; that the transcript is a true and complete and correct record of my testimony, and that the answers on the record as given by me are true and correct.

_____

DR. MICHAEL NIKOLAOU

Signed and subscribed to before me this _____ day of _____,

20__.

_____

Notary Public

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I, S. Arielle Santos, CSR, CLR, do hereby certify:

That prior to being examined, the witness named in the forgoing deposition, was by me duly affirmed remotely under order SC of FL No. AOSC20-23 Amendment 4 (II)(C)(2) to testify the truth, the whole truth, and nothing but the truth.

That said deposition was taken before me at the time and place set forth and was taken down by me in shorthand and thereafter reduced to computerized transcription under my direction and supervision, and I hereby certify the foregoing deposition is a full, true and correct transcript of my shorthand notes so taken.

I further certify that I am neither counsel for nor related to any party to said action nor in anywise interested in the outcome thereof.

_____

S. Arielle Santos, CSR

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