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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

CMS CEPBOR, LTD., and CMS)
CEPCOR AMERICANS, LLC,)Case No. IPR2024-01380
Petitioners,)Patent No. 9,827,568
vs.)
SANDVIK INTELLECTUAL PROPERTY)Case No. IPR2024-01381
AB,)Patent No. 11,014,090
Patent Owner.)
_____)

DEPOSITION OF DAVID SMITH
June 11, 2025

REPORTED BY:
COLLEEN P. DOHERTY, CSR 345
Notary Public
JOB No. 7405355

PAGES 1 - 98

1 THE DEPOSITION OF DAVID SMITH was taken on
2 behalf of the Patent Owner, at the offices of Veritext
3 Idaho, located at 1109 Main Street, Suite 220, Boise,
4 Idaho, commencing at 9:30 a.m., on June 11, 2025, before
5 Colleen P. Doherty, Certified Shorthand Reporter and
6 Notary Public within and for the State of Idaho, in the
7 above-entitled matter.

8 APPEARANCES:

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25 ALSO PRESENT: Brianna Pruitt (Present Remotely)

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1 DAVID SMITH,
2 first duly sworn to tell the truth relating to said
3 cause, testified as follows:

4 EXAMINATION

5 QUESTIONS BY MR. ARJOMAND:

6 Q. Good morning.

7 A. Good morning.

8 Q. Please state and spell your name for the
9 record.

10 A. David Smith, D-a-v-i-d, S-m-i-t-h.

11 Q. Great. And do you understand that you have
12 taken an oath to tell the truth today?

13 A. Yes.

14 Q. Is there any reason that you cannot give
15 complete and accurate testimony today?

16 A. No.

17 Q. Have you ever taken a deposition in an inter
18 partes review or IPR proceeding?

19 A. This will be the first in that venue.

20 Q. Okay. So I'll ask a question. Counsel here
21 may make an objection, and then you must answer my
22 question, unless it relates to privilege or confidential
23 information. Does that make sense?

24 A. Yes.

25 Q. We can take a break when you need one, but we

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1 can't take a break during a pending question. Does that
2 make sense to you?

3 A. Yes.

4 Q. During cross-examination at breaks, you can't
5 speak to counsel regarding the subject matter of your
6 testimony. Do you understand that?

7 A. Yes.

8 Q. Okay. Great. So, Mr. Smith, have you served
9 as an expert on any prior cases?

10 A. I have.

11 Q. How many?

12 A. I've been retained on approximately 150 cases.

13 Q. And in those 150 cases, how many times have
14 you testified, whether in deposition or in court?

15 A. I have testified in trial five times, and in
16 deposition, I think, this is 34.

17 Q. Have any of those 150 cases been cases
18 relating to a patent?

19 A. Yes.

20 Q. How many?

21 A. Probably between 40 and 50.

22 Q. And for those 40 to 50 cases, have you ever
23 testified in a deposition or in court?

24 A. Yes.

25 Q. How many times?

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1 A. It's probably been 10 to 15 times in
2 deposition, and twice in court.

3 Q. Have you ever worked on a case as an expert
4 involving a rock crusher?

5 A. This will be the first on technology that
6 specific.

7 Q. Have you ever worked on a case involving
8 grooves for delivering pressurized fluid?

9 A. There have been a lot of cases that involved
10 hydraulics. But as far as grooves, particularly, this
11 might be the first.

12 Q. In the 50 or so cases where you've testified
13 in trial or in deposition, has the court ever excluded
14 an opinion that you offered, to your knowledge?

15 A. Yes.

16 Q. Okay. Which case is that?

17 A. There have been two cases, to my knowledge.
18 The first one was Hoist versus TuffStuff. And in that
19 case, I had made an animation to help explain a claim
20 construction issue. The animation was excluded, but the
21 court construed the term the way we proposed.

22 The second case was GYT versus Dbest Products.
23 And GYT is an acronym or abbreviation for a Chinese
24 company, that I can't pronounce or remember. And in
25 that case, I think there were two reasons that I was

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1 excluded. The first was that the attorneys failed to
2 submit my report by the deadline, even though they had
3 it. And the second, they said that my opinions did not
4 comply with the court's claim construction of plain and
5 ordinary meaning.

6 Q. In the Hoist v. TuffStuff case, which parties
7 did you represent?

8 A. TuffStuff, the defendants.

9 Q. And in the GYT versus Dbest Products case,
10 which party did you represent?

11 A. GYT.

12 Q. As you sit here today, can you recall any
13 other case where a court has excluded your opinion?

14 A. To my knowledge, there haven't been any
15 others.

16 Q. And to your knowledge, has a court ever
17 criticized an opinion that you've offered?

18 A. Not to my knowledge.

19 Q. So, Mr. Smith, in this proceeding, the
20 petitioner is CMS Cepcor; is that your understanding?

21 A. Yes.

22 Q. And you've been hired by CMS Cepcor to be
23 their expert?

24 A. I was retained by counsel for CMS Cepcor.

25 Q. Have you ever represented CMS Cepcor before?

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1 A. No.

2 Q. You said that you were hired by counsel to
3 represent CMS Cepcor. Would that be the law firm,
4 Beusse Sanks?

5 A. It's my understanding that I was initially
6 retained by another firm, and that has been passed to
7 Beusse Sanks.

8 Q. Have you ever worked with the law firm
9 Bois-see Sanks?

10 MR. SANKS: Beus-see.

11 MR. ARJOMAND: Beusse Sanks. Sorry, Counsel.

12 MR. SANKS: That's all right.

13 Q. (BY MR. ARJOMAND) Have you ever worked with
14 the law firm Beusse Sanks before?

15 A. I have not.

16 Q. Mr. Smith, in preparing your opinions for the
17 150 cases that you've been retained as an expert, is it
18 your practice to sign your declarations?

19 A. Yes.

20 Q. Would you say that an unsigned declaration is
21 invalid?

22 A. I'm not sure where that stands legally.

23 Q. Okay. Have you ever submitted a declaration
24 in a case where you haven't signed a declaration?

25 A. Not to my knowledge.

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1 Q. All right. So, Mr. Smith, we have two
2 proceedings in this case, IPR 2023-01380, directed to
3 598 patent, and IPR 2023-01381, directed to the 090
4 patent. Does that make sense to you?

5 A. That sounds familiar, yes.

6 Q. Okay. Good. Today, when I'll be asking you
7 questions, the questions will be directed to both
8 proceedings, unless my question is specifically directed
9 to one of those proceedings. Does that make sense?

10 A. Okay.

11 Q. All right. So in preparation for today's
12 deposition, what did you do, Mr. Smith?

13 A. I went back through my declarations, and the
14 patents, and some of the prior art, and I had a
15 conversation with Mr. Sanks.

16 Q. So you reviewed your declaration, Exhibit
17 1002, in both the 1380 and 1381 proceedings; is that
18 correct?

19 A. That's correct.

20 Q. And did you review the 598 and 090 patents?

21 A. I did.

22 Q. Okay. And did you review -- strike that.

23 You said that you reviewed prior art. Which
24 prior art references did you review?

25 A. I looked at the Piepho reference, the Polinski

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1 reference, and probably briefly looked at a couple of
2 others.

3 Q. I apologize if I reference the 598 patent. I
4 meant the 568 patent. Did you understand my questions
5 when I was referencing the 598 patent?

6 A. I do, yes.

7 Q. Okay. Sorry about that. Okay. So you
8 testified that you probably looked at a couple of other
9 prior art references. As you sit here, do you recall
10 what they were?

11 A. So there are the other references that are in
12 the grounds for the two different IPRs.

13 Q. Did you review the Harless reference?

14 A. Yes.

15 Q. Did you review the Yagi reference?

16 A. I would have to look at it.

17 Q. Okay. Other than your declarations, the
18 patents at issues, and the prior art references that
19 you've testified about, is there anything else that you
20 recall reviewing in preparation for today's deposition?

21 A. I reviewed other documents during the course
22 of the case. But specific to today's deposition, that
23 is what I reviewed.

24 Q. Okay. And what were those other documents
25 that you reviewed in the course of preparing your

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1 declarations in this proceeding?

2 A. Well, there were a lot of different prior art
3 references that I reviewed. I have reviewed the IPR
4 petition, and the response to the petition. I reviewed
5 respondent's expert's declaration. And there is
6 probably other documents that I reviewed in the course
7 of preparing my declaration, but it's been several
8 months.

9 Q. Okay. You said, "I reviewed the respondent's
10 expert's declaration." What did you mean by that?

11 A. For the 090 patents, my understanding is that
12 there is a declaration from an expert for the
13 respondents. I can't remember his name off the top of
14 my head, but I reviewed his declaration.

15 Q. Did you review the institution decisions that
16 the patent, the PTAP issue in, I believe, March of this
17 year?

18 A. Yes, I believe I would have reviewed those.

19 Q. Okay. As you sit here today, is there
20 anything else that you reviewed, either in preparation
21 for today's deposition, or in preparing your
22 declarations that you can recall?

23 A. That's all that I can recall specifically.

24 Q. Okay. Did you review any dictionary
25 definitions?

1 A. Probably during the course of putting together
2 my declaration, that would be something I would normally
3 do. I don't have a specific recollection at this point.

4 Q. You don't have a specific recollection of
5 reviewing any dictionary definitions for these two
6 proceedings; is that correct?

7 A. Not as I sit here today.

8 Q. In reviewing your declarations for today's
9 deposition, did you notice any errors?

10 A. That there were a couple of typos that I
11 noticed. But substantively, I don't think so.

12 Q. Okay. So we'll give you an opportunity to
13 review your declarations today. And in some of the
14 questions that we'll be asking, if you identify, or see
15 those typos, would you let me know?

16 A. Sure.

17 Q. Okay. Great. Is there anything that you
18 would like to change in your declarations?

19 A. I don't think so.

20 Q. You indicated that you met with counsel in
21 preparation for today's deposition; is that correct?

22 A. That's correct.

23 Q. And that counsel would be Terry Sanks?

24 A. That's correct.

25 Q. Did you meet with anybody else?

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1 A. I did not.

2 Q. How long did you meet with Mr. Sanks?

3 A. I believe it was about half an hour.

4 Q. And when did you meet with Mr. Sanks?

5 A. Monday.

6 Q. In general, how many hours did you take to
7 prepare for today's deposition?

8 A. Can you clarify the question? I would review
9 all of the work that I've done on this case so far to be
10 preparation for the deposition.

11 Q. Okay. Yeah, let me ask that question. So how
12 many hours did it take you to prepare your declaration
13 in the two proceedings? Let's start with that.

14 A. You know, it's been a while, and I haven't
15 looked recently. So I don't have a specific number for
16 you.

17 Q. Was it more than 20 hours?

18 A. It was.

19 Q. More than 50 hours?

20 A. I expect so.

21 Q. More than 100 hours?

22 A. I'm not sure.

23 Q. Okay. And then since you submitted your
24 declarations in these two proceedings, how many hours
25 have you worked on this case?

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1 A. I don't have a specific number, but I expect
2 it's probably between 15 and 20 hours.

3 Q. And the 15 and 20 hours would include the
4 specific preparation that you did for today's
5 deposition, and your meeting with Mr. Sanks?

6 A. It would include that, yes.

7 Q. Okay. So roughly, the total number of hours
8 that you've worked on this case is somewhere in the
9 ballpark of 70 to 120 hours; does that sound about
10 right?

11 A. Maybe, I'm not entirely sure, if I'm being
12 honest. But that sounds like a good ballpark.

13 Q. Okay. All right. Now, let me place in front
14 of you the 090 patent.

15 (Exhibit 1 marked.)

16 Q. (BY MR. ARJOMAND) Let's mark, this was
17 previously marked as 1001. But the court reporter is
18 going to mark it as Exhibit 1, because we have two
19 Exhibit 1001 in the two proceedings.

20 Mr. Smith, do you recognize this document?

21 A. I do.

22 Q. What is it?

23 A. U.S. Patent 11,014,090.

24 Q. And how much time have you spent reviewing the
25 090 patent?

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1 A. I'm not sure I have a good estimate for you.
2 It was a substantial amount of time when I put my
3 declarations together. It's been very brief since then.

4 Q. 10 hours?

5 A. I don't know.

6 Q. 20 hours?

7 A. It's difficult to say, because as you are
8 writing a declaration, as I'm sure you know, you are in
9 and out, and back and forth. And so to put an actual
10 number on it, I can't say.

11 Q. Fair enough. Did you read the 090 patent in
12 its entirety?

13 A. I did.

14 Q. Would you say you understand everything that's
15 described in the 090 patent?

16 A. I think so, yes.

17 Q. Okay. Did you review the 090 patent's
18 priority date?

19 A. I believe I did.

20 Q. And in your opinion, what is the priority date
21 of the 090 patent?

22 A. I believe I've put that in my declaration.
23 I'm not sure I recall it off the top of my head.

24 Q. Would it be helpful if we provide you your
25 declaration?

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1 A. Yes.

2 Q. Okay.

3 (Exhibit 2 marked.)

4 Q. (BY MR. ARJOMAND) So I'm placing in front of
5 the witness, Exhibit 2, which is Mr. Smith's declaration
6 in the 0138 proceeding directed to the 090 patent; is
7 that correct, Mr. Smith?

8 A. Yes.

9 Q. Okay. So now that you have your declaration
10 for the 090 patent in front of you, what is the priority
11 date to the 090 patent?

12 A. It looks like the effective filing date is the
13 priority date, and that's May 23rd, 2014.

14 Q. Okay. Now, let me turn you back to the 090
15 patent, which is Exhibit 1 for this deposition. And do
16 you see the first page of the 090 patent?

17 A. I do.

18 Q. And let me direct you to the left column at
19 the bottom. There is a heading entitled "Foreign
20 Application Priority Data." Do you see that?

21 A. I do.

22 Q. Do you understand -- strike that.

23 What do you understand the "Foreign
24 Application Priority Data" to refer to?

25 A. I'm not an attorney, but I expect that that

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1 means that there was a patent filed somewhere outside of
2 the United States.

3 Q. Uh-huh. And do you understand that that
4 patent would be related to the 090 patent that was filed
5 on May 23rd, 2014?

6 A. I expect so.

7 Q. Okay. Do you understand that the reference to
8 the "Foreign Application Priority Data" in the left
9 column of the 090 patent, is a claim to priority as of
10 November 12th, 2013?

11 A. Again, I'm not an attorney, so I don't know
12 specifically on that.

13 Q. Okay. Let me now direct you to paragraph 46
14 of your declaration in the 090 proceeding.

15 A. Did you say 46?

16 Q. Yes. It's on page 24 of Exhibit 2.

17 A. Okay.

18 Q. Let me know when you are there?

19 A. I am there.

20 Q. Take a moment to read paragraph 46, Mr. Smith.

21 A. Okay.

22 Q. Now, taking a look at the bottom left column
23 of the 090 patent that sets forth the "Foreign
24 Application Priority Data," specifically at date of
25 November 12th, 2013. Does your opinion in paragraph 46

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1 of your declaration change?

2 A. So if the priority date for the 090 patent is
3 November of 2013, and the actual priority date for the
4 Aberg reference is February of 2014, then that would not
5 be before.

6 Q. Correct. And in that situation, would it be
7 your understanding that Aberg is not prior art to the
8 090 patent?

9 A. If it was not before, then it would not be
10 prior art is my understanding.

11 Q. Okay. So let me just direct you to paragraph
12 62 and 63 of your declaration of the 090 proceeding,
13 there on pages 38 and 39 of Exhibit 2.

14 A. Okay.

15 Q. Take a moment to read those two paragraphs to
16 yourself?

17 A. I'm sorry? Did you say paragraph 62?

18 Q. Yes, paragraphs 62 and 63.

19 A. I'm sorry. I went to page 62. Okay.

20 Q. So paragraphs 62 and 63 are in a section
21 beginning on page 13 of your declaration that begins
22 with "Background and State of the Art."

23 A. Okay.

24 Q. Do you see that?

25 A. I do.

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1 Q. So if Aberg is not prior art based on the 2013
2 priority date, you would agree that paragraphs 62 and 63
3 would not apply as background or as state of the art?

4 A. So it might not be prior art. But my
5 understanding is that even if a patent is not prior art,
6 it can be used to help understand what was known in the
7 art around the time of the invention.

8 Q. But you would agree, that if Aberg's priority
9 date is May 2013, then what you are saying in paragraphs
10 62 and 63 of your declaration, the 090 proceeding, would
11 not be what was known when the 090 application was filed
12 in 2013; is that correct?

13 A. So the actual words that are written in Aberg
14 would not have been known for a couple of months. But
15 my understanding is that even if a reference is not
16 prior art, it can still help to describe what was known
17 in the art around a certain time.

18 Q. Even if it was after the earliest filing date
19 of the 090 patent?

20 A. That's my understanding.

21 Q. Okay. So you would rely upon for the
22 background, or the state of the art, on a document that
23 might be a year or two years later than the filing date
24 of a given patent?

25 A. So this is maybe a couple of months later. If

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1 those dates line up right, November 12th through
2 February of -- November 12th, 2013 to February of 2014.
3 So we're not talking about a couple of years. But
4 again, we're just talking about what was known in that
5 time period. And my understanding of the patent law, as
6 it's been explained to me, is that even if a reference
7 is not technically prior art, it can still be useful in
8 determining what was known in the art around that time.

9 Q. So, Mr. Smith, I just wanted to follow up one
10 more time with my previous question. Would you rely on
11 a document that was a year or two after the filing date
12 of a given patent, to establish what was known in the
13 prior art as the time that patent was filed?

14 A. I mean, if it's a year or two, I might look at
15 that on a case-by-case basis. And my understanding is
16 that art, even if it is not before the priority date,
17 can be used to establish what was known the art. And if
18 we're looking at something that's, you know, two or
19 three years later, I might look at that on a specific
20 case-by-case basis.

21 Q. Okay. But as you sit here today, you admit
22 that Aberg is not prior art to the 090 patent; is that
23 correct?

24 A. So again, I said I'm just an engineer, not an
25 attorney. And so as far as what the priority date is,

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1 I've been asked to assume that it's May 23rd, 2014. If
2 it is actually November 12th, 2013, and the priority
3 date of -- or the earliest publication of Aberg is
4 February of 2014, then that would not be prior art,
5 assuming all those things are true.

6 Q. Okay. Thank you. So let me direct you back
7 to the 090 patent, Mr. Smith.

8 A. Okay.

9 Q. What problem is addressed by the invention of
10 the 090 patent, in your opinion?

11 A. So the patent is titled "Gyratory Crusher Main
12 Shaft and Assembly." It discloses a main shaft for a
13 gyratory crusher that has a tapered conical section with
14 a protective sleeve. And it has a groove that is used
15 to help mount and dismount the sleeve with hydraulic
16 pressure.

17 Q. Are you reading from the abstract of the 090
18 patent, Mr. Smith?

19 A. The title of the patent and the abstract, yes.

20 Q. Okay. I guess my question was a little bit
21 different. It was, in your opinion, what problem is
22 addressed by the invention of the 090 patent?

23 A. On a broad scale, I would probably say, that
24 it's talking about how the -- what are the best ways for
25 seating or assembling of the sleeve over the conical

Page 21

1 section of the main shaft.

2 Q. In your opinion, are there difficulties with
3 seating or assembling a sleeve over a conical section of
4 a main shaft?

5 A. There can be, sure.

6 Q. Based on your experience, what would those
7 problems be?

8 A. So if we're trying to put a conical sleeve
9 onto a conical shaft, and have an interference fit. You
10 know, you might heat up or cool down one of the parts.
11 And if as you put that on, if it cools down or heats up
12 before you get it fully seated, it gets stuck in the
13 wrong place, and you have to, you know, reheat or
14 re-cool, if possible. That's one of the problems.

15 Q. What do you mean if "it gets stuck in the
16 wrong place"?

17 A. So as you are putting it on, putting
18 this -- its bearing or protective cover on the sleeve,
19 you have to seat it correctly on the sleeve. You want
20 to get it all the way on, and, you know, aligned axially
21 so that it -- the inside surface of the sleeve mates
22 with the outside surface of the shaft. And as you are
23 putting that on, if you don't get it all the way down
24 before the tolerances no longer have clearance, then it
25 kind of gets stuck in that place that is not all the way

Page 22

1 seated, or possibly it could be a little bit askew. So
2 the axes aren't aligned properly.

3 Q. So your previous answers seem to relate to the
4 relationship between the shaft and the sleeve not being
5 aligned axially in the proper manner. Would there be
6 any other problems that you can think of as you sit here
7 today?

8 A. Of not being aligned axially is part of it.
9 And not being fully seated is another part of it, and
10 probably a larger part of it.

11 Q. If there is an oil bore in the shaft, would
12 there potentially be an alignment issue as well?

13 A. I guess there could. There is always a
14 potential for a misalignment, but I think that's
15 probably less of a problem when you are using hydraulic
16 fluid to seat it.

17 Q. "When you are using hydraulic fluid to seat
18 it," can you explain that?

19 A. So the groove in the shaft is pressurized with
20 hydraulic fluid. And that pressure serves to expand the
21 sleeve and contract the shaft. And so, you know, with
22 that, you can then push the sleeve over the shaft,
23 creating a difference in tolerance, so that there is
24 room for that to slide over.

25 Similar to how heating the sleeve would also

Page 23

1 make that larger, and give it some tolerance to slide
2 over the sleeve. With the hydraulic pressure, and the
3 groove in the shaft, you don't really have the same
4 problem with that, of the sleeve cooling off before you
5 get it fully seated. And so that is less of a problem
6 in that instance.

7 Q. What about trying to align an oil bore with
8 a -- in a shaft with a groove in a sleeve, or the other
9 way around?

10 A. Can you say that again?

11 Q. Yes. Would there be any problems, in your
12 opinion, with trying to align an oil bore in a shaft
13 with a groove on a sleeve?

14 A. I mean, generally speaking, the groove on the
15 sleeve would be in a particular location. And so until
16 the outlet in the shaft aligns with that groove, you may
17 not get as good of dispersion of the high pressure oil
18 around the whole shaft.

19 Q. But you don't think there is a problem
20 typically with aligning an oil bore with groove and a
21 sleeve?

22 A. I'm not sure I follow.

23 Q. I think we started this series of questions
24 and answers based on the difficulties in seating or
25 assembling a sleeve over a conical section of a main

1 shaft. And what I'm trying to understand is whether
2 aligning an oil bore with a groove would be one of those
3 difficulties?

4 A. So if it's conical, that's less of a
5 difficulty, because the groove can be wide enough to
6 accommodate the whole range of motion, because you don't
7 have to press it on very far. I believe I had an image
8 of that in my declaration. Let's see. Yes, on page 52.

9 Q. Of your declaration in there relating to the
10 090 patent?

11 A. Yes. This is at the bottom of paragraph 87.
12 It just shows both a cylindrical end shaft and a tapered
13 shaft end. With a cylindrical shaft, it shows that you
14 have to heat up and expand the sleeve, and/or contract
15 the shaft for the whole length of the sleeve that you
16 are trying to seat.

17 However, with a tapered shaft and a tapered
18 sleeve, those are going to fit together much better, up
19 to a large percentage of the distance that you are
20 trying to seat the sleeve. And so if you have -- if you
21 are trying to align an oil groove on a cylindrical
22 shaft, it's a little more difficult, because you -- at
23 the beginning, there is no overlap, and so you can't use
24 the pressure to expand the cylindrical sleeve.

25 However, with a tapered shaft, the groove can

Page 25

1 be large enough to sit over the opening where the
2 high-pressure fluid comes, in allowing you to pressurize
3 and expand the sleeve, and fully seat it, because there
4 is only a small amount of distance that you have to move
5 it from a position that it slides to without
6 interference to the press fit condition.

7 Q. So, Mr. Smith, trying to encapsulate your
8 testimony in the previous series of questions and
9 answers. Would it be fair to say that the difficulties
10 with seating or assembling a sleeve over a conical
11 section of the main shaft, would be aligning the shaft
12 and sleeve axially for the shaft to be fully seated, and
13 for the alignment of any grooves in the sleeve with a
14 bore in the shaft? Does that sound fair?

15 A. I mean, so for a conical tapered shaft, you
16 don't really have the problem with aligning the groove
17 and the opening at the groove, and the sleeve, and the
18 opening in the cone, the conical portion. There is
19 still some potential for axial misalignment, but it's
20 much smaller due to the tapers that help to align that
21 naturally.

22 Q. If there is an axial misalignment, could that
23 potentially result in a misalignment of the oil bore and
24 any grooves in the sleeve?

25 A. So we're talking about an axial misalignment.

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1 We're talking about the sleeve being a little bit
2 misaligned or tilted relative to the shaft. Which, you
3 know, as I mentioned before, is not the main problem
4 that you would be dealing with, with seating a
5 bearing -- or seating a sleeve on a shaft. It's
6 possible, but that alignment would be minimal. And I
7 don't think -- or that misalignment, if it happened, it
8 would be minimal. And I don't think it would be large
9 enough to interfere with the seating of the groove, or
10 the alignment of the groove with the opening in the
11 shaft.

12 Q. So just to make sure that I understand your
13 testimony. What, again, is the main problem, in your
14 opinion?

15 A. So, I mean, we started out talking about the
16 cylindrical non-tapered shafts. And with that, it's
17 really getting the sleeve all the way onto the shaft
18 before it cools down. With a tapered sleeve, that
19 largely goes away, because you can put it most of the
20 way onto the shaft, before you even have to pressurize
21 it or heat it up.

22 And so the tapered sleeve -- the tapered
23 sleeved and the tapered shaft overall simplify the
24 process of putting a sleeve on the shaft, because you
25 have to move it a relatively small distance compared to

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1 the distance you would have to move it with a
2 cylindrical shaft.

3 Q. And are there any other problems that you can
4 think of as you sit here today?

5 A. Any other problems with putting a sleeve on a
6 shaft?

7 Q. Yes.

8 A. Depending on how it's done, you know, it
9 can -- if you have to with a, you know, a cylindrical
10 or, with a tapered, even if you have to pound on it with
11 a hammer to get it to the right place to get it off, you
12 know, that can cause damage. And there is a lot of
13 things that could happen. But in the context of the
14 patent and the oil bores, I think we've talked about
15 that.

16 Q. Okay. So again, just to sort of
17 recap -- strike that.

18 So if I were to ask you to provide what the
19 top three problems would be with seating or assembling a
20 sleeve over a tapered section of a main shaft, what
21 would that be?

22 A. Just in general, talking about a tapered
23 shaft?

24 Q. Yes.

25 A. In this hypothetical, does this tapered shaft

1 use hydraulics to seat a bushing, or is it done another
2 way?

3 Q. Let's start with hydraulics.

4 A. Okay. So hydraulics, you know the
5 difficulties are going to be having the equipment
6 necessary to provide sufficient pressure to expand
7 the -- expand the sleeve, having the right equipment to
8 be able to apply the force to seat it correctly. And
9 then, I guess, access is probably another problem. You
10 know, can it be done in place, or does the whole machine
11 have to be taken apart to get to it? Would probably be
12 another problem that I would expect to see in some
13 instances.

14 MR. ARJOMAND: Okay. Thank you. We've been
15 going for about an hour, would you like to take a break?

16 THE WITNESS: Sure.

17 MR. ARJOMAND: Let's go off the record.

18 (Recess.)

19 Q. (BY MR. ARJOMAND) Mr. Smith, before the
20 break, you testified, "I guess access is probably
21 another problem." Can you expand on that?

22 A. Sure. Depending on where the shaft that you
23 are trying to put on a sleeve, or take off a sleeve is
24 located within a piece of equipment, that can prove to
25 be more difficult in some situations, and less difficult

Page 29

1 in others.

2 Q. Are there any other problems associated with
3 access that you can think of as you sit here?

4 A. Particularly, for a tapered shaft with
5 hydraulic seating? I guess you have to be able to have
6 access in some instances which might require disassembly
7 in whole or in part of the equipment. You know, you
8 might require, you know, having the equipment necessary
9 for the hydraulic seating, and, you know, for
10 positioning the sleeve in the correct place. So getting
11 the shaft and all of the equipment into the same
12 relative location where they are close enough together
13 to be used, can cause a problem with access. So in some
14 instances, that's easier. And in some instances, that
15 requires a lot more work.

16 Q. All right. Let me turn you back to the 090
17 patent, which we've marked as Exhibit 2 for this
18 deposition. Let me direct you to column 6, lines 24 to
19 31. Let me know when you are there?

20 A. I am there.

21 Q. Can you take a moment to read that paragraph?

22 A. Okay.

23 Q. Are you familiar with this portion of this 090
24 patent?

25 A. I am.

Page 30

1 Q. Can you explain what this paragraph at column
2 6, lines 24 to 31 describes?

3 A. Sure. If we look at Figure 3 that may help
4 and in explaining this. So the fluid supply conduit,
5 it's labeled 120, comprises an axial section 204. So
6 that extends along parallel to the axis of the shaft.
7 And it's terminated by a radially extending section. So
8 the opening or the pathway extends parallel to the axis
9 of the shaft, and then turns to extend radially or away
10 from the axis of the shaft, out towards the outside
11 edge. And it's terminated. And it extends to the
12 outside surface of the shaft 200. And those two
13 pathways, the axial pathway and the radial pathway, are
14 connected. And they connect to a groove 121a, that
15 extends around the outside of the shaft.

16 Q. Are you looking at Figure 2 or Figure 3 by any
17 chance?

18 A. I was looking at Figure 3, but they show in
19 large part the same thing. Figure 2 has a sleeve on the
20 shaft. And Figure 3 does not have the sleeve on the
21 shaft.

22 Q. Yeah, I just thought you were looking at
23 Figure 2, because you mentioned fluid supply conduit
24 120, which is labeled in Figure 2?

25 A. It is, that's correct.

Page 31

1 Q. So in Figure 2, does the radial shaft extend
2 to any other grooves beyond the axial upper groove,
3 121a?

4 A. So if we -- sorry. Can you say that question
5 again?

6 Q. Okay. Does the fluid supply conduit 120
7 extend to any other grooves beyond the axially upper
8 groove 121a?

9 A. So if we look at the next paragraph in column
10 6.

11 Q. Uh-huh.

12 A. It talks about, you have grooves 121a and 121b
13 both extend 360 degrees around the circumference of the
14 shaft. And there is an interconnecting fluid flow
15 channel 208, which connects those two grooves. That
16 appears to be separate from the fluid supply conduit,
17 120.

18 Q. So would it be your understanding that the
19 radially extending section 205 of the fluid supply
20 conduit 120, is only reaching axial upper groove 121a?

21 A. That's what the specification says, yes. That
22 205, that terminates at shaft and external facing
23 surface 200. But that that is in fluid communication
24 with 121a at that surface.

25 Q. In your expert opinion, is it easier to

Page 32

1 machine a shorter fluid conduit within a shaft as
2 opposed to machining a longer conduit?

3 A. In generally speaking, if you are going to
4 machine a conduit into a shaft, you would have to get
5 that all set up with your drill bit going into the
6 shaft. So as long as you are not exceeding the length
7 of the drill bit, I don't think it's any more difficult.
8 And the main difficulty is getting everything fit up,
9 and held in place so that you can drill the hole, and
10 you know, the length or the depth of the hole is really
11 inconsequential to the rest of it.

12 Q. So turning to, let's say, Figure 3 of the 090
13 patent. Is it your expert opinion that one could
14 machine the axial region 204 of the fluid supply conduit
15 all the way vertically down the shaft, maybe even past
16 the lower groove 121, assuming you have a long enough
17 drill bit?

18 A. Yes, I would say, that's certainly possible.

19 Q. And in your expert opinion, would there be any
20 disadvantages in having such a lengthy axial region of
21 the fluid supply conduit extending essentially the
22 length of the shaft?

23 A. You know, I haven't really thought through
24 that. I suppose there probably could be some
25 disadvantages, as well as some advantages. But I

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1 haven't really thought through that at this point.

2 Q. Okay. All right. Let me now turn you to,
3 since we're looking at the figures of the 090 patent,
4 let me turn you to Figure 1 of the 090 patent.

5 A. Okay.

6 Q. Okay. So let me direct you to element 124.
7 Do you see that?

8 A. I do.

9 Q. Do you agree that that's the sleeve that's
10 mounted on the tapered axial region 113?

11 A. Yes, I would agree with that.

12 Q. Now, let me direct you to component 105. Do
13 you see that?

14 A. Yes.

15 Q. And what is your understanding of component
16 105?

17 A. 105 is described as the inner-crushing shell
18 and specification.

19 Q. Okay. And do you see component 103 in Figure
20 1 of the 090 patent?

21 A. I do.

22 Q. And what is that component?

23 A. 103 is called the crushing head in the
24 specification.

25 Q. So continuing to look at Figure 1, would you

Page 34

1 agree that the inner-crushing shell 105, and the
2 crushing head 103, are not in contact with sleeve 124?

3 A. Yes, I would agree with that.

4 Q. And would you agree that the inner-crushing
5 shell 105, and the crushing head 103, are mounted to the
6 shaft 107 independently of the sleeve 124?

7 A. Yes, I would agree that those are mounted to
8 the shaft independently.

9 Q. Okay. Now, let me introduce the 568 patent to
10 you. We'll mark this as Exhibit 3. But it was
11 previously marked as 1001 in the 01380 suit.

12 (Exhibit 3 marked.)

13 Q. (BY MR. ARJOMAND) Do you recognize Exhibit 3
14 in front of you, Mr. Smith?

15 A. Yes, I do.

16 Q. And what is that?

17 A. It is U.S. Patent 9,827,568.

18 Q. And I'm going to ask you this question again.
19 Do you have a rough idea of how much time you spent
20 reviewing the 568 patent?

21 A. It would probably be a very similar answer to
22 what I answered for the 090 patent.

23 Q. Okay. Understood. Did you read the entirety
24 of the 568 patent?

25 A. I did.

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1 Q. And would you say that you understand
2 everything described within the 568 patent?

3 A. I think so.

4 Q. Let me direct you to Figure 2 of the 568
5 patent.

6 A. Okay.

7 Q. What do you understand line 115 to be in
8 Figure 2 of the 568 patent?

9 A. 115 is a longitudinal axis.

10 Q. Okay. And now, turning you to the left side
11 of Figure 2. What do you understand element 201 to be
12 pointing to?

13 A. 201 is an external facing surface of the
14 sleeve.

15 Q. Okay. And what do you understand the
16 relationship to be between the external facing surface
17 201 and the longitudinal axis, or axis 115?

18 A. I'm not sure I understand the question.

19 Q. Let me see if I can direct you to column 4,
20 lines 26 through 29 of the 568 patent?

21 A. Okay.

22 Q. Take a moment to read those lines to yourself.

23 A. Okay.

24 Q. Would you, now taking a look at Figure 2 of
25 the 568 patent, would you agree that the external facing

1 surface 201 is aligned substantially parallel with axis
2 115?

3 A. Yes, I would agree with that.

4 Q. And would you agree that that arrangement
5 establishes that the sleeve 114, when viewed externally,
6 comprises a substantially cylindrical geometry?

7 A. That's what's stated in the patent, yes.

8 Q. And that's your understanding in considering
9 Figure 2 in the portion of column 4, the 568 patent that
10 we've discussed?

11 A. Yes.

12 Q. Okay. Let me now turn back to Exhibit 2,
13 which is your 090 declaration. Let me direct you to
14 paragraph 30, which is page 12 of that Exhibit 2.

15 A. Okay.

16 Q. Take a moment to read that paragraph to
17 yourself, Mr. Smith.

18 A. Okay.

19 Q. So you define "a person of ordinary skill in
20 the art," in paragraph 30 of your 090 declaration as "a
21 person who has a bachelor's degree in mechanical
22 engineering or a related field, and at least two years
23 of experience with industrial equipment design and
24 development"; is that correct?

25 A. That's correct.

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1 Q. When you say, the person has a bachelor's
2 degree in mechanical engineering or a related field,
3 what do you mean by "a related field"?

4 A. It could be another scientific technical
5 field, you know, mining engineering, perhaps civil
6 engineering. I'm sure there are others that would
7 qualify as well.

8 Q. Okay. And when you say that the person of
9 ordinary skill in the art would have at least two years
10 of experience with industrial equipment design and
11 development, what would that encompass, in your opinion?

12 A. With the design and development of industrial
13 equipment, so equipment on a larger scale that includes
14 a lot of the same types of technologies, or features, or
15 components that can be applied across, you know, various
16 different types of equipment.

17 Q. Can you explain that? I'm not sure I follow
18 what your previous answer --

19 A. Sure. I think that, you know, some experience
20 with the design of industrial equipment, you know,
21 becoming familiar with different types of bearings, and
22 shafts, and components, and designing, and prototyping,
23 and the different challenges that arise during that
24 process, would be helpful to understand this technology.

25 Q. So is the two years of experience with

1 industrial equipment design and development limited to
2 rock crushers?

3 A. No, I don't think so.

4 Q. So a person of ordinary skill in the art
5 wouldn't have to have two years' experience designing
6 and developing rock crushers?

7 A. Not specifically, no.

8 Q. Do you have two years of experience designing
9 and developing rock crushers?

10 A. No, I don't.

11 Q. Presumably an individual that has two years of
12 experience designing and developing rock crushers, would
13 meet your requirement of two years of experience with
14 industrial equipment design and development; correct?

15 A. Yes, I would think that rock crushers fall
16 under industrial equipment. So that would qualify.

17 Q. What else do you think would fall under
18 industrial equipment?

19 A. Industrial equipment is a broad category of
20 equipment used in industry, whether that's manufacturing
21 equipment, or processing equipment, or material handling
22 equipment. You know, a lot of those types of
23 technologies use the same concepts, and components, and
24 things like that. They are all relevant.

25 Q. Okay. Let me ask you a question about your

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1 analysis in the 090 declaration. In your opinion, you
2 believe that claims 1 through 14 of the 090 patent are
3 obvious; is that correct?

4 A. That's correct.

5 Q. And in reaching that conclusion of
6 obviousness, do you believe that obviousness can be
7 established by establishing that the elements in a claim
8 are known?

9 A. I believe that's part of an obviousness
10 analysis, yes.

11 Q. What else would be part of the obviousness
12 analysis?

13 A. Providing some teaching suggestion or
14 motivation that someone might have to combine those
15 elements.

16 Q. Anything else?

17 A. That is in my understanding the basis, the
18 basic obviousness analysis.

19 Q. In your declaration for -- strike that.

20 In your declaration relating to the 090
21 patent, you refer to the design choice. Do you recall
22 that?

23 A. I believe so.

24 Q. And what do you mean by design choice in the
25 context of your obviousness analysis?

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1 A. Sure. So there are often multiple known ways
2 of doing something, or assembling components, or
3 aligning things. And if they are all known ways that
4 have been used in prior art, that are known in
5 the -- known in the art, then choosing which one you
6 implement on a new design is really just a design choice
7 as opposed to an inventive step, so to speak.

8 Q. And you applied that analysis that you just
9 testified about, with regard to the design choice in
10 reaching your conclusions of obviousness relating to the
11 090 claim?

12 A. I might have. I don't recall specifically if
13 I applied that in any or all of these claims at
14 this -- just sitting here.

15 Q. Okay. Let me direct you to paragraph 83 of
16 your 090 declaration. It's on page 40.

17 A. Okay.

18 Q. Take a moment to read that paragraph,
19 specifically, paragraph 83, to yourself?

20 A. Okay.

21 Q. You say, "I have used the plain and ordinary
22 meaning in my analysis." In paragraph 83 of your 090
23 declaration, what do you mean by "plain and ordinary,"
24 Mr. Smith?

25 A. The meaning that it would have had to a person

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1 of ordinary skill in the art at the time of the
2 invention.

3 Q. Okay. And can that plain and ordinary meaning
4 be established by dictionary definitions?

5 A. My understanding is that in the claim
6 construction process, if you are construing claims,
7 there is different types of evidence that you can look
8 at. And dictionary definitions would be some of the
9 evidence that is often looked at.

10 Q. Do you think that given the context of the 090
11 patent, that common English dictionaries, like the
12 Oxford English dictionary, could be utilized to
13 determine the plain and ordinary meaning of the claim
14 terms in the 090 patent?

15 A. It depends. Particularly, with technical
16 patents, sometimes common English dictionaries do a good
17 job, and sometimes not so much.

18 Q. Okay. But for terms that are not technical,
19 do you think that a common English dictionary could be
20 utilized to establish the plain and ordinary meaning of
21 a claim term of the 090 patent?

22 A. I mean, if -- I think the plain and ordinary
23 meaning is how it's understood to a person of ordinary
24 skill in the art. You know, if we're looking at
25 dictionary definitions, that may or may not comply with

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1 how a person of ordinary skill in the art would
2 understand a term. So we would probably have to look at
3 it on a case-by-case basis.

4 Q. All right. Let me direct you to paragraph 27
5 of your 090 declaration, that's on page 11.

6 A. You said 27?

7 Q. Yes, paragraph 27, on page 11.

8 A. Okay.

9 Q. Take a moment to read that paragraph to
10 yourself.

11 A. Okay.

12 Q. Okay. So let me direct you to the last two
13 sentences in paragraph 27. You say in those two
14 sentences, "Crushed rock especially granite and
15 quartzite are notoriously abrasive and will test the
16 durability of any system or material. Enhancing product
17 life expectancy and reducing downtime for maintenance
18 requires careful structural and fatigue analysis and
19 intricate knowledge and extensive testing."

20 Do you see those two sentences?

21 A. I do.

22 Q. Can you explain to me the types of failures
23 that gyratory crushers are prone to experiencing?

24 A. So I would expect failures when parts wear out
25 from abrasion. I would expect failures to happen when

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1 an uncrushable is introduced to the system. I would
2 expect fatigue, you know, if not designed properly could
3 be a problem. I guess those are the main problems that
4 I've thought through at this point.

5 Q. Is shaft failure a major concern in the design
6 of gyratory crusher main shafts?

7 A. I would expect if you are experiencing a lot
8 of shaft failures, then it becomes a major concern. If
9 it's been designed properly from the beginning, then,
10 you know, it probably isn't as big of a concern. But it
11 is definitely something that you would want to look at
12 design for.

13 Q. It would be a big concern for shaft design, if
14 the shaft is failing; is that correct?

15 A. I would say, you would want to design it in a
16 way that the shaft fails less often.

17 Q. You mentioned in your previous answer
18 as -- strike that.

19 You mentioned in your previous answer, fatigue
20 failure. Can you explain that?

21 A. Fatigue failure is when you have repeated
22 motion over and over again, which can come in a variety
23 of different ways. But certainly, in a gyratory rock
24 crusher that's rotating around, you would end up with
25 repeated motion. And fatigue can cause materials to

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1 fail, I guess, in a different way than a normal
2 overloading-type of failure. They can fail at lower
3 stresses, and lower loads after many cycles have taken
4 place.

5 Q. So maybe I didn't quite understand your
6 previous answer. Are you saying that there is two types
7 of failures; fatigue failure and overloading type of
8 failure; is that right?

9 A. Well, there are a lot of different types of
10 different failures. Those are two different types.

11 Q. So what would be other types of failures
12 beyond those two?

13 A. You could have failure due to corrosion. You
14 could have failure due to the wear. You could have
15 failure due to the exceeded load limits. I guess those
16 are some examples. I mean, in my experience, there is
17 always new ways for things to fail. But those are some
18 of the more common.

19 Q. So when you mentioned failure due to wear,
20 would that be fretting-induced fatigue failure?

21 A. So fretting could probably be classified under
22 wear.

23 Q. So what is your understanding of fretting?

24 A. My understanding of fretting is that when you
25 have two pieces that are seated together, that move

1 relative to each other in very small increments, some
2 might say that they are not expected to, or that they
3 don't appear to move relative to each other from an
4 ordinary observer perspective. That that very small
5 incremental motion can cause damage, and oxidation, and
6 result in failures.

7 Q. And in the context of gyratory crushers, in
8 your expert opinion, could fretting basically cause
9 fatigue failure?

10 A. I think they probably go hand in hand. I'm
11 not sure if one causes the other. But the repeated
12 motion can cause fatigue, and the repeated motion can
13 also cause fretting. And those two might interact as
14 well.

15 Q. Okay. Can you describe any shaft design
16 features known to exacerbate the types of failures that
17 you've mentioned in the past few answers?

18 A. Can you break that down a little bit for me?
19 Is there a specific failure that you want to talk about?

20 Q. Sure. Can you describe any shaft design
21 features for gyratory crushers that are known to
22 exacerbate fatigue failure?

23 A. So there are a lot of factors that influence
24 fatigue. That would be the size of forces, the size of
25 the components, if you have any discontinuities or

1 stress concentrations. The type of material can play a
2 part in fatigue. So there are a number of known factors
3 that influence fatigue.

4 Q. And so those factors that you've just recited,
5 how would they apply to the shaft design features for
6 gyratory crushers?

7 A. So I think when you are designing a shaft, you
8 would want to look at the different factors that affect
9 fatigue, and include those in your analysis, so that
10 your fatigue factor of safety is at an appropriate
11 level.

12 Q. So then the factors that you would consider if
13 you were designing a shaft for a gyratory crusher could
14 include the size of the forces, the size of the
15 components, discontinuities, and stress concentrations;
16 is that fair?

17 A. Yeah, those are some of them. There is a
18 whole -- I mean, in basic engineering textbooks, they
19 talk about fatigue, and there is a whole list of
20 different factors that influence that. I don't have
21 that memorized. But those would all be things that you
22 would want to consider in a situation where you are
23 expecting fatigue to be a problem.

24 Q. And if you were to look at a basic engineering
25 design textbook, what would that be?

1 A. Are you asking for a like a title, or an
2 author, or --

3 Q. Yeah. Like if I were to come to you,
4 Mr. Smith, and ask you the question that I just did
5 regarding designing a shaft for a gyratory crusher.
6 What basic engineering textbooks would you look at to
7 consider, for example, fatigue failure?

8 A. So there are textbooks on machine design.
9 There is a very popular one by an author named Shigley.
10 There are also textbooks on strength of materials that
11 would probably be helpful as well. And probably contain
12 a lot of the same information.

13 Q. Do you recall the title of the Shigley book?

14 A. Not off the top of my head.

15 Q. Do you recall the title of any of that
16 material, strength of material textbooks that you
17 mentioned?

18 A. I can tell you what they look like, and where
19 they are on my shelf. But I don't know the titles,
20 unfortunately.

21 Q. Okay. Understood. Okay. You mentioned
22 previously that you didn't have two years of experience
23 with the development and design of rock crushers. Do
24 you recall that testimony?

25 A. I do.

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1 Q. What aspect of your background do you think
2 satisfies that requirement?

3 A. Sure. There are multiple aspects. You know,
4 as we look at the definition I provided of a person of
5 ordinary skill in the art, that also included a more
6 education can account for less experience, and more
7 experience can account for less education.

8 I have a master's degree in mechanical
9 engineering. So that's, you know, two years above a
10 bachelor's degree. I have also spent, you know, the
11 majority of the last 15 to 20 years working on different
12 types of heavy equipment. Lots of rotating components,
13 and shafts, and bearings, and wear parts, whether that's
14 in a garbage truck, an aerial lift, a thrill ride,
15 manufacturing equipment, you know, excavators,
16 bulldozers, all sorts of things.

17 Q. So when you said then, the last 15 to 20 years
18 working on different types of heavy equipment, you are
19 referring to actual engineering work that you've been
20 doing, not necessarily expert consulting; is that
21 correct?

22 A. Yeah, it could be both. But I've done a lot
23 of the engineering work, as well as expert consulting
24 work.

25 Q. Going back to the issue of fatigue failure

1 with respect to the gyratory crushers. Can you just
2 explain to me what you believe the sources of fatigue
3 failure would be in that context?

4 A. So fatigue failure comes from a high number of
5 cycles, or a high number of loading and unloading, or
6 applying force to something, and then removing that
7 force. And as the number of cycles increases, the
8 strength of the component decreases. And so, you know,
9 if you are only doing ten cycles on something, you can
10 apply more force to it, than if you are expecting that
11 to go through 100,000, or a million cycles. So you
12 would have to design it to have a lower stress if you
13 are expecting fatigue.

14 Q. Okay. And then in terms of fretting-induced
15 failures, what would you believe to be the sources of
16 that type of failure in the context of gyratory
17 crushers?

18 A. So fretting-induced failures, I would expect
19 to be mainly between the wear sleeve and the shaft,
20 where those are an interference fit.

21 Q. And then the same question in the context of
22 fretting-induced fatigue failures?

23 A. So fretting-induced fatigue failures would be
24 fatigue failures where fretting occurs. So fatigue
25 failures wear the bearing, attaches to the main shaft,

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1 or the sleeve attaches to the main shaft.

2 MR. ARJOMAND: Let's go off the record for
3 five minutes.

4 (Recess.)

5 MR. ARJOMAND: Back on the record.

6 Q. (BY MR. ARJOMAND) Mr. Smith, let me place in
7 front of you, Exhibit 1017 in the 01381 IPR. We'll mark
8 this as Exhibit 4, I believe.

9 (Exhibit 4 marked.)

10 Q. (BY MR. ARJOMAND) So, Mr. Smith, this is the
11 Polinski patent.

12 A. Yes.

13 Q. Have you read the Polinski patent in its
14 entirety Mr. Smith?

15 A. I have.

16 Q. And would you say that you understand
17 everything described within the Polinski patent?

18 A. Yes, I believe so.

19 Q. Okay. So let me just ask you, if you could
20 explain the purported invention of Polinski?

21 A. Can you say that again? I didn't quite hear
22 that.

23 Q. What is your understanding of the invention of
24 the Polinski patent?

25 A. My understanding is that it's an assembly for

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1 the main shaft of the gyratory crusher.

2 Q. And so let me direct you to column 1 of the
3 Polinski patent, specifically lines 10 through 41, which
4 is entitled the "Description of the Prior Art." Do you
5 see that?

6 A. I do.

7 Q. Do you think you can take a minute to read
8 that paragraph to yourself. And let me know when you
9 are ready?

10 A. Okay.

11 Q. So could you explain to me what the
12 concern -- strike that.

13 What is the concern raised in the Polinski
14 patent with respect to column 1, lines 10 through 40?

15 A. So in this section, it talks about how in the
16 prior art, the mantle is threaded on to the main shaft.
17 And it says, "While this type of arrangement has proven
18 to be satisfactory for most crusher installations." In
19 some they have also experienced fatigue cracking in the
20 threads, and in the area right next to the threads,
21 where the mantle is attached, that have resulted in
22 failure.

23 Q. Based on your experience, or would you say
24 that, this concern described at column 1, lines 10 to 40
25 of Polinski is valid?

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1 A. It all depends on how it's specifically
2 designed, and how it's being used. And here it says,
3 you know, while this type of arrangement has proven to
4 be satisfactory for most crusher installations, to me,
5 that would say that, you know, using threads to attach
6 the mantle in many instances works just fine. In some
7 instances, if it's not designed properly, it can result
8 in fatigue cracking.

9 Q. Uh-huh. Would you agree with Polinski's
10 statements that "experience has indicated that there are
11 relatively abrupt changes in the cross-sectional area of
12 the shaft above and below the threaded section, have
13 resulted in high local stress concentrations in these
14 regions of the shaft"?

15 A. I don't have any reason to disagree with that.

16 Q. Okay. So let me now direct you to column 1,
17 lines 61 through 67 of Polinski. Take a minute to read
18 that to yourself.

19 A. Okay.

20 Q. Based on your understanding of Polinski, how
21 does it describe the removal of abrupt structural
22 discontinuities in the normally high stress regions of
23 the main shaft?

24 A. So based on my understanding, Polinski adds
25 the threads to the lower portion of the sleeve that fits

1 over the shaft. And the mantle attaches to those
2 threads, rather than directly to the shaft.

3 Q. Would it be fair to say, that in Polinski, the
4 crusher mantle is supported through, or by the sleeve
5 via the threading between the sleeve and the crusher
6 mantle?

7 A. So my understanding is that the mantle screws
8 onto the sleeve, and down into a position where it's in
9 contact with a tapered portion of the main shaft. So
10 it's supported in large part by the main shaft, and held
11 in place, if you will, by the threads on the sleeve.

12 Q. I see. So let me direct you to Figure 2 of
13 Polinski. So can you explain to me how the mantle is
14 held in place by the threads on the sleeve, with
15 reference to Figure 2?

16 A. So as seen in Figure 2, the sleeve has a
17 shoulder 28, that is threaded. And that's, you know,
18 near the lower portion, or it's at the lower portion of
19 the sleeve. And the mantle is attached to those
20 threads, threaded onto those threads, or screwed onto
21 those threads.

22 Q. Via head nut 29; is that right?

23 A. It does have a head nut 29, yes. The head nut
24 29 abuts the upper edge of the mantle to secure it to
25 the tapered portion of the midshaft.

1 Q. And that head thread nut -- strike that.

2 That head nut 29 engages with the annular
3 shoulder 28; is that correct?

4 A. That's correct.

5 Q. Mr. Smith, do you know what the purpose of the
6 counter bore 28 prime is in Figure 2 of Polinski?

7 A. It says, "Additionally, to abate fretting
8 corrosion of the main shaft in the normally high
9 stressed portion of the shaft at the base of the bearing
10 journal 11. The sleeve is counter bored as indicated at
11 28 prime, to prevent engagement between the sleeve and
12 the main shaft in the proximity of the threaded annular
13 shoulder 28."

14 Q. Is that consistent with your previous
15 testimony that fretting is a concern with respect to
16 main shafts of gyratory crushers?

17 A. Yeah, I think that is stated as a way to abate
18 fretting.

19 Q. So would it be your understanding then, that
20 in Figure 2, the arrangement shown with respect to
21 annular shoulder 28, and head nut 29, is an arrangement,
22 "wherein abrupt structural discontinuities in the
23 normally high-stressed regions of the main shaft have
24 been essentially eliminated to minimize the development
25 of fatigue fractures in the shaft." As provided in

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1 column 1, lines 60 to 65 of Polinski.

2 A. Yeah, I think that what you read is correct.
3 That the invention contemplates an arrangement where the
4 abrupt structural discontinuities in the normally
5 high-stressed regions of the main shaft have been
6 essentially eliminated. I think that's talking about
7 the threads, or the area right above or right below
8 threads.

9 I mean, here in Figure 2, though, you can see
10 that there is a radius on the shaft that constitutes a
11 structural discontinuity, and would also introduce a
12 stress concentration. So some of the stress
13 concentrations, particularly due to the threads, have
14 clearly been eliminated. But it hasn't removed all of
15 the discontinuities or stress concentrations.

16 Q. So the radius on the shaft that you pointed
17 to, would that be the radius that's shown in Figure 2,
18 just to the left of reference numeral 31? Is that what
19 you are pointing to?

20 A. Yeah, the bottom portion of that radius
21 section is just left of the numeral 31.

22 Q. Okay. Now, let me introduce what was
23 previously marked as Exhibit 1008, and is 01381 IPR, the
24 Piepho patent. At least that's how I pronounce it.

25 (Exhibit 5 marked.)

1 Q. (BY MR. ARJOMAND) Mr. Smith, are you familiar
2 with the Piepho patent, Exhibit 5?

3 A. Yes.

4 Q. And have you read the Piepho patent in its
5 entirety?

6 A. I have.

7 Q. And would you say, that you understand
8 everything described in the Piepho patent?

9 A. I believe so.

10 Q. So I did want to ask you again, a question
11 that I asked you with respect to Polinski. What did you
12 understand to be the purported invention of the Piepho
13 patent?

14 A. My understanding is that Piepho introduces a
15 coating that can be placed on the shaft to reduce or
16 eliminate fretting.

17 Q. And what type of apparatus is Piepho directed
18 to?

19 A. My recollection is that it's directed to a
20 coal pulverizer.

21 Q. And do you have any experience as an expert
22 with coal pulverizers?

23 A. Not specifically, no.

24 Q. Would it be possible for you to explain to me
25 how the coal pulverizer operates? Maybe as it's

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1 explained on Piepho, if that's easier for you?

2 A. So the Piepho reference to my recollection
3 doesn't specifically describe the inner workings of the
4 coal pulverizer. It does talk about cyclic motion, but
5 maybe focuses on the main shaft. So I recall going and
6 looking at the website for BMW coal crushers, but I
7 don't recall specifically at this point how it works.

8 Q. Would you say that a coal pulverizer
9 experiences cyclic loading?

10 A. Yes, the Piepho reference describes that the
11 pulverizer operation generates cyclic or alternate type
12 of bending loads in the top end of the main shaft.

13 Q. Is that a different type of cyclic bending
14 loads compared to gyratory crusher, such as in Polinski?

15 A. It could be. But the gyratory loads would
16 also result in bending loads on the main shaft in
17 Polinski. So I would imagine that they are the same or
18 very similar. But not knowing exactly how the Piepho
19 for the coal crusher, or coal pulverizer in Piepho
20 works, I can't imagine that they are exactly the same,
21 but I imagine they are very similar.

22 Q. With respect to Piepho, does it describe that
23 cyclic bending loads frequently lead to fretting,
24 corrosion, and fatigue failure?

25 A. My recollection is that that is what it talks

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1 about.

2 Q. Do you want to take a moment to take a look at
3 Piepho to confirm that?

4 A. Can you repeat your question again, so that I
5 know?

6 Q. Sure?

7 A. A specific phrase that I'm looking for.

8 Q. Sure. With respect to Piepho, does it
9 describe that cyclic bending loads frequently lead to
10 fretting, corrosion, and fatigue failure?

11 A. It does say that it is believed that failures
12 occur because of bending fatigue originating at fretted
13 surfaces in the lower contact land with the yolk pushing
14 bore.

15 Q. Where are you reading, Mr. Smith?

16 A. That's in column 1, approximately line 46.

17 Q. And it says further on line 48, "fretting
18 damage sometimes referred to as fretting corrosion is a
19 condition of surface deterioration brought on by very
20 small relative movements between bodies and contact"?

21 A. That's correct.

22 Q. So going back to my original question. With
23 respect to Piepho, does it describe that cyclic bending
24 loads frequently lead to fretting corrosion and fatigue
25 failure?

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1 A. I think it says, that relative movement
2 between two surfaces can lead to the fretting corrosion,
3 and fretting can lead to fatigue, bending fatigue. Yes.

4 Q. And that's that relative movement
5 between -- strike that.

6 That relative movement in the case of a coal
7 pulverizer would be between the shaft and bore of the
8 yoke; is that correct?

9 A. That's my understanding, yes.

10 Q. So would you have any reason to doubt Piepho,
11 that the relative movement between the shaft of the coal
12 pulverizer and the bore of the yoke, would lead to
13 fretting damage and fatigue failure?

14 A. No, I don't have any reason to disbelieve
15 that.

16 Q. So in your understanding, how does Piepho
17 mitigate, I guess, it would be a fretting-induced
18 fatigue failure; is that right?

19 A. Yes. So my understanding is that Piepho
20 provides an intervening material between the shaft and
21 25, and the mating bore in yoke bushing 18, fitted
22 within the bore of yoke 12 to prevent fretting damage.
23 It says that -- it also says that that intervening
24 material can be applied without -- it says, the existing
25 shaft in yoke geometries need not to be changed." Is

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1 one of the advantages of the present invention.

2 Q. Is it your understanding that intervening
3 material must be refined to a high finish?

4 A. It does say that the material must be suitable
5 for refinement of its surface to a high finish for
6 accurate fit up.

7 Q. How do you understand that -- strike that.
8 What do you understand that to mean?

9 A. That the surface of the material that is
10 sprayed on must be able to be refined to have a high
11 finish, so that it can mate appropriately with the other
12 component, whether it's on shaft or on the yoke.

13 Q. So just stepping back. This intervening
14 material would reduce the relative movement between the
15 shaft and the bore of the yoke; is that right?

16 A. My recollection is that it doesn't reduce that
17 movement, but rather that it allows that movement
18 without causing fretting.

19 Q. I see. Is that intervening material would
20 reduce the local stresses in the shaft; is that your
21 understanding?

22 A. I don't recall that specifically, that it
23 reduces the stress. But it appears to make it -- make
24 the surface more resistant to the initiation of cracking
25 of fatigue cracks.

1 Q. Let me turn you back to Exhibit 4, which is
2 the Polinski reference. So let me just direct you to
3 Figure 1 of Polinski.

4 A. Okay.

5 Q. So based on your understanding of gyratory
6 crushers, where would this cyclical bending loads be
7 experienced in the Polinski gyratory shaft?

8 A. So I think essentially the whole shaft is
9 going to be subjected to bending. The bending stresses
10 will be greatest towards the center of the shaft as it's
11 supported at the ends, and the force is applied near the
12 center.

13 Q. So if you can let me know by kind of proximity
14 to a reference numeral, what you would understand to be
15 the center of the shaft in Figure 1 of Polinski, that
16 would be helpful?

17 A. Sure. So there is an upper end of the shaft,
18 generally indicated at around 34, 35. There is a lower
19 end of the shaft, generally indicated around 18. And
20 approximately halfway in between those, it would be the
21 center of the shaft. And you would expect the bending
22 stresses to be highest towards the center. And they may
23 not be exactly the center, depending on geometry. But
24 you will have more as the forces are applied to the
25 mantle during the crushing operation, which is generally

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1 indicated at ten, I believe. Then, you know, you'll
2 have higher bending moments in the center of the shaft
3 as it's vertically arranged, than you will have at
4 either the upper end or the lower end.

5 Q. So just to summarize, in your opinion,
6 Polinski discloses that the shaft and gyratory crusher
7 experiences cyclical bending loads. And Piepho also
8 describes that the shaft at the coal pulverizer
9 experiences cyclical bending loads; is that correct?

10 A. Yes, that's correct.

11 Q. And both Polinski and Piepho are directed to
12 addressing fatigue failure associated with the
13 respective cyclical or cyclic bending loads; is that
14 correct?

15 A. Yes, Polinski addresses fatigue failure due to
16 the stress concentration of the threads, and the
17 discontinuities right next to the threads, which is a
18 high stress area. And Piepho discusses reducing
19 fatigue-related damage in areas where fretting has
20 occurred.

21 Q. Okay. Now, let me introduce Exhibit 2004
22 previously marked in the 01381 IPR proceeding. But
23 we'll mark it as Exhibit 6 to this deposition.

24 (Exhibit 6 marked.)

25 Q. (BY MR. ARJOMAND) Mr. Smith, do you recognize

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1 this document, Exhibit 6?

2 A. I believe it was produced with respondent's
3 expert's declaration, but I haven't read through it
4 thoroughly at this point.

5 Q. Do you recognize the book "Engineering
6 Tribology"?

7 A. This is not a book that I have on my shelf.

8 Q. Do you know what engineering tribology means?

9 A. Tribology, my understanding is that it
10 generally relates to bearing surfaces, and the
11 interaction between those.

12 Q. So would it be fair to say -- strike that.

13 Previously, you testified that you hadn't read
14 through Exhibit 6 from start to finish; is that correct?

15 A. That's correct.

16 Q. Do you recall the portions of Exhibit 6 that
17 you did review?

18 A. I just reviewed the portions that were cited
19 in the other expert's report.

20 Q. The portions that you reviewed of Exhibit 6,
21 would it be fair to say, that you understood those
22 portions?

23 A. I don't know that I've gone into it in that
24 depth. I've read through the report, but I haven't
25 completely analyzed it at this point.

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1 Q. And would it be fair to say, that the design
2 of gyratory rock crushers requires an understanding of
3 engineering tribology?

4 A. Yes, I think so, to some extent.

5 Q. "To some extent" meaning?

6 A. It's something that comes up during the design
7 of that. It's, you know, one of many things, but
8 something that does come up.

9 Q. All right. Let me direct you to page 593 of
10 Exhibit 6. This is the native page of the Exhibit. The
11 stamped page, I believe, would be page 5.

12 A. Okay.

13 Q. And I want to direct you to the second full
14 paragraph on native page 539, stamped page 5. And take
15 a moment to read that paragraph to yourself. And let me
16 know when you are ready?

17 A. Okay.

18 Q. Ready?

19 A. Yeah.

20 Q. So, I guess, for us to understand this
21 paragraph, I would like to ask you what your
22 understanding of an interference fit is?

23 A. So an interference fit is a fit where if we're
24 talking about for a hole, or a shaft, or a sleeve, the
25 outer diameter of the shaft is larger than the inner

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1 diameter of the sleeve.

2 Q. And why is an interference fit used in the
3 context of gyratory rock crushers?

4 A. Did you say, why is it used?

5 Q. Uh-huh.

6 A. It's used to connect the sleeve to the shaft
7 in a way that there is very little relative motion.

8 Q. So in -- strike that.

9 In the paragraph on native 593, of Exhibit
10 stamped page 6, stamped 5. It does talk about some
11 amount of siding with respect to interference fits
12 between the two members; is that correct?

13 A. That's correct.

14 Q. And would you agree with that?

15 A. I don't have any reason to disagree.

16 Q. And would you agree with that -- strike that.

17 Are you familiar with the concept of slip, and
18 no slip regions in interference fits?

19 A. To some extent.

20 Q. Okay. Can you explain that to me -- or strike
21 that.

22 Can you explain the concept of slip and no
23 slips regions in an interference clip for me?

24 A. My understanding is that, you know, in some
25 areas, there will be some relative motion or slip, and

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1 in some areas, there will not be.

2 Q. Okay. And in the areas where there would be
3 slip, how does that relate to fretting?

4 A. My understanding is that is where fretting can
5 occur.

6 Q. So would it be fair to say, that a slip
7 between two surfaces via interference fit, is a source
8 of fretting?

9 A. Yes, I think that's fair to say.

10 Q. And where at, based on your experience, is it
11 more likely to -- strike that.

12 In your experience, where is slip more likely
13 to occur? Let's go off the record.

14 (Lunch recess.)

15 MR. ARJOMAND: Back on the record.

16 Q. (BY MR. ARJOMAND) Mr. Smith, during the lunch
17 break, did you speak with counsel, Mr. Sanks about your
18 testimony?

19 A. No.

20 Q. So before our lunch break, we were discussing
21 engineering tribology, which I believe has been marked
22 as Exhibit 6 for this deposition. Do you recall that?

23 A. I do.

24 Q. And we were discussing the concept of slip and
25 no slip regions. And do you recall that?

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1 A. I do.

2 Q. And I wanted to know where you thought that
3 the slip was most likely to occur between two surfaces
4 in contact for an interference fit situation, I presume?

5 A. Yeah, my understanding is that the slip, if it
6 happens, will be towards the outside edges of the
7 interference.

8 Q. So what do you mean by "outside edges"?

9 A. So, for example, if you have a shaft with a
10 sleeve that has an interference fit, you will more
11 likely get relative motion at one end or the other of
12 the sleeve as opposed to in the middle of it, along its
13 axis.

14 Q. And can you explain to me why slip would more
15 likely occur at the outside edges between two surfaces
16 in contact?

17 A. My understanding is that there is less holding
18 it in place at that point, so it has a higher likelihood
19 of moving.

20 Q. Let me direct you to page 595 of Exhibit 6,
21 that's stamped page 7.

22 A. Okay.

23 Q. And take a minute to read the second full
24 paragraph on that page, that begins with the "Contact
25 That's Characterized." Do you see that?

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1 A. I do.

2 Q. Let me know once you've finished reading that
3 paragraph?

4 A. Okay.

5 Q. Do you understand, the paragraph that begins
6 with the "Contact That's Characterized" on page, data
7 page 595 of Exhibit 6?

8 A. I think so.

9 Q. Do you agree with the paragraph?

10 A. I have no reason to disagree.

11 Q. And do you think that when it says that
12 slip... is a source of fretting damage, and the edges of
13 the contact are most vulnerable. That's consistent with
14 your earlier testimony about slip occurring most likely
15 at the outside edges?

16 A. Yes, I would agree that that is consistent.

17 Q. You previously testified that "my
18 understanding is that there is less holding it in place.
19 So it's higher -- so it has a higher likelihood of
20 moving." Do you recall that testimony?

21 A. I do.

22 Q. That was in relationship to why slip would
23 more likely occur at the outside edges between two
24 surfaces and contact?

25 A. That's correct.

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1 Q. Could the reason that slip is more likely to
2 occur at the outside edges between two surfaces and
3 contact, be also related to the pressure differentials
4 rather than "less holding in place"?

5 A. I think they are probably related.

6 Q. Could you explain that?

7 A. So stress and deflection are very related.
8 And if you have more force towards an outside edge of a
9 sleeve, for example, or an upper or a lower edge of a
10 sleeve, if we're looking at a vertically aligned sleeve.
11 Then there is less material to resist that force, and
12 you would expect more deflection. And so you would have
13 a lower pressure, because that force caused the
14 deflection.

15 If you are more in the center of the bushing
16 or the sleeve, then you are going to have -- and you
17 apply a force, then that's going to be taken out by the
18 portions of the sleeve adjacent where the force is
19 applied. And so that force will distribute, but will be
20 at a higher pressure, because there is less deflection.

21 Q. How would your analysis or your testimony
22 change if one of the edges is a groove?

23 A. One of the edges of what?

24 Q. We were talking about one of the edges of the
25 two surfaces in contact.

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1 A. So if there is an undercut, for example, like
2 we talked about in Polinski.

3 Q. Uh-huh.

4 A. So Polinski teaches that the undercut would
5 serve to abate fretting, or cause less fretting.
6 Although my recollection, if we look at Piepho at the
7 end of column 1, top of column 2. It says, "because of
8 the foregoing, there have been many attempts to correct
9 main shaft failure frequency, such as employing
10 anti-seize compound at the taper joint using a bushing
11 busing with an undercut center portion, using full
12 contact bushings with no undercut center portion shot
13 being nitrating as a surface hardening process.

14 Remedial efforts notwithstanding, even
15 carefully fitted taper joints once subjected to cyclic
16 bending forces, often exhibit vulnerability to fatigue
17 failure, because of the fretting and strain produced
18 within the assembly." So Piepho, essentially teaches
19 whether it's undercut or whether it is not undercut, you
20 are still likely to have a problem with it, if you are
21 going to have a problem.

22 Q. When you say your Piepho teaches whether it's
23 undercut or not undercut, you are still likely to have a
24 problem with it. What does a problem with it mean?

25 A. So it says, "One subjected to cyclic bending

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1 forces fitted taper joint, soften exhibit, vulnerability
2 to fatigue failure of shafts, because of fretting, and
3 strain produced within the assembly."

4 Q. So I'm just trying to, again, understand what
5 you meant by Piepho teaches whether it's undercut or
6 undercut, you are still likely to have a problem if you
7 are going to have a problem? Can you just explain that
8 one more time for me?

9 A. Sure. So if, in your particular application,
10 fretting is a problem that you are dealing with. Piepho
11 teaches, and it sounds like they've experimented and
12 gone through this with bearings with undercuts, and
13 bearings without undercuts. And that doesn't make a
14 noticeable difference. You are still going to end up
15 with the same fatigue induced failures, whether or not
16 it's undercut.

17 Q. So if you have, let's say, two surfaces in
18 contact. One surface being a shaft, the other surface
19 being a sleeve with a groove. Would slip more likely
20 occur at the outside edges associated with the groove in
21 the sleeve and shaft?

22 A. Saying would it more likely occur at the
23 outside edges of the sleeve, or the outside edges of the
24 groove within the sleeve?

25 Q. Let's start with the first ones. Would it be

1 more likely to occur at the outside edges of the sleeve?

2 A. Yes, I think that's where we discussed that it
3 would be most likely to happen.

4 Q. And what about at the outside edges of the
5 groove within the sleeve?

6 A. I don't know for certain. That's not
7 something that I've analyzed at this point. But based
8 on the teachings of Piepho, if there is a difference
9 with an undercut, or without an undercut, such as a
10 groove. There is not enough substantial difference to
11 really move the physical needle as it pertains to
12 fatigue failures.

13 Q. All right. Turning back to the engineering
14 tribology near page 595 of Exhibit 6. Do you see the
15 figures that are shown, or three figures that are
16 labeled as Figure 15.1?

17 A. I do.

18 Q. Do you think you could walk me through those
19 figures?

20 A. As to what?

21 Q. Just explain them to me.

22 A. As I told you earlier, I haven't gone through
23 this document and really analyzed it, and make sure I
24 understand everything. So without doing that, I don't
25 think I could do that at this point.

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1 Q. Okay. All right. Let me place in front of
2 you what was previously marked as Exhibit 2006 in the
3 01381 IPR proceeding.

4 (Exhibit 7 marked.)

5 Q. (BY MR. ARJOMAND) So have you seen Exhibit 7
6 before, Mr. Smith?

7 A. My recollection is that this was also produced
8 with respondent's expert's declaration. But I haven't
9 reviewed or studied it at this point.

10 Q. Have you reviewed Exhibit 7 at all?

11 A. Not more than just a brief scan right now.

12 Q. Okay. Let me direct you to native page 231 of
13 Exhibit 7.

14 A. Okay.

15 Q. So on page 231, at the left column at the
16 start, there is a paragraph that begins with the
17 literature on fretting fatigue. And then it goes on to
18 the following paragraph, that begins with "The fatigue
19 failure." Do you see that?

20 A. I do.

21 Q. If you would read those two paragraphs, and
22 then the following paragraph. And let me know when you
23 are done, I would appreciate it?

24 A. Okay.

25 Q. Do you agree with those three paragraphs in

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1 Exhibit 7, on native page 231?

2 A. I don't have any reason to disagree with it.

3 Q. And specifically, do you agree that fatigue
4 failure is most likely to occur at edges of contact area
5 between two surfaces?

6 A. I think that's a reasonable statement.

7 Q. And would you agree that adding grooves to a
8 shaft in a region fit to a sleeve with an interference
9 fit, would add edges along the contact region?

10 A. I expect that that would create an edge in a
11 contact region.

12 Q. Okay. And do you agree that adding such
13 grooves would increase the likelihood of fretting?

14 A. I think it's possible. I'm not sure that it
15 would lead to a failure, but it would likely increase
16 the likelihood of fretting.

17 Q. Okay. All right. Let me turn you back to
18 Polinski, which we have marked as Exhibit 4. And I
19 would specifically direct you to Figure 1. And let me
20 know when you are there?

21 A. Okay.

22 Q. Do you see elements 34 and 35 in Figure 1?

23 A. I do.

24 Q. And can you explain to me the functionality of
25 components 34 and 35 as they relate to the sleeve 12 in

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1 Polinski?

2 A. 34 is a threaded lug, which is adapted to
3 receive a sleeve nut 35.

4 Q. And what is component 34 used for?

5 A. The sleeve nut 35 is threaded onto 34 to help
6 with the bearing retention is my recollection.

7 Q. All right. Do you mean that components 34 and
8 35 function together to prevent excessive rotation of
9 the sleeve on the main shaft; is that what you mean?

10 A. Yes, it has keyways that help to prevent the
11 rotation of the sleeve on the shaft or -- let's see 37.
12 Yeah, so at least one key 37 welded in a corresponding
13 pair of keyways 38 and 39 spaced on the peripheries of
14 the sleeve nut and the sleeve. So that would help to
15 prevent rotation.

16 Q. Can you explain how that would help prevent
17 rotation?

18 A. Sure. So essentially there is a key, which is
19 usually a rectangular piece of metal that fits into a
20 keyway, which is a groove cut into one or more pieces.
21 And when the key is put into those grooves, it prevents
22 rotation of one relative to the other. It holds them in
23 place rotationally.

24 Q. All right. So let me now turn your attention
25 to Figure 1 of Piepho, which we've marked as Exhibit 5.

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1 A. Okay.

2 Q. What is the component 12 in Figure 1 of
3 Piepho?

4 A. 12 is described as the yoke.

5 Q. And what's the purpose of the yoke 12 in
6 Figure 1 of Piepho?

7 A. So it says the pressure required for efficient
8 grinding is obtained from externally adjustable dual
9 purpose springs 10. The bottom ring 6 is driven by the
10 yoke 12, which is attached to the vertical main shaft
11 assembly 13 of the pulverizer. The bottom ring 6 is
12 driven by -- sorry. I just read that. The top ring 4
13 is held stationary by the dual purpose springs 10.

14 So it looks as though there are a number of
15 components, including the yoke 12, that are involved in
16 adjusting the pressure for efficient grinding, and also
17 holding the pieces stationary.

18 Q. What is yoke 12 in Figure 1 of Piepho attached
19 to?

20 A. Attached to the vertical main shaft assembly
21 14 of the pulverizer.

22 Q. Do any portions of the main shaft 14 extend
23 above the yoke 12 within the pulverizer shown in Figure
24 1?

25 A. It does appear that there is, again, a

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1 threaded portion that extends above that.

2 Q. All right. Now, let me direct you, while
3 we're still in Figure 1 of Piepho, to element 18. What
4 is that?

5 A. 18 is described as a yoke bushing.

6 Q. Okay. And do you see that at the bottom of
7 yoke bushing in Figure 1 of Piepho, there is a flange?

8 A. It does appear to be a flange there, yes.

9 Q. What is the purpose of that flange?

10 A. I'm not entirely sure. I don't think the
11 patent specifies the purpose of the flange.

12 Q. Do you think that flange could be supporting
13 yoke 12?

14 A. That might be possible, but I don't know one
15 way or the other.

16 Q. Okay. Do you think it could help
17 prevent -- strike that.

18 Do you think that flange in bushing 18 could
19 help prevent sliding of the bushing, I guess, with
20 respect to both the shaft and the yoke 12?

21 A. Can you say that one more time?

22 Q. Yeah. Strike that. Let me ask that question
23 differently.

24 Aside from providing support for the yoke 12,
25 is there anything else that that flange could be for, in

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1 your opinion?

2 A. As I said before, I don't know one way or the
3 other whether it actually supports the yoke 12. The
4 patents, to my recollection, doesn't describe the
5 purpose of that at all. So I really would just be
6 guessing.

7 Q. So I wanted to turn back to a question that I
8 just asked you about five minutes ago. I asked you, do
9 any portions of the main shaft 14 extend above the yoke
10 within the pulverizer shown in Figure 1 of Piepho? Do
11 you recall that?

12 A. I do.

13 Q. And you testified, "it does appear that there
14 is a threaded portion that extends above that." Do you
15 recall that testimony?

16 A. I do.

17 Q. What is that threaded portion attached to, in
18 your opinion?

19 A. It looks like there are some hex nuts that
20 attached to that.

21 Q. And what is the purpose, in your opinion, of
22 that -- strike that.

23 What is the purpose, in your opinion, of that
24 threaded portion in Figure 1 of Piepho?

25 A. My recollection is that the Piepho reference

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1 doesn't specifically describe what the purpose of that
2 is. My best guess would be that that is used for
3 assembly purposes, essentially to use the nuts to hold
4 something down. Whether that be the yoke bushing 18, or
5 the 2 yoke, itself, I'm not sure. But that would be my
6 best guess.

7 Q. Would it be fair to say, that that threaded
8 portion with the nut and the flanges of the bushing 18
9 sort of sandwiched together the yoke 12, in Figure 1, in
10 Piepho?

11 A. To my recollection, that's not described in
12 the patent. So I don't -- I don't know that there is
13 anything that would say that those are sandwiched
14 necessarily. I don't think there is any compressive
15 force generated there.

16 Q. Putting aside whether there is liked expressed
17 wording in the patent. Just as an expert in the field,
18 taking a look at Figure 1, would that be your
19 understanding of Figure 1 with respect to the threaded
20 nut and the flange 18 -- or the flange of bushing 18?

21 A. So looking at Figure 1, and this is a fairly
22 complex piece of prior art that is not thoroughly
23 explained. There are a lot of things that could be
24 going on that I don't know at this point.

25 Q. Uh-huh.

1 A. That's just not described in the patent.

2 Q. But you would assume that based on your
3 experience, that a flange of bushing 18 has some
4 purpose, otherwise why have it?

5 A. That's reasonable. It's possible that it, you
6 know, is an artifact from, you know, a previous design,
7 or another model where it's used as well. But generally
8 speaking, something like that would likely have a
9 purpose, although it doesn't describe what that is.

10 Q. So based on your experience, what do you think
11 the flange of bushing 18 would be used for?

12 A. As I've said before, it could be used for any
13 number of things. It could be, you know, left over from
14 a previous design where it was used for something. You
15 know, without the description in the patent, I would
16 just be guessing.

17 Q. So is it your position, Mr. Smith, that you
18 are unable to explain the purpose of a component in a
19 figure without a corresponding discussion of that
20 component in the description of the patent?

21 A. That's probably a very overly broad statement.
22 There are probably some instances where that is
23 possible. But here, when we've got a whole schematic of
24 a large complicated piece of machinery, that's not
25 really explained, it's a little bit of a reach without

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1 guessing.

2 Q. All right. Let me turn to the Harless patent.
3 I believe this was previously marked as Exhibit 1033 in
4 the 01381 IPR proceeding. For today, we'll mark it as
5 Exhibit 8 in this deposition.

6 (Exhibit 8 marked.)

7 Q. (BY MR. ARJOMAND) Mr. Smith, have you
8 reviewed the Harless patent?

9 A. I have.

10 Q. Would you say that you understand everything
11 that's described in the Harless patent?

12 A. I believe so.

13 Q. So can you explain to me the operation of
14 Harless with respect to Figure 7, specifically as it
15 relates to the use of the fluid conduits 42 and 44, and
16 the various grooves on the sleeve?

17 A. So my recollection is that there are grooves
18 on the sleeve that are labeled 42.

19 Q. Sorry, if I misspoke. I meant grooves 42 and
20 conduit 44. Sorry to interrupt.

21 A. Sure. There are grooves 42 on the inside
22 surface of the sleeve. There is a conduit 44, which
23 goes through the bore of the shaft. It goes through the
24 shaft, and then has branches that extend up to the
25 grooves on the inside surface of the sleeve. And

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1 high-pressure fluid can be pumped through conduit 44,
2 and into grooves 42, which serves to expand the sleeve,
3 allowing it to be removed from the shaft, and/or put on
4 to the shaft.

5 Q. How does pumping high-pressure fluid through
6 conduit 44 and into grooves 42 expand the sleeve?

7 A. So when the grooves extend circumferentially
8 around the sleeve. And as that area is pressurized, it
9 causes the sleeve to expand, the inside diameter of the
10 sleeve to expand, and conversely causes the outside
11 diameter of the shaft to contract. And the forces that
12 are applied to cause that expansion on the sleeve,
13 result in the diameter becoming slightly larger, and
14 allowing it to slide off of the shaft.

15 Q. Turning to Figure 3, what is the role of
16 grooves 19?

17 A. It says the peripheral surface of the hub is
18 formed with grooves 19 at both sides of the web 18.
19 These grooves being located in approximately radial
20 alignment with the edges of the grooves 15. Both end
21 portions of the hub are thus capacitated to make the
22 small expansion required for shrink fitting it on the
23 shaft. As the groove 15 provides clearance under the
24 web of the gear, no expansion of the hub at this point
25 is necessary.

1 Q. And then it goes on to say, this
2 action -- this column 2 that I believe you are reading
3 at lines roughly 32 to 42. It goes that -- this line
4 42, it goes on to say, the action is illustrated in an
5 exaggerated manner by dotted lines in Figure 3. Can you
6 explain that?

7 A. Yeah. So if we look at Figure 3, you can see,
8 you know, the solid lines of the bearing portion, which
9 is above the fluid conduit and the shaft. And you can
10 see a dotted line where that bottom portion of the
11 bearing would have the diameter increased. And so it
12 moves from the solid lines to the dotted lines.

13 And it's just saying that it can do that
14 without affecting the portion of the bearing above that,
15 which it was indicated by a numeral 18 and whatever it's
16 above that in Figure 3.

17 Q. Why does Harless need grooves 19 in Figure 3?

18 A. My understanding of the need for the grooves
19 is so that the expansion of the bearing diameter can
20 occur without affecting the web of the bearing, and the
21 things that are attached above that.

22 Q. Can you explain that a little further for me?

23 A. So I would assume that that means that there
24 are portions of this bearing that are further away from
25 the shaft, that perhaps might be adversely affected if

1 the whole bearing were to expand. And so they've
2 designed this in a way, where only the lower portion of
3 the bearing closest to the shaft deforms.

4 Q. How is that -- how is that lower portion of
5 the bearing closest to the shaft deforming achieved
6 through grooves 19?

7 A. So it appears that they've designed this in a
8 way that there is a smaller amount of material, where
9 the grooves, between grooves 19 and the bottom of the
10 bearing that comes in contact with the shaft and/or the
11 groove 15. And that creates a portion where bending can
12 occur. So the deflection takes place, you know, in the
13 material between the groove 19 and the shaft. So that
14 the rest of it moves around that point, essentially.

15 Q. So if I'm understanding you correctly. The
16 greatest amount of deflection would be between grooves
17 19?

18 A. No, I don't think that would be the greatest
19 amount of deflection. But that's where the -- I guess,
20 you could think of it as like a fulcrum of where
21 something bends. It's going to bend in that area you
22 know between 19 and the surface of the shaft, or the
23 inside surface of the bearing.

24 Q. I see. So what we've been discussing with
25 respect to grooves 19 in Figure 3, would that analysis

1 apply to the similar grooves in Figure 7, even though
2 those grooves are not labeled on 19?

3 A. I would expect so. But again, as we said,
4 it's not labeled. Let's see. What is 43? It does say
5 that the hub is relieved by groups 43 at each side of
6 these webs, which sounds like it's doing the same thing
7 as the grooves 19 in Figure 3.

8 Q. Okay. Still focusing on Figure 7, at the
9 left -- strike that.

10 In Figure 7, on the left side, there is a
11 component that's not labeled, that is associated with
12 the screw. Do you see that element?

13 A. Are you talking about, if we look at Figure 4,
14 it appears to have something similar indicated by Nos.
15 8 and 9. Is that what you are talking about? Those
16 same components in Figure 7?

17 Q. Yes. Yes, that -- I'm talking about those
18 components. What's your understanding about Figures 8
19 and 9?

20 A. Of components 8 and 9?

21 Q. Yes, I'm sorry. What is your understanding of
22 components 8 and 9 in those two figures?

23 A. So 8 and 9 can be used to push the bearing,
24 seat the bearing onto the shaft.

25 Q. Uh-huh.

1 A. And also keeps it from popping all the way off
2 when you are taking it off of the shaft.

3 Q. Uh-huh. So in Figure 1, there is an 8 and 9.
4 Do you see that?

5 A. I do.

6 Q. And then right under, I guess, element 8,
7 there is a line that seems to correspond to the end of
8 the shaft. Do you see that?

9 A. I'm not sure I follow.

10 Q. Okay. So do you see element 9, in Figure 1 of
11 Harless?

12 A. I do.

13 Q. And do you see element 1, in Figure 1 of
14 Harless?

15 A. I do.

16 Q. And element 1 is referring to a tapered end;
17 is that correct?

18 A. I believe that's correct.

19 Q. And is there in this figure, a vertical line
20 that's shown to reflect the end of the tapered end?

21 A. I expect so.

22 Q. And is there a vertical line that shows the
23 end of washer 8?

24 A. I expect so.

25 Q. And are those two vertical lines in parallel

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1 and crossed by the reference line for element 1 in
2 Figure 1?

3 A. So looking at that, I believe that the side of
4 the washer 8 is going to be flush up against the end of
5 the tapered shaft. The two lines that you see here, I
6 would expect represent either a chamfer or a fillet, a
7 small curve at the end of the tapered shaft, not some
8 space between the two components.

9 Q. And turning to Figure 4, do you see the washer
10 8 in that figure?

11 A. I do.

12 Q. And do you see the tapered shaft?

13 A. I do.

14 Q. And would you understand the two parallel
15 lines between those elements to have a small curve or a
16 chamfer portion of the shaft?

17 A. So in column 3, lines about 67, 68, Figure 4
18 show the construction in which it's, being the bearing,
19 is displaced outwardly of the shaft from a central
20 location. The construction and operations are in other
21 respects, the same as in the construction of Figures of
22 1 to 3. So I think in Figure 4, there is actually a
23 gap. But as it says, that's different than Figures 1
24 through 3.

25 Q. All right. Now, turning to Figure 7.

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1 A. Okay.

2 Q. What do you understand to be the relationship
3 between, I guess, what we've been referring to as
4 element 8, the washer and the tapered shaft?

5 A. So in column 4, it discusses Figure 7, it
6 says, the invention may also be applied to double webbed
7 gears, where both webs extend radially. And such an
8 application is shown in Figure 7. In this case, the hub
9 40 has a pair of radial webs 41. And the hub is
10 relieved by grooves 43 at each side of these webs. The
11 oil bore 44 has branches for supplying oil to both of
12 the grooves, 42 as indicated. The construction and
13 operation is otherwise the same as in the embodiments
14 previously described.

15 So in Figure 7, I would imagine, or as
16 previously described, the bolt in 9, and the washer 8
17 are used to push the bearing or the hub onto the shaft.
18 So I expect that would get to a point where it was flush
19 as well with the end of the shaft. It would get to a
20 point where the washer 8 is flush with the end of the
21 tapered shaft.

22 Q. And would there be a chamfer or a fillet
23 associated with the end of the shaft in Figure 7 of
24 Harless?

25 A. That's possible, yes. I don't know for sure,

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1 but it's possible.

2 Q. So how do you understand the vertically
3 parallel lines that are shown in Figure 7, between the
4 washer 18 -- sorry. Strike that -- the washer 8 and the
5 tapered shaft?

6 A. Yeah. So here, there are three vertical
7 lines, and the patent doesn't really describe what each
8 of them are. So I'm not sure what to tell you.

9 Q. Okay. Let me direct you back to Figure 3 of
10 Harless, where we were discussing grooves 19.

11 A. Okay.

12 Q. Do you recall that?

13 A. I do.

14 Q. So in the operation, or the pressurized fluid
15 is being applied, would the portions that are further
16 away from 18, axially further away from 18, expand more
17 than the portions that are closer to element 18?

18 A. I think as we were discussing before, the
19 portions of 18 that are further away from the axis,
20 don't move at all. All of the motion is shown in the
21 bottom block where the grooves 19 are. And that's why
22 those grooves exist is so that the bottom block moves,
23 and the top portion where 18 is doesn't expand radially.

24 Q. I think you are referring to the axis of 18.
25 And I was more referring to, I guess, the axial

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1 direction of the shaft.

2 A. Okay. Apparently, I misunderstood the
3 question. Do you want to start over?

4 Q. Yeah, let me. I'm sorry if I confused you.
5 So is it your understanding that the portions axially
6 further from web 18, in Figure 3, expand more, while the
7 portion beneath web 18 expands less. And by axially,
8 I'm referring to the axial direction of the -- I guess,
9 the longitudinal direction of the shaft?

10 A. So let me see if I understand that.

11 Q. I might have butchered it again. I think I
12 might have butchered it again. Sorry. Let me ask it
13 again.

14 So I'm trying to understand if there is a
15 difference between the expansion of the portion under 18
16 versus the portions away from 18?

17 A. When you say "the portions away from 18," are
18 you talking about those blocks on either side of the
19 grooves 19?

20 Q. Yes, right.

21 A. Yes, I think as the patent describes, and as
22 we discussed earlier, the portions away from 18 are the
23 two blocks and the grooves are what move, represented by
24 the dotted lines. So it will move from an initial
25 position where the solid lines are drawn. And the two

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1 outside blocks will move, or essentially pivot, around a
2 point, you know, near the grooves 19. And the portion
3 18 in the middle doesn't move, because there are no
4 dotted lines around 18.

5 MR. ARJOMAND: Okay. Let's take a five minute
6 break.

7 (Recess.)

8 MR. ARJOMAND: Back on the record.

9 Q. (BY MR. ARJOMAND) Mr. Smith, can you turn to
10 Exhibit 2, which is your 090 declaration?

11 A. Okay.

12 Q. And I wanted to direct you to paragraph 5 of
13 your declaration. It's on page 2.

14 A. Okay.

15 Q. Take a moment to read that paragraph.

16 A. Okay.

17 Q. So you list the products -- strike that. You
18 list some of the products that you've consulted on in
19 the past, including drill rigs, pipe breakers, brick
20 saws, auger conveyors, belt conveyors, dry bulk
21 trailers, rock slingers, dump trailers, and other
22 hydraulic equipment; is that correct?

23 A. That's correct.

24 Q. Do you think that listing of products that
25 you've worked on is the closest to the subject matter of

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1 the patents in these proceedings relating to gyratory
2 rock crushers?

3 A. I would say, that's a good sampling. And
4 these all deal with rotating components, with shafts,
5 and sleeves, and bushings, and that sort of thing.

6 Q. Is there, as you sit here today, any product
7 that you've consulted on that you think is closer to a
8 gyratory crusher beyond the ones that you've listed here
9 in paragraph 5 of your declaration?

10 A. I can't think of anything that might be
11 closer.

12 Q. Did you draft your declaration on your own?

13 A. I believe, if I'm going to be honest, I really
14 don't remember at this point. I know I was involved
15 heavily. I don't know if most of the drafting was
16 done -- I believe most of the drafting was done by me
17 and one of my employees, but that's my best
18 recollection.

19 Q. And may I ask, who is that employee that
20 helped you draft your declaration?

21 A. If I remember right, it was Nathan Macdonald.

22 Q. And he prepared both your declaration and the
23 01380 proceeding, and the 01381 proceeding?

24 A. I expect that he was involved in the
25 preparation. I wouldn't say that he prepared them. But

1 he, under my direction, helped put things together.

2 Q. Okay. No, I didn't mean to imply, that he
3 wrote them. So do you know roughly how long it took you
4 to draft the 090 declaration?

5 A. I think we talked about this a little bit at
6 the beginning of the deposition. I don't have a
7 specific recollection. I don't have my invoices or time
8 sheets in front of me right now. But it's something I
9 could certainly look up.

10 Q. Okay. Was it about a month, two months?

11 A. I would expect that most of the work was done
12 within a two-month time period. But I was probably
13 working on other things during those two months as well.

14 MR. ARJOMAND: Great. I have no further
15 questions.

16 MR. SANKS: No questions here.

17 MR. ARJOMAND: That concludes it then. Off
18 the record.

19 THE REPORTER: Do you want a copy, Mr. Sanks?

20 MR. SANKS: Yes, please. Read and sign.

21 (Deposition concluded at 2:57 p.m.)

22 (Signature requested.)

23

24

25

REPORTER'S CERTIFICATE

I, COLLEEN P. DOHERTY, CSR No. 345, Certified
Shorthand Reporter, certify:

That the foregoing proceedings were taken
before me at the time and place therein set forth, at
which time the witness was put under oath by me;

That the testimony and all objections made were
recorded stenographically by me and transcribed by me or
under my direction;

That the foregoing is a true and correct record
of all testimony given, to the best of my ability;

I further certify that I am not a relative or
employee of any attorney or party, nor am I financially
interested in the action.

IN WITNESS WHEREOF, I set my hand and seal this
12th day of June, 2025.



COLLEEN P. DOHERTY, CSR 345

Notary Public

1109 West Main Street, Suite 220

Boise, Idaho 83702

My commission expires September 7, 2029.

1 TERRY M. SANKS
2 tsanks@firstiniplaw.com

3 June 12, 2025

4 RE: CMS Cepcor v. Sandvik Intellectual Property AB
5 6/11/2025, David Smith (#7405355)

6 The above-referenced transcript is available for
7 review.

8 Within the applicable timeframe, the witness should
9 read the testimony to verify its accuracy. If there are
10 any changes, the witness should note those with the
11 reason, on the attached Errata Sheet.

12 The witness should sign the Acknowledgment of
13 Deponent and Errata and return to the deposing attorney.
14 Copies should be sent to all counsel, and to Veritext at
15 (production-ca@veritext.com).

16 Return completed errata within 30 days from
17 receipt of testimony.

18 If the witness fails to do so within the time
19 allotted, the transcript may be used as if signed.

20

21

22 Yours,

23 Veritext Legal Solutions

24

25

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1 CMS Cepcor v. Sandvik Intellectual Property AB
2 David Smith (#7405355)
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24 David Smith Date
25

1 CMS Cepcor v. Sandvik Intellectual Property AB
2 David Smith (#7405355)

3 ACKNOWLEDGEMENT OF DEPONENT

4 I, David Smith, do hereby declare that I
5 have read the foregoing transcript, I have made any
6 corrections, additions, or changes I deemed necessary as
7 noted above to be appended hereto, and that the same is
8 a true, correct and complete transcript of the testimony
9 given by me.

10

11

12 _____
David Smith

Date

13 *If notary is required

14 SUBSCRIBED AND SWORN TO BEFORE ME THIS
15 _____ DAY OF _____, 20____.

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