IN THE UNITED STATES DISTRICT COURT

FOR THE CENTRAL DISTRICT OF CALIFORNIA

WESTERN DIVISION

POSCO Co., Ltd,

Plaintiff,

vs.

ARCELORMITTAL,

Defendant.

_____/

IPR2025-00370
US Patent No 10,961,602

IPR2025-00371
US Patent 11,326,227

Reference No. 58281-0002IP2
58281-0003IP2

The Zoom Deposition of DIERK RAABE, Ph.D.

10:10 a.m. - 8:09 p.m.

January 15, 2026

REPORTED BY:

STEVEN POULAKOS, RPR

JOB NO: J13930574

POSCO-1078
POSCO v. ArcelorMittal
IPR2025-00370

The deposition of DIERK RAABE, Ph.D. was held via Zoom videoconference on Thursday, January 15, 2026, commencing at 10:10 a.m., before Steven Poulakos, Notary Public.

REPORTED BY: Steven Poulakos, RPR

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EXHIBITS

NONE

P R O C E E D I N G S

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Whereupon,

DIERK RAABE, M.D.,

called as a witness, having been first duly sworn to tell the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

EXAMINATION BY MR. MONALDO

Q Good morning, Dr. Raabe. Can you please state your name for the record?

A My name is Dierk Raabe, and Raabe, the family name is written R-A-A-B-E.

Q Thank you.

Have you been deposed before?

A Yes.

Q So you understand how this is going to work. I'll try to take breaks about every hour, but if you need to take a break at any time, will you please just let me know?

A Thank you.

Q And we'll also plan to break for lunch. Do you have a preference on time you'd like to break?

A I'm fine. Whatever is convenient for you guys, I'm fine.

Q You understand that you've given an oath here today; is that correct?
A That is correct.
Q And that oath requires you to tell the truth, correct?
A Correct.
Q And you'll agree to do that today?
A I agree to do that today, yes.
Q If at any point of the deposition you want to supplement or change an answer that you've given, will you please let me know?
A I will.
Q Is there any reason you can't give your best most accurate testimony today?
A No, there's no such reason.
Q What sort of preparation did you do for today's deposition?
A I was essentially revisiting my report, my declaration report and the associated sources that are given in the report.
Q Did you meet with counsel?
A I've been meeting with counsel.
Q How many meetings did you have?
A I had essentially on three days, we had discussions in each day for several hours.

Q So about how long in total did you meet with counsel?
A In total, maybe like 20, 25 hours, something like that, altogether just very rough number.
Q Okay.
MR. LaMAGNA: Can we temporarily go off the record?
(A discussion was held off the record.)
BY MR. MONALDO:
Q So, Dr. Raabe, do you understand that we're covering two proceedings involving two patents during today's deposition?
A I do understand.
Q The first proceeding is numbered IPR2025-00370 and that involves U.S. Patent Number 10,961,602. I'll refer to that patent today as the '602 patent. Is that okay?
A That is okay.
Q The second proceeding is numbered IPR202500371. It involves U.S. Patent Number 11,326,227. I'll refer to that patent today as the '227 patent. Is that okay?
A Okay.
Q You understand that the specifications and the drawings of the '602 patent and the '227 patent are

generally the same, correct?

A Correct.

Q So to save time and make both of our jobs easier, I will primarily refer to the '602 patent today. Given the similarity between the patents and the issues involved in the two proceedings, my questions will apply equally to both the '602 and the '227 patents unless I specify that a question applies to only one of the patents. Is that okay with you?

MR. LaMAGNA: Objection, compound, vague.

THE WITNESS: Yes, that is okay.

BY MR. MONALDO:

Q And when you answer a question, I will assume your answer applies equally to both the '602 and '227 patent unless you specify that an answer applies to only one of the patents. Is that okay?

MR. LaMAGNA: Same objection.

THE WITNESS: That is okay.

BY MR. MONALDO:

Q Did you review the '602 and '227 patents as part of your preparation for the deposition?

A I did.

Q Did the '602 and '227 patents make sense to you?

A They did.

Q I'd like to turn to your declaration which is Exhibit 2040 as it relates to the '602 patent proceeding. Do you have that in front of you?

A I have a printout in front of me, yes.

Q Do you have any corrections or changes that you want to make to the declaration at this time?

A No.

Q Did you draft the declaration?

A Yes.

Q Did anyone help you with the drafting of the declaration?

A I had some minor editorial support from counsel.

Q And did counsel help you prepare any of the opinions set forth in the declaration?

A The opinions are mine.

Q So the opinions are all yours and yours alone, correct?

A That is correct.

Q Can I turn you to paragraph 17 of your declaration?

A Yes. I'm there.

Q You'd agree with me that that paragraph states that you considered all the documents cited in your report and the Miles declarations and all

documents cited there and/or attached thereto, correct?
A Correct.
Q Those materials did not include any materials related to patent notice products, correct?
A Correct.
Q So you did not consider patent notice products as part of your analysis for this declaration, correct?
A Correct.
Q Can I move you to paragraph 33 of your declaration?
A Yes. I'm there.
Q So for paragraph 33, you see that it states that you used Dr. Miles' description of POSITA which is an acronym for person of ordinary skill in the art; is that correct?
A That is correct.
Q And that definition covers someone that would have at least an undergraduate degree in material science, manufacturing engineering, mechanical engineering or equivalent knowledge, training or experience with at least two years of experience working in metallurgy, correct?
A That is correct.
Q Is this the definition you applied in the

analysis set forth in your declaration?

A Yes. That's the definition I applied for POSITA, correct.

Q And so in paragraph 35 of your declaration, you mentioned a steel worker working on the line at a plant. Do you see that?

A Let me revisit it. You're at paragraph 35?

Q Correct.

A I read here, for example, Dr. Brown testified that a steel worker working on a line at a plant would qualify as a POSITA. That's from Dr. Brown.

Q Do you think a steel worker working on the line at a plant qualifies as a POSITA under the definition set forth in paragraph 33?

A I would think first of all I was interested or a bit surprised that the two experts have not the same opinion. I found that surprising on how to define such a POSITA. I would rather stick with the definition that Dr. Miles has given, so I think the suggestion of Dr. Brown that you just need some time as a steel worker working on a line would be enough, I don't think that it's very convincing. So I would rather go with the definition that Dr. Miles has given.

Q Okay. And that description is in paragraph

36 of your declaration, correct?

A That is correct.

Q So you agree with Dr. Miles' statements at paragraph 36, correct?

A I agree with Dr. Miles' suggestion that what Dr. Brown had stated would not fully qualify as a POSITA.

Q In your declaration, did you apply the standard described at paragraph 36 of your declaration?

A Yes. For a definition of a POSITA, I described what we had described in paragraph 33 and then in 36 just underpinning that I and Dr. Miles have the same understanding.

Q Great. Do you agree with the definition set forth in paragraph 33?

MR. LaMAGNA: Objection, vague.

THE WITNESS: In 36 or the main reference, I would rather prefer what I said in paragraph I think 33 where we gave the definition how we define or how I define a POSITA.

BY MR. MONALDO:

Q So I'd like to clarify that answer. So I'm asking about the definition in paragraph 33. Do you agree that is a good definition for a person of ordinary skill in the art?

A Yes, I agree.

Q And you would agree with the statements in the discussion in paragraph 36 that that person of ordinary skill in the art would have some background in the process of creating these products; is that correct?

MR. LaMAGNA: Objection, vague, misstates the paragraph.

THE WITNESS: Maybe if you give me a second. I would like to reread the entire paragraph or the text of that paragraph. Just to understand your question directly, I think this paragraph 36 reflects rather a discussion among the experts from the Posco side and that is more a citation of their disagreement on how exactly did you find a person of skill in the field while I prefer to adhere to my own definition when I said I agree with Dr. Miles and what's given in section 33.

BY MR. MONALDO:

Q Okay. And to be clear, you do not believe a steel worker working, for example, at a blast furnace in a plant qualifies under the definition set forth in paragraph 33?

MR. LaMAGNA: Objection, vague.

THE WITNESS: The definition of a person of

skill in the field that would have or would be a steel worker working on a line in a plant was not given by me. That was given by Dr. Brown as written down in paragraph 35. And as I mentioned before, that is not how I would define such a person of skill in the field. I would rather prefer to stick with the description I have given in paragraph 33.

BY MR. MONALDO:

Q So, Dr. Raabe, have you ever managed a commercial automotive hot stamping production line?

A I have not managed a commercial line, no.

Q Have you observed how a commercial automotive hot stamping production line operates on a daily basis?

A I have observed the operation of such a line during my 40 years experience very frequently, but I have not observed it on a daily basis.

Q Have you done any research or work with auto manufacturers?

A Yes. I have worked with automotive manufacturers and with OEMs in that field over more than 30 years, yes.

Q When working with the auto manufacturers, do you take into account any specifications that they require for their products?

A When I worked with automotive manufacturers, for instance, on steels, then part of such a communication or part of such a project would be to discuss certain requirements that their product should have.

Q How did they communicate those requirements to you?

A The communication between project partners or discussion partners I had from this field or had from the field was typically in the form of cascade of first identifying what the challenge is, what they want to do with us and then we try to narrow this down to specify the actual academic engineering problem they want to have tackled by me and my team.

Q So in part of your research, are you motivated to meet the requirements and specifications that the auto makers set forth for you?

A When we have certain targets that a product or a steel or coating should have, then that is typically well defined in terms of certain features for that product. And then we ask researchers and project partners of course together with these automotive partners to meet their requirements and often it is a very big portion of that collaboration to really understand how these processes work in detail and how

these process windows have to look like and things like that.

Q Do you find it difficult to find specifications from auto makers in your research?

A It is typically not so much my target or my team's target to look for a range of specifications that auto makers around the globe might have. That is not really the aim of an expert, but what we would instead do is sit down with the specific partner, try to exactly understand what the partner wants to achieve with the researcher or with the engineer or an R&D person and then try to nail that down and pursue that target. I would typically not skim the Internet or the literature on a daily basis for such specs.

Q Do you think you could find such specs if you were interested in them?

MR. LaMAGNA: Compound.

THE WITNESS: I think that is a very wake question because I could imagine from my experience that there might be specifications that you probably can find in literature, in patents or in whatever is made available. While I could also imagine or my experience tells me that sometimes such specifications are not available because maybe the automotive maker does not want to share them with competitors or the

rest of the world. So I think we don't know. The question seems to be too general.

BY MR. MONALDO:

Q But in some circumstances, auto makers are incentivized to make their specifications available to researchers and persons of skill, correct?

MR. LaMAGNA: Asked and answered.

THE WITNESS: When we are in a situation that you develop a project together or have already signed an agreement and do work together on such problems, then it is quite common that either the project partner, so the automotive maker would give you a certain spec to meet or sometimes even they don't like to do that either, but instead just rephrase it in their own words and develop it into the language that an academic person would adhere to and sometimes also because they maybe do not want to share the full spec.

BY MR. MONALDO:

Q If we can turn back to your declaration. I might turn you to paragraph 51.

A Yes, I got it.

Q In paragraph 51, you see that you discuss transfer hot stamping and cooling as part of the process?

A Yes, I see the paragraph.

Q If we move to paragraph 52, the last two sentences in paragraph 52 discuss the cooling step. Do you see that?

A I got the paragraph. Let me just read the sentences. Yes, I see the sentence.

Q Would you agree with me that these sentences state that the cooling step relates to martensitic transformation?

A A cooling step in such a complicated process refers to many different aspects. One important aspect is that you in this specific case that we discuss here today, you want to turn the material through the cooling into martensite, but that is not the only thing that you are doing by cooling. You are changing other things also.

Q What other things are you changing?

A This process of stamping plus cooling such a coated material for a couple of very complicated and, you know, entangled effects. So another one could be, for instance, not just to lower the temperature obviously or as we already said transform the materials into a martensitic state, but you also simply adjust and shape the part because you want to assume a certain part -- shape to fit into whatever car. And so that is another very essential thing that you're doing here.

You shape it.

Q In part of the step, you're shaping the material and you're transferring it into a martensite; is that correct?

A That is correct. And you do a couple of other things also, but those are two very essential things that you're doing plus cooling it of course.

Q What other things are you doing as part of this process?

A You do what we say you also coat it for. That means we do not only talk about a piece of steel, but this piece of steel is coated in a very specific way according to the '602 patent claims with a very complicated layer structure and the steel and these layers are as we say as experts coated for. So you subject them to the same machine.

Q I understand that. I'm talking and referring specifically to the cooling step discussed at the last two sentences of paragraph 52. As part of that step, is there other things occurring other than shaping of the part and the transition to martensite?

A Yes. There are further aspects in this really complicated process. A further aspect would be the rate at which you cool because it does not only affect the martensite that you form or whether you form

enough martensite and so on, but it could also affect the cooling of the coating. Both are cooled. They are not just co-deformed, but they're also cooled together.

Q How does the cooling affect the coating?

A The coating as described in the patent consists of a very complex layer which are characterized by the fusion processes or by processes such as formation of intermetallics. And when you cool this material, this coating layered material together with the steel, you have, for instance, aspects like an individual heat connectivity. So they might cool not exactly at the same rate as the steel beneath, so you must adjust that in your or consider that in your design of this coating process.

Q So does the cooling change the coating in any way?

MR. LaMAGNA: Objection, vague.

THE WITNESS: The main design of the coating is made in the oven prior to the pressing process or cooling process together. That's where many of these foundations are laid as described in the claim, but when you consider the difference, for instance, in the melting points, right, then you now consider putting this compound material from this very high temperature from the oven into such a cooling and

shaping press.

Then it could even in the upper parts of the cooling, it is conceivable that you have further, you know, diffuse processes in the coating because it has a different melting point compared to the base steel which has a hair melting point. So there are further things that you are changing.

BY MR. MONALDO:

Q Could you be more specific on those things that would change in the coating?

A Yes, sure. I could also imagine that you have a certain surface structure from the coating. So when we look into the '602 or '227 patents and look at the micrographs, we don't only see this very complicated result of this process with the different layers resulting from the fusion and intermetallic formation, but you also have a certain superficial layer.

You have an outermost layer and that has also certain topology and roughness, et cetera. And when I put this together with that base in that press, that's where the contact is happening. So it plays for sure also role say how the topology or the shape of this outermost superficial layer looks like from your proceeding process.

BY MR. MONALDO:

Q So the superficial layer, the outer surface, the roughness, that would be impacted by the cooling. Is there anything else as part of the coating that would be impacted?

A I could imagine that there are further aspects where this morphology and chemistry of these layers play a role during the cooling. Do you want me to go further into this?

Q Just interested in understanding exactly what those things would be.

A For instance, I give -- should I elaborate on this?

Q Yes, please elaborate.

A So another aspect I could think of what happens during the cooling is that related to the surface topology and roughness and exact chemical composition formation of intermetallics, the different layers that are described in the patents, they altogether produce a compound heat conduction property. And when we cool it, that means we take out heat of the material, but that heat goes through the contact area. And the contact area is that superficial layer plus these intermetallic and interdiffusion layers beneath.

And so I could imagine that also the exact

composition and layering properties of this surface product has an effect on how the cooling is really kinetic-wise happening, so how quickly or how slow do you get the heat out of the material. It can be more insulation. It could be -- you know, have a higher connectivity. All of these things I believe play a role to achieve the quality that you want.

Q Can I turn you to paragraph 65 of your declaration?

A Yes. I'm at 65.

Q Do you see that paragraph 65 states your opinion that the challenge patent enables a beneficial coating microstructure that is obtained in a repeatable, consistent and robust manner?

A Yes, I see that sentence.

Q And your viewpoint and your opinion on the enablement of the '602 patent is from the perspective of a person of ordinary skill in the art as defined in paragraph 33, correct?

A That is correct.

Q And you would consider the specification and the disclosure in the '602 sufficient to enable a person of ordinary skill in the art as defined in paragraph 33 to make and use the invention claimed in the '602 patent, correct?

A Correct.
Q If I can move you back to paragraph 41 of your declaration.
A I'm at paragraph 41.
Q Paragraph 41 has a quote from the '602 patent, correct?
A Let me read this passage again. Yes, that is correct.
Q And if you go to paragraph 42, you provided a picture of the hot stamping process; is that correct?
A Yes, that is correct.
Q And that picture aligns with your understanding of the process in the '602 patent, correct?
A The picture that I give in paragraph 42 is a very high level and of course highly simplified schematic picture of the essential work flow. It does not contain all the fine details that are described in the '602 patent.
Q But you would agree with me that that is general high level process described in the '602 patent for hot stamping?
A I agree. It's essentially at a high level and schematic level the work flow during that heat treatment and the hot stamping and so on, yes.

Q And you'd agree with me that as shown in the image at paragraph 42 of your declaration there are essentially four high level process steps, that being blanking, heating, transfer and hot stamping; is that correct?

A That is essentially correct, although as you can see that from an icon, actually even the blanking has not shown in terms of an icon, but it's put between the decoiling and the heat treatment indicating that you have a blanking step and so on. So at a very high and schematic level, that is indeed the way how you produce these parts, yes.

Q So it's a relatively simple process at a high level, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: No, that is not a simple process. I said the picture is relatively simple. I did not say the process is simple.

BY MR. MONALDO:

Q So what complicates the process?

A The process to achieve the outcome described in the '602 patent, you need to follow many of these very fine particularly the microstructure details that are discussed and shown in the patent where one of the key features, for instance, is the

occurrence of these four layers together with the specific card that are given like resulting from the fusion and intermetallics and so on. So the details are much more complicated than described in this schematic.

Q As part of the blanking step, is there anything complicated about that process?

A Please can you specify the question a little bit more because you say except for the blanking process whether there's anything -- can you please repeat the question?

Q I am referring to the blanking step itself and I'm saying whether there is anything complicated about the blanking step.

A The blanking step itself refers to cutting suited blanks from the coil. So, again, from the work flow and from the schematic here, it looks like a simple step. And, again, if you were a person responsible for the best possible quality of the blanking, of the quality of the cutting edge and so on, I could imagine that even the details of the cutting blanks are in itself a complicated thing to arrive at a certain desired quality.

Q Did the inventors of the '602 patent invent anything related to the blanking step?

A The blanking step is to the best of my current knowledge, but I would be happy to go back to the patent if you point me at the corresponding portions of that patent, I would say that the blanking is not in the center of the '602 patent.

Q So your assessment is that the '602 patent uses a conventional blanking process, correct?

A I was not really in a position to opine profoundly on that specific blanking step. And it was not -- it's not so much part of my report as you can see, but it was more inherent that when you want to coat a piece of steel, it's likely that you first would want to cut a certain portion out of it to subject it to the described process. But I did not spend much time on contemplating or explaining the blanking step in itself.

Q Fair enough. So at the blanking step, you'd agree with me that you have a piece of steel that is ready to be treated and heated; is that correct?

A Yes, I agree. When you have a cut out blank piece of steel from the coil, then you would next subject it to the process that is described in the '602 patent.

Q And at the blanking step, you'd agree with me that the relative variables in the process relate to

the thickness of the steel and the composition of the steel; is that correct?

A So the starting point or the downstream processes after the blanking would have to take into account a couple of pretty important things whereas you already pointed out the chemical composition of the steel plays a role, but also other aspects such as the thickness of the product and the total mass of the product and things like that.

Q So the primary variables are the thickness and the composition, correct?

A I would not agree to the statement. I think you also would have to know the total mass because sheet steel that is blank has three dimensions. It has a length. It has a thickness and it has a width. And all that together might apply with the respective mass density which again is tied to the chemical composition gives you a number that you would need to consider in your investigations how fast, for instance, heat is taken up by such a process.

Q Okay. And so you'd agree with me there are essentially three variables, the composition of the steel, the thickness of the steel and the mass of the steel, correct?

A I would not quite agree. So you have

indeed listed a couple of very important features that you would need to know for reproducing the '602 claims, but there might be further parameters. I could, for instance, also think of things like the dewpoint in your environment. You might want to know what is the humidity in the environment, for example.

Q So in the process, my understanding is that the steel is precoated with a precoating substance; is that correct?

A Yes. When you go through the process described in the '602 patent, you do that for a base steel that is coated by a certain substance, that is correct.

Q And what are the important parameters of the coating?

MR. LaMAGNA: Objection, vague.

THE WITNESS: Maybe I could ask you to be more specific. Do you refer now to the coating before the sheet goes into the oven?

BY MR. MONALDO:

Q Yes. I'm asking about precoating before it goes into the oven.

A When you -- so parameters you would need to know and study of course is, for instance, things like the chemical composition of the coating substance.

Q So you'd agree with me that the composition of the coating is important, correct?
A The composition of the coating is important for reproducing what is described in the '602 patent, that is correct.
Q You'd agree with me that the thickness of the coating is also important, correct?
A I agree the thickness of the coating is also important.
Q Are there any other attributes of the coating that you would find important in the process of the '602 patent?
A Yes. There are couple of further parameters that I think should be considered when you reproduce the '602 patent. Besides the chemical composition of the coating or the thickness of the coating, you must also like described in the patent bring this into accord and in line with the thickness of the base material because you have a compound system which is developing these layers together. And like we discussed before when, for instance, the material is thicker or thinner, you must consider this for your overall process.
Q So we've discussed several variables, that being the thickness of the steel, composition of the

steel, total mass of the steel, composition of the coating, thickness of the coating and dewpoint; is that correct?

A That is correct.

Q Are there other variables that are important in the process as it relates to the heating step?

A When you refer to the heating step, that is happening when you bring this coated or precoated compound into the oven as described in my schematic. Then there are a couple of process variables that you definitely would want to consider for understanding the heating rate and what the heating rate is doing to your product.

Q So heating rate would be one variable you would consider, correct?

A Heating rate is one variable to consider, that is correct, but we must adhere that the heating rate alone is by nonexperts may be sometimes misinterpreted as a linear transition. But it depends on the type of the oven and type of the coating and so on how the heating rate really looks like for a specific process setup.

Q So your understanding is that nonlinear heating rates would be used as part of this process,

correct?

A That is not correct. So my understanding from the teaching of the '602 patent would be that you need to take the possible ways how you heat the material in the oven into consideration. Whether this is in linear or nonlinear is maybe varying dependent on the setup of your input mass and the type of the coating and the type of the chemical composition of the steel, but the patent '602 essentially teaches that you have to take these parameters into account.

Q Another variable of the heating step is the temperature, correct?

A You are referring to which temperature because the patent describes many temperatures? You referred to the temperature of the sheet or of the oven or what do you mean?

Q The temperature of the sheet as part of the process, the max temperature that you would hold the steel at as part of the heating step.

A We must differentiate here several aspects. Like one is the temperature in the oven, right, the temperature that the oven has. And even that depending on your specific setup could have a different distribution say across the oven or things like that.

The other thing is the temperature that

this compound coated material is acquiring and that's where the heating rate comes into the play as the patent is teaching. That means you do not instantaneously shift the temperature of the steel and the coating when it enters the oven to that temperature, but you need a certain heating rate to arrive at the temperature. So I just want to be specific that the patent is teaching us that you do not want to confuse these two temperatures.

Q And those two temperatures being the heating rate and the temperature that you're trying to achieve, correct?

A No. The -- yet another point. One is the temperature or say temperature distribution that an oven would have, that depends on your specific oven like at home in the kitchen. The second thing is, for instance, something like the starting temperature that the sheet has before you put it into the oven. It's different whether operated in Alaska or in Florida. It's a different temperature.

And then I need as a third temperature to understand coming now or connected to the heating rate how fast this temperature is changing inside of the oven. So, again, my point is that the patent is quite specific that it teaches us that you have to take these

different process variables into consideration to achieve a certain holding temperature that you target for the sheet.

Q Then we talked a little bit earlier today about the cooling step. You would agree with me that a cooling rate and final temperature would be important variables as part of the cooling process, correct?

A Yes. Cooling rate and the cooling process with the different parameters that we discussed before definitely play also a role for final product, yes.

Q Can I turn you -- and you have a copy of the '602 patent with you?

A Let me check very quickly. Yes, I do have a copy of the patent.

Q Okay. Good. Can I turn you to column 7 line about 46 through 50?

A Line --

Q Line 46 through about 50.

A Forty-six, it does not say any column. Okay.

Q Do you see the second sentence in that paragraph talks about a composition of an aluminum alloy with 5 to 11 percent by weight of silicon, correct?

A So I'm in column 7 and apologies. Can you

again say which line you are in now?

Q It is line 47 to 50. It's the second sentence in that paragraph that starts the strip of base steel.

A I got it.

Q And you'd agree with me that that specifies the composition in aluminum alloy coating with 5 to 11 percent weight of silicon, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: From this paragraph in column 7, several ranges of possible silicon compositions in the aluminum are given. So it's 5 to 11.

BY MR. MONALDO:

Q And you'd agree with me that aluminum alloy coating of 5 to 11 percent by weight of silicon is covered by the '602 patent, correct?

A So the '602 patent is covering that you have such a range of silicon in your aluminum for the coating.

Q And you'd agree with me that this teaching here is sufficient to enable a person of ordinary skill in the art to understand the composition of the coating applied to the base steel, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So what the patent is

teaching us is that the chemical composition of the coating given mainly in terms of the silicon content and the base material being aluminum for the coating that these composition aspects need to be carefully taken into consideration to arrive at the claims that you have a certain interdiffusion and intermetallic layer formation because these aspects depend on how the original precoating and the material is composed.

BY MR. MONALDO:

Q But you'd agree with me that the patent states that a coating with 5 to 11 percent silicon is acceptable for the process described by the '602 patent?

A The patent is using coatings of that compositional range as described in the paragraph. And as you can see, it has even further reference to certain calcium content and so on, but essentially, yes, I agree with you that this is a range of aluminum silicon compositions that are used in that patent.

Q And that disclosure is sufficient to enable a person of ordinary skill in the art to understand the composition of the coating, correct?

A The patent goes beyond that. Of course as you correctly say that is the base composition range of possible coating composition, but the main point of the

patent is that this is not enough. But that you must in adherence to certain complicated range of other process parameters make sure that you bring these things in line to arrive at the main point which is you want a certain layered structure, a certain intermetallic formation, certain interdiffusion and the patent teaches us that for that purpose of arriving at these claims, you had need to understand the range of composition that is given here.

Q If I can turn you to column 7 line 36.

A Yes, I'm there.

Q Do you see that the '602 patent describes thickness of the coating between 20 and 33 micrometers, correct?

A That's not quite correct. I would be more specific. Let me read that sentence. A special advantage arises from precoatings whose thickness is comprised between 20 and 33 microns. That means the patent is very specific and says that's the precoating.

Q Yes. Fair point. Agree. So the patent describes a precoating thickness between 20 and 33 micrometers, correct?

A Correct.

Q And we discussed that that coating is one that has aluminum with 5 to 11 percent silicon,

correct?

A Yes, that is correct. That embraces this range of composition plus the minor ingredients that are listed, for instance.

Q If I can turn you to column 7 line 1.

A Yes.

Q Do you see that the '602 patent describes that you heat the coated steel to a temperature between 880 to 940 degrees Celsius, correct?

A Please let me read the complete sentence to double-check. So what this sentence is saying is when we turn to the end of column 6 also to have the full context and not just this small portion of the sentence, it is more specific here. It says things about a certain thickness range from .7 to 3 millimeters are heated for 3 to 13 minutes. This time includes the heating phase which we discussed before and the holding time and then in a furnace heated to a temperature of 880 to 940 degrees. So this sentence speaks about the furnace temperature here.

Q So in this sentence, the '602 patent defines the thickness of the steel between 0.7 to 3 millimeters, correct?

A That is correct.

Q It also defines the heating time to be

between 3 to 13 minutes including the heating phases and the holding time, correct?

A It's a little bit more specific. It says, yes, 3 to 13 minutes and it's more specific in saying the time includes the heating phase and the holding time, yes, correct.

Q And the temperature of the furnace is between 880 to 940 degrees Celsius, correct?

A Correct.

Q Could I turn you to column 7 line 13?

A That's in there.

Q The sentence starting at line 12. Do you see the '602 patent describes a heating rate between 4 and 12 degrees Celsius, correct?

A Yes. Again, it is -- that is correct, but it's also adding in the same sentence for producing a favorable alloy layer disposition.

Q Yes. So your understanding of this is the heating rate described by the '602 patent is a rate between 4 and 12 degrees Celsius per second, correct?

A Correct.

Q And your understanding, that would be a linear rate of heating, correct?

A No, that is not correct.

Q Why do you say this is not a linear rate

for heating?

A Because the patent does not say that. Where is in that sentence the word linear? I don't see it.

Q If you're heating something at a rate of Celsius per second, would a person of ordinary skill in the art consider that covers a linear rate?

A No, because that's not what the sentence is saying. The sentence is saying is comprised between 4 and 12. That is the range and the range can adhere to any kind of function. It says between, so it does not imply automatically it must be linear, no.

Q But linear would be an option, correct?

A The possibility that a linear heating occurs in such a process is not -- mathematically not excluded, but it should be highly unexpected. I think due to the complexities of the process we have discussed before, it can be linear, but it can be something else.

Q Does the '602 patent describe something else beyond linear heating rates?

A The '602 patent is not specifying that let's say you have to have a certain shape of the function. That's not the point of the patent, but the patent says you have to consider all these different

parameters and they are complex, really complicated interplay to reproduce what is claimed namely these four layers with their complicated microstructure and composition.

Q So you'd agree with me that the '602 patent does not describe a particular heating curve or shape at which you would be heating the steel as part of its process, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: The '602 patent makes the point that you have to take first of all the heating rate as one of the many other process parameters properly into account again dependent on the parameters we discussed before like the total mass, your oven setup and so on, but also the patent is also very clear that you must do all of that to be able to reproduce this very complicated microstructure that is described in the claims.

And it makes also very clear that these parameters depend on each other and the dependence of these many variables where the heating rate is one and the shape of the heating rate function is one depends on these other parameters that we already started to discuss.

BY MR. MONALDO:

Q And you'd agree with me that the '602 patent doesn't describe a particular shape of a heating curve, correct?

A The '602 patent is open to shapes. That means it says the target is the microstructure that is described in the claims. And when you put all of these parameters together or let's better say the parameter ranges that we discussed or we discussed some of them how they influence the real heating rate that your material would be exposed to, then the main teaching of the '602 patent is if you do not take these effects into account and by that automatically will arrive at a certain heating rate shape, then you do not reproduce what the patent is teaching.

Q But the patent itself does not describe a heating rate shape, correct?

A Exact shape, exact prescribed shape is not given in the patent.

Q If I could turn you down to line 24 of column 7.

A Yes.

Q You see it lists heating rates again as 6, 7, 8, 9, 10 and 11 degrees Celsius are included and then later in that sentence, it gives out an example of 7.7 degrees Celsius per second?

A Let me read the sentence, please, first.
Q Sure.
A Yes. I had a chance now to revisit that sentence. Can you kindly repeat the question?
Q I'll ask you a different question here. Would you agree with me that a heating rate of 7.7 degrees Celsius per second is not a range?
A A number of 7.7 degrees centigrade is not a range, but it is a number. But we must read that specific number in the context of the sentence before. And I find that sentence is very specific that it says along the lines we discussed before that the rate 6, 7, 8, et cetera, et cetera are included as are all numbers, ranges and subranges. They're between including all numbers between each listed value as it's written and it's entity 7.7.

That means the inventors are here very specific that they say, look, there are certain ranges and there may be certain variations which they then in part have to maybe simplify here into a certain number, but they keep it entirely open that this means that they still can vary during the heating process. That's what the sentence is saying.
Q But if you have a heating rate of 7.7 degrees Celsius per second, that would be a linear

heating rate, correct?

A When they say here in the sentence explicitly, they don't use the word linear heating rate. They don't do that. What they say is you would write it out as a holding point as a simple benchmark in -- at 7.7, but the sentence is very explicit that this is representative of a much more complicated heating process as the preceding portion of that sentence and of course the rest of the patent is describing. So they don't say it's a linear heating rate. They don't say that.

Q But would a linear heating rate of 7.7 degrees Celsius per second in your opinion be covered by the '602 patent?

MR. LaMAGNA: Objection.

THE WITNESS: The patent teaches us essentially that the main thing is to arrive at these complex microstructures that are in the claims. And they say that obviously the heating rate and the heating process together with these many variables on which the true numbers over the cost of the heating would depend must be taken into account. Otherwise you cannot reproduce this layered structure.

In this specific sentence that we currently discuss, they say you can at some point give a rough

benchmark. They give as an example 7.7, but they clearly say in the same sentence before that this steel would cover all ranges or variations. So they don't say by that it must be a linear heating rate like 7.7. They also do not exclude that.

MR. LaMAGNA: We've been going for about an hour now. Would it be a good time to take a break coming up?

MR. MONALDO: Let me just ask a few more questions along these lines and we can take a break.

BY MR. MONALDO:

Q So when you say the patent doesn't exclude a linear heating rate of 7.7 degrees Celsius per second, in your opinion, it includes a process where the heating rate is 7.7 degrees Celsius per second as a linear function?

A As we discussed before, the patent is very clear that this process of heating with the aim of reproducing the claimed microstructure with these complicated diffusion and intermetallic formation processes depends on the way how you heat your compound material.

And for that, they do not explicitly exclude that a heating function pertaining to your specific setup when you reproduce the patent could be a

linear one. They nowhere say that. They don't exclude that, but they do not by that do the opposite either. They do not say you have to be linear or something like that.

So that is simply not the point of the patent. It's also not said in the sentence. It only reveals to us that this process is highly complicated and they spend so much time of saying, look, you even must look not only at ranges, but even they say in the same sentence you must look even at subranges. And that with me as somebody reading it be aware or make me sensitive that I really want to do this very carefully and not just say everything is linear. That would be a mistake to read that sentence that way.

Q And because the '602 patent is not explicit as to whether it's a linear heating rate or a nonlinear heating rate or any specific shape of a heating curve, the '602 patent leaves it up to a person of ordinary skill in the art to determine the specific heating curve that is used, correct?

MR. LaMAGNA: Vague.

THE WITNESS: That is not quite correct because the patent says the target to arrive at a certain layered structured with these features described in the claim related to diffusion and

intermetallics, et cetera.

And it teaches us further that among these many variables, the heating process among which again the heating rate is one important set of subvariables as they say themselves or subranges to consider that these must be done in a way depending on your specific setup, your specific equipment, your specifics on the conditions to arrive at this result that is described in the claim.

And by that, they make us sensitive that this can include variations, ramps, different rates and even different subranges of how this temperature is really acquired by the product. So I would almost read this as a warning light saying be careful how you do it. It's definitely very unlikely to be a simple linear process. It is a very, very complicated process.

BY MR. MONALDO:

Q But by describing these ranges that we've been discussing, the patent, the '602 patent enables a person of ordinary skill in the art to perform the heating needed to achieve the composition claimed in the '602 patent, correct?

A The heating rate is not enabling you to make a composition. I don't understand the question.

Q The question is: The heating portion of the process that we talked about by providing the description of these heating ranges, is that sufficient to enable a person of ordinary skill in the art to make the invention claimed in the '602 patent?

A No, that is not enough. The patent makes it much more clear that there are many aspects to consider to reproduce the claim. And the heating rate is one very central portion of the process that you want to consider. Again, broken down into the aspects that we have just discussed before, but of course you need to consider many, many more process parameters also as described in the patent, not just the heating rate.

Q That's right. But as it relates to heating rate specifically, this disclosure is sufficient in combination with the other parameters to enable a person of ordinary skill in the art to make and use the invention of the '602 patent; is that correct?

A Yes. That is a description of a process pertaining to the heating rate and the variants that puts you in a position to reproduce these claims considering all the other complex entangled process parameters also.

MR. MONALDO: Let's go off the record and

take a five-minute break or so.

(Deposition recessed at 11:27 a.m.)

(Deposition resumed at 11:38 a.m.)

BY MR. MONALDO:

Q So, Dr. Raabe, we have been discussing the '602 patent. I would like to turn you now to column 7 line 43 of the '602 patent.

A Yes.

Q Do you see at that line it discloses a cooling rate of more than 30 degrees Celsius per second, correct?

A Let me read the sentence. Cooled at a rate of more than 30 degrees centigrade per second. Yeah, I see that sentence.

Q Is that a different disclosure to enable a person of ordinary skill in the art to perform the cooling step described in the '602 patent?

A The patent is also here and its entity of course more informative when it comes to several parameters and some of those we have discussed this morning already. And here they specifically refer only to the cooling rate of more than 30 degrees centigrade.

Q That's right. And as it relates to cooling only, I understand there are other parameters, but as to cooling, is this disclosure sufficient to enable a

person of ordinary skill in the art to make and use the invention claimed in the '602 patent?

A This is cooling rate as described here is one out of many parameters to reproduce the microstructure that is required according to the claims. And as we discussed before and some other aspects we did not yet discuss, to reproduce the claimed microstructure, you need to also consider a number of other aspects where the cooling rate being about 30 degrees centigrade per second here is one out of the many parameters.

Q But for the parameter of cooling rate, this disclosure is sufficient to enable someone to make and use the invention claimed in the '602 patent, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: From the cooling rate as we said, the patent is teaching us that you also want to consider the cooling rate of course, but also other aspects like we said, what is the mass, what is maybe as we say this contact situation that we discussed this morning, but, yes, the cooling rate should be above 30 degrees centigrade. And if you reproduce the claimed microstructure or not, then it depends on taking these many other parameters also into account.

BY MR. MONALDO:

Q If we move over to column 8 line 4.
A Yes.
Q Do you see that section of the '602 patent describes an example of a preferred steel for the strip of base steel and provides a composition of that steel?
A Yes.
Q Is that composition well-known and typical as of the time of the '602 patent for a strip of base steel?
MR. LaMAGNA: Vague.
THE WITNESS: Let me read that paragraph in detail because there are a couple of elements given. Your question is whether this would be a typical steel used at the time when the patent was written for hot stamping? Is that your question?
BY MR. MONALDO:
Q Yes.
A So my perception is that at that time, first of all, I would be from my perspective a bit careful of knowing all the possible steels that maybe any company has put in a press because that is maybe a bit beyond what I could know, but what I can say is that this is one possible steel that would be used in hot stamping among many other composition possible variants, yes.

Q Okay. But composition is one that would meet the requirements of the '602 patent, correct?

A The '602 patent is giving this base steel composition as one example of a preferred steel, so, yes, they considered as a representative of possible steel to be used in their process.

Q Okay. So during this morning's discussion, we've talked in trying to inventory it about eight different parameters described in the '602 patent. If you bear with me, I'd like to maybe recap each of those eight parameters here with you today.

So I'll start with the first one and that parameter is the coating composition. Do you recall that we discussed that the '602 patent describes a coating composition of an aluminum alloy with 5 to 11 percent silicon?

A Yes, I recall that.

Q The next parameter I'd like to discuss is coating thickness. Do you recall that we discussed that the precoating thickness was given and described by the '602 patent as a range of 20 to 33 micrometers?

A Yes. That was a thickness range given for the precoating.

Q We also talked about oven temperature. Do you recall that we discussed that an oven temperature

range of 880 to 940 degrees Celsius was described by the '602 patent?

A Yes.

Q The fourth variable we talked about was time, the dwell time which included heating phase and the hold time. Do you recall that the '602 patent described a range of 3 to 13 minutes for that time?

A Correct.

Q Then the fifth variable we talked about was the steel thickness. Do you recall that the '602 patent described the steel thickness of 0.7 to 3 millimeters?

A Yes.

Q The seventh variable we talked about was the cooling rate and as we just discussed, do you recall that the '602 patent describes a cooling rate of more than 30 degrees Celsius per second?

A Correct.

Q And then the final, the eighth variable we talked about was the steel composition and the example given at column 8. Do you recall that that example composition was described in the '602 patent?

A Correct. That is one example composition among many others, yes.

Q So the collective description of these

eight variables in your opinion, would that description enable a person of ordinary skill in the art to make and use the invention claimed in the '602 patent?

MR. LaMAGNA: Vague.

THE WITNESS: Well, the parameters that you have listed are very important parameters and many of them have a nonlinear interdependence. So you must very carefully adjust them with respect to each other to arrive at that narrow window as the patent teaches us to use to reproduce the microstructure of these claims, but there are a number of further parameters that you would have to take into account.

BY MR. MONALDO:

Q I realize I missed one of the parameters we discussed and that would be heating rate. Do you recall that we discussed that the '602 patent describes a heating rate of 4 to 12 degrees Celsius per second?

A When it comes to the heating rate, first of all, yes, I recall our discussion about this point, but we also had agreed or underlined that this sentence was teaching us that there are certain ranges and subranges. All this is really working out and imposed onto the steel, but, yes, the heating rate is another very important parameter, yes.

Q So, again, just to recap, the eight

parameters we discussed would be coating composition, precoating thickness, temperature of the oven, time for heating and holding of the steel, heating rate, steel thickness, cooling rate and steel composition, correct?

A These are a couple of very important parameters that enable you to arrive at the claims of the patents, but there are more parameters.

Q What additional parameters are there?

A There are several other parameters that I explicitly also discussed in the patent as I had also mentioned in my report and one important parameter is, for instance, the dewpoint.

Q Does the '602 patent describe anything about dewpoint?

A The '602 patent is mentioning that you have to take into consideration the dewpoint.

Q Where in the '602 patent does it mention that?

A Let me maybe go back to my report and refresh my recollection on this point. Maybe from the top of my head, it is a little bit hard to point you to exactly at the line where the dewpoint is mentioned. But if you give me some time, I can find where exactly in the patent the dewpoint is mentioned.

Q Sure.

A (Reviewing document.)

At the moment, I cannot find the dewpoint part in the patent. It might also have been in the literature that they referred to, but maybe I could use a search function on the computer to find it faster for you.

MR. LaMAGNA: I don't have that document yet on that computer.

THE WITNESS: Because the number of documents is so large that it might be faster if I tried to find it in a search function in a PDF or something like that. And as I said, only the dewpoint is only one out of many other parameters. There are many, many more.

MR. MONALDO: Ray, if you're able to get him an electronic copy that's searchable.

MR. LaMAGNA: Yeah. Sorry for the IT problems we've had this morning. Perhaps if we break for lunch around 12:30 or so, during that little break, I can try to get someone from my IT to come and make sure we have that set up.

MR. MONALDO: Okay. Great.

BY MR. MONALDO:

Q Dr. Raabe, you'd agree with me that dewpoint is an important parameter, but you have not

been able to find a description of dewpoint in the '602 patent sitting here today?

A What I said is I would -- at the moment from the top of my head, I cannot exactly tell where it is in the patent or in the quoted literature that they relied on, but I would be happy to use a digital search function in these many, many documents to make sure to identify where the dewpoint is mentioned.

Q What quoted literature are you referring to?

A When we open the patent, the patent makes explicit references to which were taken into account such as references cited for patent documents and other publications and so on.

Q You understand those documents are not part of the disclosure of the '602 patent, correct?

A I understand that is not part of the disclosure of the patent, but the patent and the details of the processing that you need to arrive at the claims of course work on a certain set of literature which I explicitly refer to in the patent.

Q And so in your opinion, a person of ordinary skill in the art would have access to that literature and would be able to understand other parameters such as dewpoint from that literature,

correct?

MR. LaMAGNA: Objection, misstates his testimony, vague.

THE WITNESS: That's not what I said. What I'm saying is that you cannot just go and grab something from any literature. So it is more that the teaching from the '602 patent is expecting the existing knowledge at that time and cast this in the form of the patent into a process description to arrive at the patent claims. And I mentioned that the dewpoint is among many, many other variables, one of the aspects that might deserve attention in that context and the patent mentions many, many more even.

BY MR. MONALDO:

Q So sitting here today, you would consider dewpoint as something that's not described in the '602 patent, but part of the existing knowledge, correct?

A The dewpoint is just one out of many variables that you want to take into consideration when you want to arrive at the patent claims, but, again, the more of the patent is that this complex is really a very, very complex industry process. And there's only a relatively narrow regime or narrow window how you can reproduce these claims. And the patent for sure makes an effort to highlighting the most important ones to

enable you to reproduce these claims, but there are many more parameters which are also explicitly stated in the patent.

Q So because the '602 patent doesn't explicitly describe dewpoint, your understanding is that a person of ordinary skill in the art would have been able to select an appropriate dewpoint based on existing knowledge, correct?

A Yes, that's correct.

Q So you mentioned other parameters beyond the eight that we discussed earlier. One of those was dewpoint. Are there any others?

A There are several other parameters that occur in the patent as I have also pointed out in my report other aspects, for instance, that are named are the formability.

Q Does the '602 patent describe details about formability?

A The '602 patent makes a mention about formability of the compound material to be one of the many parameters that you want to consider.

Q Okay. Does it tell a person of ordinary skill in the art what that formability needs to be to make and use the invention of the '602 patent?

A Let me try to find the passage where

formability is on. There are certain passages, but, again, I think it would be easier if we would have an electronic access to this so that it would allow us to skim when you ask for such specific words in this hundred thousands of words of all the documents that I can find that quicker.

But just to give you a rough example in column number 9 of the patent, we have explicit references taken, for instance, on page 41 and the following sentences. We read the treatment applied at the time of the hot forming process or after forming makes it possible to have mechanical characteristics which can exceed 1,500.

So that is just one statement, but there are many other statements where explicit statements are made in the patent about the mechanical requirements of this material, but there were many other parts of the patent also. I just need more time to read through the patent to find the exact wording.

Q But you'd agree with me that that statement is a statement about the characteristics of the end product, not the process of how to achieve the end product, correct?

A That is correct. I found another passage, for instance, in column 11. When we start at line 32,

for instance, and column 11 of the '602 patent and it says it enables one to produce a hot steel of a desired thickness coated and affording extensive forming possibilities in which alter treatment and so on. So that is also a statement about mechanical properties and forming properties.

Q But you'd agree with me again that those are properties of the end product, not parameters of a process to achieve the end product, correct?

A So in this little paragraph, it primarily addresses the mechanical properties of the product after the stamping, but you must remember that this is such a complicated product and process that this material has a certain history in its mechanical properties also during the stamping process.

The final property as the patent is teaching us is a result of all of this acting together during, for instance, the stamping, cooling, heating and so on. So the patent by that informs us also that certain mechanical properties will occur during the stamping, for instance.

Q So these are mechanical properties of the finished product, but does not teach you to process to achieve those mechanical properties, correct?

A No, that is not quite correct. When you do

not follow the teaching of the '602 patent, you would not arrive at these desired properties. I give you a simple example and that would, for instance, be if we don't adhere to the many parameters we discussed before as an example including also the cooling rate, you might not arrive at a martensitic structure and that would mean you might lose some of your mechanical features.

Q Yes. I understand that, Dr. Raabe. I'm trying to understand though that this description of the final product is not one that describes process in and of itself, correct?

A In such a complicated process, you must embrace and the patent is teaching us that this is connected because the patent is very clear that it informs us about hot stamped parts that are used for car applications where among other things something like safety, corrosion and so on play a role and that implies certain mechanical response. So I think the patent is not excluding that the mechanical features of the product are a very important part of the teaching.

Q Okay. We discussed the eight parameters I mentioned in the process. You've added two more, dewpoint and formability. Are there any other parameters one would have to consider as part of the

process?

A Yes. Another aspect is, for instance, the transfer time.

Q Are there any other properties besides dewpoint, formability and transfer time that you'd consider?

A Let me go through what I already mention in my report. Just give me a second. There are further aspects as I have mentioned in my report also is, for instance, things like the coating homogeneity. That means the superficial layer is another aspect that's resulting from the coating properties and particularly the way how the coating is later formed into this layered structure resulting from interdiffusion. So these are also very important parameters.

Q Does the '602 patent describe anything about coating homogeneity?

A The patent teaches us very clearly that you want to arrive at these four layers and when you do not have a corresponding homogeneous coating, you don't form a layer.

Q Okay. Does the '602 patent say that explicitly as it relates to a homogeneous layer?

A When we take a look, for instance, at figure -- that is figure number 1 in the '602 patent

and say it, for instance, says something like an aluminum rich intermetallic layer and at the same time shows that this is fulfilling the features of layer topology, that to a person of skill in the field would imply that there must be homogeneity of that layer included. Otherwise it would not form into a layer.

Q Okay. And you know that from the figure itself and the fact that it formed into a layer, correct?

A I would know it from again the entity of the description of the required diffusion processes.

Q Okay. And in your experience, would use of a homogeneous precoating be something that was known in existing art?

A At the time when the patent was written and granted, the prior art did not show examples of corresponding homogeneity of such coatings. So the patent teaches us that in order to arrive at this required full layer structure, you need to consider not only the many parameters that we already have discussed, but you must adhere to certain conditions for the coating also. Otherwise the underlying diffusion processes would not give you the result that the claims describe.

Q So in terms of additional parameters, we've

talked about dewpoint, formability, transfer time, homogeneity. Are there any others that you can think of?

A Yes, there are many other parameters in this really complicated industry process. One aspect that the patent is mentioning also is the so-called fouling.

Q Is fouling a process parameter?

A Fouling is occurring in a certain process window, so it's connected to process parameters.

Q So does the '602 patent describe fouling in a way that teaches someone how to make and use the '602 patent claims?

A The discussion of the consequences such as fouling is one of the key points of the patent among many others because the steel has a melting point above 1,500 degrees centigrade. The aluminum has a melting point depending on the exact silicon content and so on which is between 620 and 700 degrees centigrade. That means if you do not very carefully adhere to the process description and the ranges given by the patent, you have liquid aluminum and that is an extreme consequences.

You can shut down your production site when you do that because you have permanent fouling and

ripping of aluminum. So that is a very important point of the patent to take care of that you do not get this fouling. That is very important.

Q But you'd agree with me that fouling is an adverse result of the process if you don't control the process in the way described by the '602 patent?

A Correct. It is showing us from the teaching of the patent that the very fine adjustment of these many process parameters that we discussed in part already before leads you to a process window where you avoid the fouling and that is indeed was not in the art before. That is very essential for this process.

Q To avoid fouling, you control the precoating thickness, heating rate, things of that nature, the process parameters we discussed previously, correct?

A Correct.

Q So fouling itself is not a process parameter?

A Fouling itself is a consequence of acting or calling to the patent. It's not per se a process parameter. It's a phenomenon that you want to avoid when you follow the patent and its teaching.

Q Are there any other process parameters that you'd have to consider that we haven't discussed yet

today?

A There are a couple of further parameters that I've also mentioned in my report. I think they are -- in the patent, they also mention things like adhesion to the context properties between the stamping tool and the compound sheet.

For instance, if I can point you at column number 7 and the patent '602 and we start reading out the sentence starting at line 46 and it says in the middle that is more like line 49 or 50 -- sorry -- line 50 in column 7, it says silicon is present in order to prevent the formation of thick nonmetallic intermetallic layer which reduces adherence and formability. So this also points out that also these further aspects like I mentioned before formability and adherence must be taken into account.

Q But formability and adherence are not themselves process parameters, correct?

A No. They are the result -- you are correct. They are the result of adhering to the teaching of the claim to arrive again in a certain process window where these aspects are then also the result of matching the window as described by the patent.

Q Okay. So I'll ask the question again about

process parameters specifically. Are there other process parameters that we have not talked about today that are important to enabling a person of skill in the art to make and use the '602 patent claims?

A Also as I said, I must find the exact sentence again, but makes statements about the atmosphere and dewpoint and so on because that would again affect things like oxidation and scaling behavior and so on.

Q Sitting here today, and I understand you'll look for that in an electronic copy perhaps at lunch, but sitting here right now, you don't see that description in the '602 patent, correct?

A I don't explicitly find it now from the top of my head in the patent text. And I would later as we said go back to an electronic version to find these terms quicker.

Q Any other process parameters we haven't talked about?

A Let me go back to what I've already stated in the report. I think I have already mentioned the transfer time and that refers to the transfer time between the oven and the hot stamping process or the press.

Q Okay. In your experience, would persons of

ordinary skill in the art try to make that transfer time as small as possible?

A There would be a certain range not automatically as short as possible, but you would have to follow the description of the patent because when you make the transfer, for instance, too slow, you obviously lose temperature. But it might be when you do it maybe too fast, maybe you still have some liquid patches on the surface.

So I would assume that the patent is also here explicit that it says you at least want to take the exact time of the transfer into consideration and just not do it so arbitrarily. Again, that is a little bit the main story line of the patent that it was the first document, the first patent which was precise of narrowing down all of these many process parameters to enable us arriving in that process bindle which gives you these four claimed layers and their composition and properties.

Q Okay. So if I could point you to column 10 of the '602 patent line 59.

A Column 10 line 59. I see the sentence, yes.

Q You'd agree with me that that specifies in the '602 patent a transfer time of less than 10

seconds, correct?

A Let me read the sentence.

(Reviewing document.)

Yes. The sentence is making here a statement that you want to be below 10 seconds for the transfer because then there might be partial transformation of austenite to martensite already happening or it could be also -- it only says transformation from austenite and there are different ways how it could transform.

Again, when you don't follow the teaching on the patent also including the transfer time, you might make a mistake because you lose austenite and that is again a very, very important part of the teaching here.

Q You'd agree with me they don't set a minimum transfer time in the '602 patent, correct?

A In this sentence, they do not explicitly say a minimum transfer time, but as a person of ordinary skill in the field when you read that, you of course know that such a gigantic industry apparatus like dealing with huge steel plates -- I mean, this is a huge way. It's automatically not happening instantaneously, but you always have naturally given through your equipment a certain minimum transfer time

automatically.

So that is for a person of skill in the field totally clear that the machinery allows you only to do it at a certain say transfer time, but what I find important in the patent is that it is explicit on giving you also the upper time. The upper time is really, really essential. Otherwise you lose many of the properties described in the claim. So, again, we learn how specific and delicate the process description and the interplay of all of these parameters is and the minimum time is given by the equipment.

Q So a person of skill using their own knowledge would understand there's a minimum time, correct?

A The person of ordinary skill would check the equipment that is available to reproduce a claim and then learn what is the minimum time from these equipment features.

Q Would a person of ordinary skill in the art without this teaching in the '602 patent understand there would be an upper limit on the transfer time?

A A person of ordinary skill in the field would understand that when the transfer time is excessively say above the 10 second range given here, then you might lose some of the austenite. So a person

of skill in the field should hopefully know that, yes.

Q So they would know that if you have a transfer time that's over 10 seconds, there might be a loss of some of the austenite as you mentioned?

A Yes. I would agree to that. However, you need the patent to teach you that what the consequence of that would be and these are two different statements.

MR. LaMAGNA: We should probably break for lunch soon.

MR. MONALDO: Let me just ask a last question.

BY MR. MONALDO:

Q So if I can turn you to column 11 of the '602 patent line 60, the first sentence there discusses a precoating thickness in the range of 20 to 33 micrometers in the context of what it labels as example one, correct?

A Please let me read the sentence.

(Reviewing document.)

Yes. I see the sentence, yes.

Q Okay. And then if I move you to column 12 line I think it's 32. It's the beginning of example 2. Do you see the first sentence there that discusses example 2 as having the same composition and same

precoating as example 1?

A Let me read the sentence, please.

(Reviewing document.)

Yes, I see. It says with the same composition and the same precoating as in example 1. Yes, I see it.

Q Then if you move to line 41, it talks about length after their hot stamping. It says the parts obtained after hot stamping are covered by a coating 40 micrometers thick as illustrated in figure 1, correct?

A Yes, that's correct.

Q So from this discussion, the precoating of 20 to 33 micrometers resulted in a coating that was 40 micrometers thick, correct?

A For example 2, correct.

Q You would agree with me that a coating of 20 micrometers is within range of what the patent describes for the precoating, correct?

A The precoating thickness of 20 microns is indeed the lower limit for the range that the patent gives us.

Q And you'd agree with me that a precoating thickness and 20 microns would result in the 40 micron coating described in column 12, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: That is not quite correct. That's not what these two examples are teaching us. The example number 1 says you have to control it in that range 20 to 33 microns. And it also is very explicit like we discussed before at every location which is again a very clear hint that you have to satisfy that with a certain as we said homogeneity.

But tying now the lower bound 20 microns explicitly to the 40 microns of example 2 is not said by that because these are two separate examples. So this says that in this specific example number 2, the 40 micrometers were the result of this specific example.

BY MR. MONALDO:

Q But as we talked about at line 35 of column 12, it says that in example 2 it uses the same precoating as in example 1, correct?

A Correct.

Q So the precoating in example 1 could be 20 microns at every location of the steel. You'd agree with me that would be encompassed within the range described in example 1, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: That is a little bit connecting a range from example 1 to a point in example

2 and now you extrapolate that this automatically refers to say the lower bound like 20 microns, but this is not set in example number 2.

So the example number 2 only says we made use of controlling the precoating in that range 20 to 33. That's the only thing that example 2 is saying. It did not give the exact number or value of the thickness or the precoating that was used in example number 2.

BY MR. MONALDO:

Q So what thickness of precoating would you need to result in the coating being 40 micrometers thick as described in example 2?

A The requirement by the patent is that in order to have a chance to arrive at the claimed properties of these layers was a very specific diffusion and intermetallic features to fall into that range of 20 to 33 for the precoating.

But the patent is also teaching us that the final thickness of 40 microns is not sufficient, but it's only sufficient when these other features of these four layers of microstructures are also met. They just say that the precoating starting point will fall into that range of 20 to 33 microns.

Q So my question is what thickness within

that range would result in the 40 micron thickness of the layer in example 2?

MR. LaMAGNA: Calls for speculation.

THE WITNESS: Example 2 is not explicit on this specific starting number for the precoating. It is something from that example here simply do not know. The only thing I do know is that they said you want to start with the precoating like this as a range in example 1. The rest I would have to speculate.

BY MR. MONALDO:

Q So in your opinion, when a person of ordinary skill in the art had been able to figure out what precoating thickness within the range of 20 to 33 microns to use to achieve a coating with a thickness of 40 microns?

A A person of ordinary skill in that art would know and understand from the teaching of the patent that these are not the only two points you would have to follow. Say 40 microns as a target and range of 20 to 33 as a starting point, but the person would understand that it has to follow all of these many processes with their respective ranges that we have discussed before.

So a person of ordinary skill in the field would know I cannot just do cherrypicking of two points

and expect I reproduce the claims. But for this to do, I would definitively need to embrace the entity of these complex process parameters with their entanglements.

Q And you'd agree with me in example 2, it does provide process parameters, correct?

A For this specific example 2, a few process parameters are explicitly written down. For instance, the lengths, the width, the specific thickness and so on, but it's not explicit of telling us exactly what for this example the precoating thickness was. The only information it gives us is that it fell into the range of 20 to 33. That's what the example 2 is telling us and the rest would be speculative.

MR. LaMAGNA: Where do we stand on breaking for lunch?

MR. MONALDO: Just a few more questions on this topic and then I think we can take a break.

BY MR. MONALDO:

Q Dr. Raabe, in your opinion given the process parameters you discussed and those set forth in example 2, given the range of 20 to 33 microns for a precoating thickness, would a person of ordinary skill in the art have been able to select the appropriate precoating thickness to achieve a 40 micron coating

thickness?

A Example number 2 is teaching us not only a target of about 40 microns thickness, but the person of ordinary skill trying as you correctly say trying to reproduce the product, to make the product according to the claims would read the entire example, not just this one sentence.

And the entire example tells many aspects that you need to consider like the nature of the interdiffusion layer, the intermediate and the intermetallic layers and so on. And from that entity in an entire recipe teaching of that patent, that person would be able to reproduce and make that product.

Q And they would be able to select what precoating thickness is needed within the range of 20 to 33 microns to achieve that product shown in figure 1 with the 40 micron thick coating, correct?

MR. LaMAGNA: Asked and answered.

THE WITNESS: The patent and its entity and also specifically with the example number 2 parameters would enable a person of ordinary skill in the field to reproduce these claims and make the product. And it might be that even if one or two additional tests would have to be done, you would never be in a range of undue

experimentation.

The point again that we have to agree upon is that the great achievement among many others of this patent is that it makes clear that this sweet spot to arrive not just at a thickness but also at the features, feature of these microstructures which are in that thickness require to follow all these cooking recipes that we have discussed before including also the range of the precoating 20 to 33 microns.

MR. LaMAGNA: And just to make sure that we're on a clean record, I think the live note that I'm looking at which I know does not control here has that answer ascribed to me just in terms of who's the speaker. And that should be obviously the witness.

MR. MONALDO: Thank you for that clarification.

BY MR. MONALDO:

Q So, Dr. Raabe, in reading the '602 patent, would a person of skill know what precoating thickness to select to achieve the 40 micron thickness described for example 2?

A Yes.

Q Was your answer yes?

A The answer was yes.

Q And what would that precoating thickness

be?

A The patent gives us a range of precoatings which lies between 20 and 33 microns and gives then a number of many, you know, intermittently connected process parameters to arrive at the claim. And the claim is very specific on the nature of these layers. And this is the teaching of the patent that would enable a person of ordinary skill in the field to make that product.

Q And so a person of ordinary skill in the art looking at the range of 20 to 30 microns could select a thickness of 20 microns and achieve the product described by example 2?

MR. LaMAGNA: Objection, misstates his testimony.

THE WITNESS: That is not what example 2 is saying. Example 2 is saying in this specific example with many, many further details, example details given for example 2, that's a quite long paragraph or part of the document. It says explicitly that the precoating fell into the range described in example 1 and that number or range is 20 to 33 micrometers. And the rest is for me speculative. I could not explicitly say which exact number it was within that range, but it was within that range.

BY MR. MONALDO:

Q And so how would a person of ordinary skill in the art figure out which number in that range to use?

MR. LaMAGNA: Objection, asked and answered.

THE WITNESS: So the person of ordinary still in the art now equipped with this patent, with this document would read the complete document in its full entity and including all the many other parameters that we have discussed and some of which are elaborated on further here in example number 2 and that person would also know that the precoating thickness to start with would be in the range described in example number 1 namely between 20 and 33 micrometers.

And even if say one example would not reproducing directly the layered structure, you might have to do a second one, but this is very speculative now for me to assume. But the point is one more experiment is not a game changer to reproduce that patent. The point of the patent is if you had not these details and the descriptions of how to reach that processing window to reproduce the claims, you would have, you know, an enormous amount of labor and experimentation being necessary. But the teaching is

that the range puts you in a safe place and a safe harbor to start at. That's definitely informing a person of ordinary skill in the field.

Q Okay.

MR. LaMAGNA: Before we go on, I need to take a break shortly. We can go for a five-minute break. If you really want to continue this line of questioning, that's fine. Take a short break and then we can come back and do lunch later if that's what you prefer.

MR. MONALDO: We can take a short break and then we'll break for lunch. I just had a few more questions on this line.

MR. LaMAGNA: Let's go off the record for a few minutes.

(Deposition recessed at 12:43 p.m.)

(Deposition resumed at 12:46 p.m.)

BY MR. MONALDO:

Q So, Dr. Raabe, we were discussing example 2 in the '602 patent and the precoating thickness in the range of 20 to 33 micrometers. You mentioned there might be some experimentation needed to find the exact thickness that would result in the 40 micrometer thickness described for example 2; is that correct?

A That is correct.

Q And that level of experimentation would encompass what types of things in your mind?

MR. LaMAGNA: Objection, vague.

THE WITNESS: That would be to reproduce like exactly, for instance, example number 2 coming back to your question of say what would be the matching precoating for that 40 micrometer example, it is very hard for me to say, but what I definitely can say that the person of ordinary skill in the field would need maybe a few experiments, a small number of things.

But for this I would for sure have to go to some experiments and let myself to be more specific, but the point is that would be a very small number of variance you would have to do to answer your specific question to tie the final thickness to the precoating thickness for this very example number 2.

BY MR. MONALDO:

Q When you say a few experiments, how many do you mean?

A The exact number would be for me at that moment hard to give you a specific number. I think the number would not be very high. It would definitely not fall under the category of massive or undue experimentation or so because the teachings of the patents are so specific in which parameters to take

into account and which ranges to use that the number would be likely very small.

Q Can you give me a possible range on the number of experiments?

MR. LaMAGNA: Objection, calls for speculation.

THE WITNESS: That is for me very hard to say to give you a very specific number, but the number would be rather small. And also we want to be a little bit careful that the patent itself does not say that you need a spot landing of 40 micrometers. That's not what the patent is saying. That is only what the example number 2 is suggesting.

And I would rather target my own -- if I had to experiments to say I would try to meet the claims, correct, and the claim says when we go column number 15 says wherein the coating has a thickness greater than 30 micrometers, it means I could maybe spend time as you say and do experiments and say what exactly led to 40 micrometers in example number 2.

But I would as an expert in the field or as a POSITA would take the step back and say wait a second, what is the patent claim I want to meet and the patent claim doesn't say it has to be spot on 40 microns. It says it has to be more than 30. I'm just

saying it might be when I do too many experiments, it's a waste of time. And so I think the number of experiments could be very small when I follow the rest of the patent recipe.

BY MR. MONALDO:

Q And so if I'm looking at the claim and it says more than 30 micrometers, would you expect the precoating thickness of 20 micrometers to achieve a thickness greater than 30 micrometers?

MR. LaMAGNA: Objection, calls for speculation.

THE WITNESS: That would include a lot of speculation on my side. The point as an expert in the field using the patent to make the product according to the claims would be not a spot landing on an exact thing in micrometer, but it would be to make sure to fall in the ranges described and the precoating range is 20 to 33 micrometer. That's the range. I don't need -- as we say, I don't have to be more Catholic than the pope. Okay? And the claims say I need to be greater than 30 microns and that is what the patent allows me to reproduce without undue experimentation.

BY MR. MONALDO:

Q Okay. So which precoating thicknesses would result in a coating that is greater than 30

micrometers as set forth in the claim?

MR. LaMAGNA: Objection, vague, incomplete hypothetical.

THE WITNESS: That the patent is not explicitly linking one exact nanometer scale precoating thickness to an exact one-to-one outcome of so and so number, but what it does instead is give you the range in which you operate safely to reproduce the claimed layers. Certain ranges are minimum value and that is what I need to know.

BY MR. MONALDO:

Q So if I'm within the range of the '602 patent's process parameters including the precoating thickness, you would expect to achieve a coating thickness greater than 30 micrometers as set forth in the claim, correct?

MR. LaMAGNA: Objection, vague, incomplete hypothetical.

THE WITNESS: Maybe can you please repeat the question? I wasn't sure I grasped the question correctly. Could you kindly repeat it?

BY MR. MONALDO:

Q So if I'm looking at the '602 patent and I'm following its process parameters with the range as set forth including the precoating thickness, you would

expect to achieve a coating that has thickness greater than 30 micrometers as set forth in the claim, correct?

A Yes, correct.

Q And that includes a precoating thickness of 20 micrometers since that is part of the range, correct?

MR. LaMAGNA: Objection, vague, incomplete hypothetical.

THE WITNESS: So the patent says it has two ranges. One range is the precoating range which is 20 to 33 and it gives us in the claims a second range and that is a final coating thickness which must be greater than 30 microns. And according to these details and the many parameters that we discussed before given in the patent and examples worked out, these are the two things that are linked.

When we want to spot landing on a certain exact micrometers, that's not what the patent requires. You have to fall into ranges and that's what the patent is teaching us.

MR. LaMAGNA: Where do we stand on -- I know that we had a -- you've been promising that this line of inquiry was a couple more questions now for the last half hour. What is the real target?

MR. MONALDO: How about 1:00 p.m.?

MR. LaMAGNA: Okay.

BY MR. MONALDO:

Q So if I am practicing the ranges set forth in the '602 patent, you'd expect to be able to meet the range of greater than 30 micrometer thickness set forth in the claim, correct?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: So how as a person of ordinary skill in the field holding that patent in his or her hands, that person would see a complex description of process parameters and coating features including the thickness range of the precoating to arrive at the claims and the claims among many other things include a certain minimum thickness which it says is the coating has a thickness greater than 30 micrometers.

And I can with the parameters that are given without any undue experimentation tie these two things together. That means the patent is informing me in a sufficiently detailed way that I have a very realistic chance to arrive at these claims when I adhere to this precoating range which starts from 20 and ranges to 33.

BY MR. MONALDO:

Q In a range of 20 to 33 if I have one point in the precoating thickness where it's 20 micrometers and then another point where it's 33 micrometers, would you consider that precoating thickness to be homogenous?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So that is a question which the patent is answering in that sentence that we discussed before that this thickness has to apply across an area expansion, across a layer, across a pancake. That means the point is not to have like a lava lamp or a cloud that fulfills such a thickness statement, but instead the patent was clear to say you must have this as a systematic two dimensional entity where this category or this parameter is fulfilled.

BY MR. MONALDO:

Q So I don't think that answered my question. My question is: Would it be homogenous if there was one point where the thickness was 20 micrometers and another where it was 33 micrometers?

MR. LaMAGNA: Objection, vague.

THE WITNESS: Your question is whether there might be a coating that has -- I'm just trying to understand your question. Your coating has 20 microns here and 33 microns there.

BY MR. MONALDO:

Q Yes. Is that homogenous?

A That is very speculative, artificial question that you're asking which I would have to maybe do my own few experiments to double-check, but as a person of ordinary skill in the field, you would know that these dipping coating processes that I have myself seen many, many times in industry do not just give you arbitrary surfing waves of aluminum coatings. That's not how liquid works.

When you pour a liquid on a table, it is not forming mountains right away or so. That means as a person of ordinary skill in the field, you would anticipate with due right and like the patent says that a certain homogeneity given by the liquid viscosity state of that material, if you, you know, a fair distribution that falls within that range whether what you are now explicitly asking, you have certain mountains where in the liquid state you suddenly ramp from 20 to 33 microns, it's very speculative. It's for me very hard to answer such a question. I might have to do a few experiments for you for answering this.

Q In your opinion, when you applied the precoating, it naturally forms into a homogenous coating, correct?

MR. LaMAGNA: Objection, misstates his prior testimony, vague.

THE WITNESS: That's not quite what I said. What I said is that a person of ordinary skill in the field would try to reproduce the patent or apply the patent on an equipment where you have certain control of the homogeneity as required by the patent. The patent is explicit. The patent says you want to have a certain thickness range given over wider lateral expansion.

And that's what a person of ordinary skill would -- how that person would read that patent. And so your question is very speculative. That's not how a person of ordinary skill in the field would read the patent when you deal with liquids that you put on a hard material like steel.

MR. LaMAGNA: We're now at 1:00.

MR. MONALDO: I was going to say let's break for lunch.

MR. LaMAGNA: Thanks.

(Recessed at 1:00 p.m. for lunch.)

A F T E R N O O N S E S S I O N

(Reconvened at 1:51 p.m.)

BY MR. MONALDO:

Q Dr. Raabe, have you talked about the substance of your testimony with counsel at any point during any of the breaks today?

A No, I didn't.

Q I'd like to change gears a bit from what we were talking about and I'll turn you to paragraph 120 of your declaration.

A Yes, 120.

Q In that paragraph, you define what it means to be an intermetallic layer as a layer containing two or more metallic or metalloid elements atomically joined with defined stoichiometry in an ordered crystal structure, correct?

A Correct.

Q You're aware that you submitted a declaration and an earlier IPR involving the '602 patent, correct?

A Correct.

Q And that declaration was Exhibit 2013 in IPR 2024-01376, correct?

A Yes, I assume that's correct. I have to double-check it. You're talking about the previous

declaration?

Q That's correct.

A Can you please give me the number again because I have to find it now on the computer?

Q It was IPR 2024-01376 in Exhibit 2013.

MR. LaMAGNA: That's not on there. If you can -- I have a paper copy of that in my bag. If you want to go off the record for 60 seconds, I can run back to a different room and grab a paper copy for you.

MR. MONALDO: That sounds good.

MR. LaMAGNA: Why don't we go off the record?

(Deposition recessed at 1:53 p.m.)

(Deposition resumed at 1:55 p.m.)

MR. LaMAGNA: I think I have the right one. This is from IPR 376.

MR. MONALDO: That's correct.

MR. LaMAGNA: Exhibit 2013?

MR. MONALDO: Yes.

BY MR. MONALDO:

Q In your prior declaration in the first IPR proceeding involving the '602 patent, you did not provide an intermetallic, correct?

A Let me take time to go through that document. You say in that document I now have to

double-check if I provided -- are you saying I did not provide any definition?

Q Correct.

A Let me just double-check this document.

(Reviewing document.)

There's no definition here. I think I would simply trust you on this because I think when you checked it, there is no definition in there. I don't want to read now these many pages. I think we can agree that maybe I have no definition in that old document. I just trust you on this because otherwise I think it takes a lot of time to read through every page now.

Q Thank you for that.

I guess my question is: Why did you provide a construction of the term intermetallic in this declaration but not in the prior one?

A The reason that I felt it would be helpful to add a little bit more insight and go a bit deeper here is that some of the prior art references that Dr. Miles opined about and also when I was reading the declaration of Dr. Miles, I felt it might be pertinent and helpful to clarify what an intermetallic layer really encompasses and means and what it does not mean. And so I thought that might help the process.

Q It wasn't helpful in the prior declaration because of the prior art that was advanced in that proceeding, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: My perception was I was particularly stumbling over formulations in the declaration of Dr. Miles specifically because the claim in the '602 is specifically referring to the term intermetallic. And when Dr. Miles was asked to opine on the definition or his understanding of what an intermetallic is, then I thought that was first of all not correct what he stated.

And secondly I thought in order to underpin what I think was a mistake in Dr. Miles' understanding, I said it would be better to clarify it in my report. So I referred more to the declaration of Dr. Miles here.

BY MR. MONALDO:

Q And Dr. Miles' declaration, the first IPR, he provided the same understanding of the term intermetallic, so I'm trying to understand why you didn't offer construction in that proceeding.

MR. LaMAGNA: Objection, asked and answered.

THE WITNESS: So I think in the declaration

of Dr. Miles when we're now focusing that the claim explicitly requests or states the information of an intermetallic layer which was not in the prior art, then I thought it's a key point of the patent that now deserves upon iteration because we iterate this thing over a certain number of years, it would be helpful.

So I added this additional item of knowledge which I always carried with me, but I felt after these iterations that not everybody concerned with the case had that same understanding, so I just wanted to characterize the joint understanding of this.

BY MR. MONALDO:

Q So just to confirm in paragraph 120, your definition of intermetallic is two or more metallic or metalloid elements atomically joined with defined stoichiometry in an ordered crystal structure, correct?

MR. LaMAGNA: Objection, misstates the document. Sorry. You just missed a couple of words.

THE WITNESS: The definition I give in 120, in paragraph 120 is defining an intermetallic layer here in the context and was referenced to the '602 patent as a layer containing two or more metallic or metalloid elements atomically joined with defined stoichiometry in an ordered crystal structure. So these are a few key items that characterize an

intermetallic where when you maybe go into other textbook sources and sources that I have given as a reference, you sometimes find very similar formulations. And when pinpointing slight deviations down, you -- I'm more than happy to go a little bit more into physics here. It's no problem.

BY MR. MONALDO:

Q Does claim 1 of the '602 patent recite the word atomically joined?

A The word atomically joined is not explicitly in the '602 patent. That's not used. But when the patent is describing the intermetallic layer, that's what a person of skill in that field would associate it with. So this is why I gave a couple of textbook references.

Q Does the '602 patent use the words defined stoichiometry?

A The word stoichiometry is not explicitly used in the '602 patent, but it's again the same. We have to read the '602 patent from the viewpoint of a person of skill in the field, of ordinary skill in the field at that time and that's why I also gave references from the time before.

So it was a state of understanding for a person of skill in the field that you need a certain

stoichiometry or stoichiometric range that refers to the ratio of certain atoms, atomic species and that is the common knowledge in that field at that time.

And, again, you can maybe deviate in the specific wording right or left, but the patent is talking about an intermetallic layer which implicitly refers to having certain stoichiometries fulfilled among these other parameters that I list here.

Q And so does the '602 patent mention an ordered crystal structure?

A The patent '602 does not explicitly mention the word ordered crystal structure, but like we discussed regarding the other proceeding terms, that is a definition where the people who wrote the patent knew that the person of ordinary skill in the field would know from a textbook, textbook knowledge. And that's why I gave these at that time textbook references where you would find these statements.

So that is all embraced or implicitly said in the patent claims which talk about the formation of the intermetallic layer. So I just tried to define what that term means to such a person of skill in the field because I felt that it's sometimes used by Dr. Miles in a more arbitrary and ill defined sense.

Q So if a layer has the exact chemical

composition that's required by the intermetallic layer in the '602 patent, but its crystal structure is slightly disordered, would that fall outside of your definition for intermetallic layer?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: First of all, the -- as you pointed out correctly yourself is the patent does not use these terms, right? And we agreed on this, but patent is saying you form an intermetallic layer and the intermetallic, the term intermetallic layer at that time has a very clear scientific meaning which I would be more than happy to elaborate deeper on again in different wording variance let's say when you go to the different textbooks, but the term ordered crystal structure is one of the aspects to fulfill the criterion for an intermetallic layer. That's why I have more aspects mentioned in that sentence.

BY MR. MONALDO:

Q So my question was ordered crystal structure. If there's a slight disorderment in the crystal structure, does that cause a layer to fall outside of your definition?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: When intermetallic is formed, then you can have minor variations in the exact chemical composition, but some intermetallics you can. For others, you can't. That depends a little bit on the specific intermetallic phase you look at. But this is not a statement made in the patent. The patent is not saying, look, you have to adhere in my claim according to minor variation A and B. That is not what the claim is saying.

The claim is saying you form an intermetallic layer and in that definition, yes, it is not per se excluded that you can have minor variations. And that's not what the claim is saying. It only says intermetallic.

BY MR. MONALDO:

Q Okay. But an intermetallic layer as set forth in the claim, you can have minor variations in the crystal structure; is that correct?

A Yes, you can have minor variations in the crystal structure and you can have minor variations also in the exact chemical stoichiometry. That is not excluded by the claim. The claim in the patent is only very clear on saying you form an intermetallic.

Q I'm trying to understand exactly how much variation you can have for something to still be an

intermetallic. Can you provide thoughts on how much variation is acceptable?

A A specific number does not make much sense and I would have to do my own experimentation to nail down, for instance, numbers for specific process variants because the patent is very clear on the fact that you have to form a layered structure of an intermetallic state, but the claim does not at all rule out what you just was asking -- were asking whether I can have minor variations in that state.

That's not what the patent is ruling out, but the patent teaches us that you have to consider the several process parameters that we mentioned before to at all have a chance to land in a system which can form intermetallic in the first place. So the second order deviation is not so much the concern of the claim.

Q So if a layer has multiple phases of two or more metallic elements with different crystal structures, would that be part of your definition of intermetallic layer?

MR. LaMAGNA: Objection, incomplete hypothetical.

THE WITNESS: Can you be more specific? You used a number of vary hard scientific terms in the sense. You talked about chemical elements. You talked

about the phase. You talked about layered intermetallic. Can you maybe be a bit more specific? I did not fully grasp your question.

BY MR. MONALDO:

Q Sure. So my question is: If a layer has two or more metallic elements in it and those two or more metallic elements have different crystal structures, could that be included in your definition of intermetallic?

A That's --

MR. LaMAGNA: Same objections.

THE WITNESS: It's a little bit hypothetical textbook question to me that has nothing to do with the claim, but let me try to understand what you mean. So you say when I have two elements or more, two elements like aluminum and iron and you want to know whether they can assume different crystal structures in the same layer? Is that what you're asking?

BY MR. MONALDO:

Q Yes. And if that is covered by your definition of an intermetallic layer.

A These are two very different questions. So question A has nothing to do with question B. Let me stick with question number A just to understand what we

talk about because I felt that in the declaration of Dr. Miles it was essentially what I felt was being mixed up a little bit and it's not arbitrary. The claim, it's very, very clear.

The claim makes a differentiation between things like an interdiffusion layer that has a very clear physics meaning, okay, like milk and coffee or something like that. And it makes a separate statement of saying in that other layer, you have an intermetallic form. And intermetallic is not the same thing as mixing two elements.

So when I get back to question number one or like part A of your question and you mix two elements and beyond principle in general, yes, they could assume different crystal structure. We call that a precipitant. Okay? But that has nothing to do with the patent claim.

I don't know the context between your question and the patent claim. The patent claim says I have interdiffusion layer. I have intermetallic layers and so on.

Q I'm trying to get an understanding of your construction and what added words mean. And so that's why I was asking the question.

A Okay. Yeah. So like I said, I would stick

with my definition that I have given here and the discussion again underpins to me that it is probably pertinent to have a somewhat more stringent and crisp definition of what an intermetallic layer is because an intermetallic layer is not mixing two or more atoms. That is not what is defining intermetallic, but you have a certain ordering like A, B, A, B and things like that as I coin here by atomically like joined with a defined stoichiometry.

And that is like when you have milk and coffee. That's not an ordered structure. That is a solution and the solution we have also in the solid state. And that's what we have in the patent claim in what is called the interdiffusion layer. That is your milk and coffee layer while the intermetallic layer is rather something like a chocolate chip structure where the chocolate chips have a very clear ordering. So that's something profoundly different.

Q So an interdiffusion layer is different than an intermetallic layer?

A Correct. Let me be more specific. An interdiffusion layer is again a very different animal, very different state. Interdiffusion says one atom is going from right to left. The other from left to right. It means not diffusion. It means

interdiffusion. That means both species are moving and mixing. Okay? They go in either direction.

That does per se in physics not exclude that you might, you know, get some ordering out of that, but what you definitely get and the patent claim described is meaning that at some point obviously it led to a separate layer where these atoms assumed an ordered state and that is very important to distinguish which I in the report of Dr. Miles did not see was being made.

Q Now the patent claims also use the term intermediate layer, correct?

A Correct.

Q Now, an intermediate layer, could that be an intermetallic layer?

A Let me go back to the patent claims and the picture to which they are referring. That would be, for instance, in the -- I'm now in the patent '602 and the first figure exhibit in that patent where they show that intermediate layer. And the intermediate layer is in the patent description placed between the interdiffusion layer and the aluminum rich intermetallic layer.

And in between, they give it the name intermediate layer. And in the intermediate layer

description in the patent claim, they do not describe it in any way deeper than in terms of the chemical composition, right? So they do not say or rule out or give any deeper insight and they don't have to. Whether it's intermetallic or mixed or something like that, that's not the point.

The point is that this is an intermediate layer between these two other layers that we have discussed before. That's fair to say a person of ordinary skill in the field would have to know to reproduce the claim.

Q So if the intermediate layer happened to also be an intermetallic layer, that would be perfectly fine as it relates to the '602 patent?

A No, that is an incorrect statement.

MR. LaMAGNA: Objection, vague. Sorry.

BY MR. MONALDO:

Q Does the intermediate layer have to have a specific type?

A The intermediate layer, the nature of intermediate layer is described in the patent claims as we just said in terms of its respective position in that sequence of layers and it is further described later in the chemical composition. And in some parts of the patent, it's also described in terms of the

hardness they use.

That is all I need to know as a person of skill in the field, but when I understood your question correctly saying tying this automatically to a statement like could it be all intermetallic or could it be whatever, something else, it's very speculative and not context of the patent. And you could maybe find that out, but that's not what the claim is saying or ruling out in any way.

Q Okay. So if you had a layer that met the chemical composition of the intermediate layer described in the patent and the hardness values and all other properties and it happened to be an intermetallic layer, is that covered by the claim?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: The claim is very, very specific. The claim says that one of these layered regions needs to be an intermetallic to meet the claim demands, right? And that is what we discussed before. That has to be very clearly defined and understood that this is not just some mixture of atoms, but it's an ordered state.

Now, the intermediate layer is described first of all in the picture, figure number 1 of the

'602 patent in terms of its topological position, in terms of what you correctly cited, the hardness and the chemical composition. And the person of ordinary skill has now that patent in hand and has the task to reproduce it. Then the question would simply not come up what else I need to know at that state, but the point is what I do need to know is that one of these layers must be an intermetallic layer.

BY MR. MONALDO:

Q Okay. But there could be two intermetallic layers?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: The question is interesting, but I think it is wrong. Why is it wrong? If I had been the inventor and had suddenly a second layer which is also like you said, that's not set in the patent. It's not set in my report. It's not set by anybody except by you that you say now we had a second intermetallic layer which again nobody except you is saying. Then if I had been the inventor, I would have mentioned that, but I see that not mentioned. Nowhere in the patent you find a text that says, oh, there's a second intermetallic layer. That's not said.

Q Turning back to your definition, you used

the term defined stoichiometry. The question is: What is a defined stoichiometry as opposed to an undefined stoichiometry?

A It's a specific relation among atomic species within certain ranges according to the corresponding measurement that you made.

Q And how do you know if a stoichiometry is defined or undefined?

A You would make a measurement of the chemical elements and then would have to fulfill the other criteria that I have given, the crystal structure and that there's a certain nature of the atomic electronic bonding between these atoms which leads them to ordering rather than randomly mixing. And these categories or these aspects together fulfill that criteria of an intermetallic layer.

So, again, when the inventors would have suddenly seen, oh, look, this whatever intermediate layer is also an intermetallic, why would they not have mentioned that? So I find your question is interesting, but in the context of the claim, it seems extremely hypothetical and it's not said in the claims.

Q If I can turn you to paragraph 118 of your declaration.

A Yes.

Q You see the end of that paragraph you cite three different exhibits, Exhibit 2037, Exhibit 2038, and Exhibit 2039, correct?

A Correct.

Q And those are the textbooks you mentioned before that you cited to support your definition, correct?

A Correct.

Q What is the subject matter of these textbooks?

A Intermetallics. One is more from general and physical metallurgy which has a big subchapter of intermetallics. One is a book of Gerhard Sauthoff whom I know personally very well who wrote the first authoritative book only about intermetallics and so on. These are at the time of the patent where the main stand up text that a person of skill in the field would look into.

Q Did any of these textbooks specifically relate to hot stamping?

A These textbooks do not refer to hot stamping because these are books about the definition of intermetallics. And that was what I wanted to highlight in my paragraph. That paragraph of defining intermetallic is not defining hot stamping. It's

defining intermetallic and that was the task of that paragraph.

Q Any of these textbooks mention hot stamping?

A These textbooks do not mention hot stamping and that was not the target of me putting a paragraph of a crisp physic based definition of intermetallic in the book. Otherwise I would have called that section section about defining hot stamping, but I called the section definition of intermetallics. That's why I used intermetallics oriented textbooks.

Q So let me turn to the first textbook, Exhibit 2037. In your paragraph 118 of your declaration, you cite to the entire textbook. Do the words that are used in your claim construction for intermetallic, are they found in Exhibit 2037 and if so, can you point me to a specific location?

A The Exhibit 2037 as I said before might probably have slightly deviating wording, but my task here was or my intention was in the first place not to give a complete, you know, in depth physics discussion of what an intermetallic is according to that very textbook 2037 which again I would be more than happy to elaborate about.

But the task here was more in response to

the misunderstanding of the definition that Mr. Miles seems to assume on high level to translate this textbook physics into a person of ordinary skill in the field would understand what an intermetallics is. So the point is not the one-to-one copy, paste of the exact same wording.

Q So the words in your construction for the term intermetallic do not appear in Exhibit 2037?

A That's not what I said, but I would be happy I opened the book now and it's one of the main textbooks at that time about intermetallics. And you asked me now to find exactly which words and I will try to do this now electronically. It's maybe a bit faster. Which word should I look for?

Q The wording used in your construction in paragraph 120.

A When I go to the term ordering, I found here 320 text positions about the term ordering. Which one do you want me to elaborate on? This is a big textbook. You understand I just try to condense it into a high level version for a person of skill in the field.

Q I'm trying to get a sense because it's such a long textbook, we couldn't really quite figure out where you got the words for your claim construction.

So that's what I'm trying to ask. And Dr. Miles, he cited a definition. He took the words from the definition and put it in his construction. What I'm hearing is that you looked at a long series of textbooks and then you formulated your own understanding of what they described; is that correct?

MR. LaMAGNA: Objection, misstates his testimony.

THE WITNESS: That's not correct. I'm not just somebody forming any opinion. I work in the field for 40 years and my citations on intermetallics on my publications. You're welcome to look them up. So when I see something as an expert with 40 years of experience, translating from three or four textbooks something into a wording at a high level that a person of skill, of ordinary skill that I'm educating, you might want to trust me on this.

BY MR. MONALDO:

Q Sure. In terms of Exhibit 2037, can I turn you to page 17 using the numbering at the bottom right corner of the exhibit?

A We are in that textbook, Exhibit 20 --

Q Thirty-seven, yes.

A Yes. To which page should I go?

Q Seventeen.

A Seventeen. Okay.
Q Do you see on page 17 it says table 1.1?
A Let me first find page 17.
Q Look at the bottom right.
A I'm not sure whether we are -- so it says electronic structure page 17, electronic localization. Do you mean that chapter?
Q It's in the introduction. It's page 4 at the upper left of the document. There's two page numbers on the document. The bottom right is page 17.
A The bottom right. We take our own page. Now I see it. Let me go to the page -- to the bottom right page number you mean, right?
Q That's correct.
A Got it. Got it.
Q And do you see in the middle introduces table 1?
A Now I got it. That table -- I have a table at the bottom of page 17, table 1.1.
Q The sentence directly above that, it starts with the word unfortunately. Can you read that sentence for me?
A The caption of table 1.
Q Not the caption. The sentence immediately above it.

A Got it. Unfortunately for the sequence of elements in the chemical formula of intermetallic compounds, there is no clear guidance on the IUPAC recommendations. We do not even -- which do not even define the term intermetallic compound.

Q What is IUPAC?

A IUPAC is an international association that defines certain crystal structure definition.

Q Is it correct that IUPAC is responsible for standardizing chemical nomenclature and terminology?

A No. Scientists are responsible for that. It is just one association among hundred other associations. They make use and screen crystallographic or other chemical data to then see how we already at a stage to put them say into a standardization. These are two different things, but this is a scientific textbook. This is not like what you see from standardization officers. So that is a scientific textbook.

Q At the time of this textbook, IUPAC did not think there was a standard definition for the term intermetallic compound, correct?

A No. That's what this sentence and this specific subsection author is saying that one specific organization does not feel fit enough to have a general

standardization of this term intermetallic. And that's what this sentence from this author is saying, yes.

Q Can I turn you to page 452 of that same exhibit? It's the start of chapter 8.

A This program, it just takes a little while to navigate it, but I think I got it now and it's a big book. I got page 452.

Q And do you see the second paragraph that starts a well defined?

A Yes, I got it.

Q And so the last sentence in that paragraph states due to the lack of a 3D unit cell, this approach cannot be used for non-3D periodic CIMs such as quasi crystals or amorphous intermetallic phases.

A Yes, I read the sentence.

Q What does it mean for material to be amorphous?

A Amorphous means you don't have crystal structure, but the atoms are more ordered like in a liquid. That means you do not have it like on a mathematics paper or like points on a chess board, but they can deviate from this exact crystal positioning and then you don't get any defective spots anymore and that's what we call amorphous. It's like liquid water and ice water.

Q The textbooks reference here to amorphous intermetallic phases is not covered by your definition of intermetallic, correct?

A The -- again, we must be maybe a little bit more specific what my intention was. When you want me to write a scientific text about the understanding of maybe four or 500 scientists around the globe in that year 2016 or what an intermetallic is and this is a very, very hard task because it was still a matter of ongoing research with some very fine subfeatures like amorphous intermetallic phase which has nothing, absolutely nothing to do with the patent '602. There's no such thing as an amorphous intermetallic.

Then I would be more than happy to do it, but it was not my intention to highlight third or fifth order aspects of the entire word of intermetallics, but to rather state to close to the '602 patent to making clear the main misunderstanding was only that in the declaration of Dr. Miles, he made no distinction whatsoever between a statistical mixing of atom A and B like coffee, milk compared to an ordered layered directed atomic bond structure.

That was all I tried to make. I didn't mean to overload my definition with 500 pages of a textbook going to third or fourth order effects. I

would be happy to do that, but I think it has not so much to do with the patent. That's why I did not go into this rabbit hole.

Q But there are intermetallics that exist but fall outside of your definition such as amorphous intermetallics, correct?

A There might be under certain extreme conditions that maybe this specific subchapter author out of 500 or 600 page textbook might have found that this does not fall fully under the umbrella of my definition, but that I mean applies to maybe very, very many scientific and engineering topics that you always can find one niche aspect that does not fully match a classic textbook definition.

This has not much to do with the claims of the '602 patent and so I didn't mean to cover all third, fourth, fifth order aspects because I think that would have more obscured the clear view on what I wanted to convey namely that these are ordered structures and that's what really matters. That's how also the authors and the person of skill in the art at that time would have understood that sentence of the claim. That is what mattered.

Q So turning back to paragraph 118 of your declaration, the second textbook you cite here 2038,

you provide a citation at page 15 and that citation says that intermetallic form particular crystal structures with ordered atom distributions where atoms are preferentially surrounded unlike atoms, correct?

A Correct.

Q So do you have Exhibit 2038 available to you?

A Yes. Let me double-check real quickly. Yes. That's the book of Gerhard Sauthoff who is a person I know very well and you say I go to page 15.

Q I'd actually like you to go page 11. We'll use the numbering that's at the bottom right-hand corner.

A Okay. I got it.

Q Do you see on the column on the left-hand side heading 1.1 that says definition of intermetallics?

A Yes, I see it.

Q Do you see the first two sentences under that heading?

A Yes.

Q In the second sentence, it provides a simple definition of intermetallics as compounds and metals whose crystal structures are different from those of the constituent metals and thus intermetallic

phases and ordered alloys are included.

Do you see that?

A Let me maybe read that part.

(Reviewing document.)

Yes, I see it.

Q Is there a reason you did not cite that definition in your report and instead cited page 15?

A Yes. Yes, there's a reason.

Q What is that reason?

A The reason is like the author is saying here very clearly that is, you know -- again, we talked here about an academic textbook that was at that time pretty much cutting edge and he says clearly as a starting point as a motivation. That's how you write textbooks. He says according to a simple definition. He says simple definition of Schultz and Giggis (ph) from the year 1967. That's very, very long ago and '83. Very long ago before the patent was made.

Intermetallics are compounds of metals whose crystal structures are different from those of constituent metals. So that is his entry point. That's where he in writing the book says, look, that's the simplest possible denominator for which the community was starting off to at least get an understanding that intermetallics are a different type

of state than the solid solution. That's how it turned out to be.

But I felt in the year of the patent the question is how would a person of ordinary skill in the field translate this and his common understanding in reading the patent. And that person would not say, oh, let me look up the oldest possible citation I can find from 60 years ago, but the person would rather go through such a textbook in his or her education and say that is my aggregated understanding how to read those patent claims.

I just wanted to avoid cherrypicking a very old entry quote that the author is giving here, but rather give the understanding how a POSITA would read that claim. And I also felt as an expert in the field with 40 years of doing this and teaching this -- I mean, I teach that in classes 30 years. Then I thought I take a more representative statement.

And as I mentioned before, you will find in the entire literature about intermetallic materials. You will sure find a certain variation in these final definitions.

Q Your opinion is that the definition of intermetallics changed between 1983 and 2006 when the patent was filed?

MR. LaMAGNA: Objection, misstates his testimony.

THE WITNESS: The definition of the term intermetallic is refined over the years. And that's what I think also this book of Gerhard Sauthoff is explaining, but, again, my intention and my task in my report was not to write a history book about the science of intermetallic phases. That was not my job.

My job was to try from the entire literature that I can oversee since 40 years to extract a reasonable summary and a very high level format translation how a person of ordinary skill in my field would read that in light of the '602 patent claims.

That was what mattered here and that's why I arrived at this high level aggregated definition. And, again, I repeat that is not meant to do cherrypicking or one-to-one translation or copy, paste of one or the other sentence because I could have added 500 sentences.

And that does not mean it's arbitrary because I try to aggregate this in a way to expect the main principles. And the main principle is it is an ordered atomically directly bonded structure. That is kind of the core principle. That's why I did that.

BY MR. MONALDO:

Q If you pull up figure 1 of the '602 patent. If you look at the SEM micrograph itself without considering the labels, would a researcher be able to recognize or appreciate that layer C contains two or more metallic elements atomically joined with defined stoichiometry in an ordered crystal structure?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: That is not the task of somebody who is reading that patent and trying to replicate and turn this or adopt it for making a good product. That is not the point of saying I take all the information out and can you read it yourself. That is -- nobody would do that.

The point of a patent is that they did the invention. They did, you know, the research and development and came up with this definition what they said must be met to match the claim for making a good product. That means why would a POSITA in this situation say, oh, you know what, I take the patent, cut out all the definitions, throw them away and take a wild guess.

I don't know. That makes to me not so much sense, so I cannot answer your question really why somebody would discard 90 percent of the information

that the researchers have here secured and done. I mean, that's why they have written a patent that you do not have to take a wild guess but follow the recipe.

BY MR. MONALDO:

Q If I can turn you to column 6 of the '602 patent or column 5. Excuse me. And it would be line 51.

A Yes, I got it.

Q Could you read that paragraph?

A I read it. You mean the sentence starting with if the precoating thickness?

Q The precoating thickness.

A Okay. Got it. I'll read it. Give me a second.

(Reviewing document.)

I've read the first sentence. Should I read the entire paragraph?

Q Yes, the entire paragraph, please.

A Okay. Got it. I'll do it.

MR. LaMAGNA: Which column are we on?

THE WITNESS: Column 5 starting at line 51.

(Reviewing document.)

Okay. I have read it. I will also open it because the letters are really tiny. I have read it.

BY MR. MONALDO:

Q Do you agree with me that this paragraph states that when the precoating is too thick, the alloy reaction forming the intermetallic alloy may take place to an insufficient degree, correct?

A Let me check this again. They say when the precoating thickness is more than 33 micrometers and it gives a location on a sheet. The risk is that the difference of thickness between this location and some other location. Coating is thinner, becomes too important. The setting of the heat treatment in the furnace may be adapted to the thinner value of the precoating, but not to the thicker one.

(Reviewing document.)

Yes, I see that. Again, what is your question?

Q I just wanted to confirm that if the precoating thickness is too thick, that's when the alloying reaction forming the intermetallic alloy may take place to an insufficient degree.

A No. That's not what this paragraph is saying. This paragraph is much more specific. It's much more specific. This paragraph says when you have a variation in thickness from one location in plain to the next location in plain and you do adjust your heat treatment parameters to the thinner section, only then

may the thicker area have that disadvantage of insufficient diffusion. That's what this section is saying.

Q So in this section when it mentions an intermetallic alloy, what is that referring to?

A Forming the intermetallic alloy. The term -- the alloying reaction forming the intermetallic alloy. That's the intermetallic.

Q So that is the same as an intermetallic layer?

A No.

MR. LaMAGNA: Object -- objection, vague, misstates.

THE WITNESS: No. The -- so the definition of layer has more to it than just the definition of that -- the substance that makes this layer is an intermetallic. So layer refers to a certain product, to a certain elongated structure. And when this assumes this stoichiometric ordering and the ordered crystal structure and the directed atomic joints that we discussed before, all this together with the lateral expansion definition defines what I call or what the patent also refers to as an intermetallic layer.

BY MR. MONALDO:

Q So if it's an intermetallic alloy, does it

have to have the defined stoichiometry, the atomically joined elements and the ordered crystal structure?

MR. LaMAGNA: Objection, vague.

THE WITNESS: The term intermetallic alloy refers to that intermetallic, right, and intermetallic falls under the definition of this ordered crystal structure and directed in a certain stoichiometric range.

BY MR. MONALDO:

Q So your answer is yes that the intermetallic alloy must meet your definition of intermetallic, correct?

MR. LaMAGNA: I'm sorry. Could you repeat that question?

BY MR. MONALDO:

Q So the question is: Your definition of intermetallic would have to meet the intermetallic alloy described in this paragraph, correct?

A Again --

MR. LaMAGNA: Objection, vague.

THE WITNESS: So, again, what the intention of my definition is in the paragraph 120 of my report refers explicitly to cleaning up the misunderstanding from the report of Dr. Miles who did not -- who just created it in the same way like any disordered solid

solution.

And I referred secondly to you said definition to share a joint understanding and to jointly educate us what is meant in the claims. And the claims explicitly talk about an intermetallic layer and that's why in my paragraph 120 when you read this again, you see I talk about an intermetallic layer and at the categories that have defining it and the main thing is that we make clear what the claims are saying.

MR. LaMAGNA: Is there a point where we can take a break soon?

MR. MONALDO: We can take a break now.

(Deposition recessed at 2:51 p.m.)

(Deposition resumed at 3:06 p.m.)

BY MR. MONALDO:

Q So, Dr. Raabe, can I have you pull up paragraph 132 of your declaration?

A Yes, I got it.

Q Do you see the third sentence in paragraph 132 that begins with the word however?

A Let me read it.

(Reviewing document.)

Yes. I see the paragraph and the sentence, yes.

Q You'd agree with me that your position that

is that figure 2 of the '602 patent does not show a layer exhibiting atomically joined metallic elements with defined stoichiometry and an ordered crystal structure, correct?

A So that is figure number 2 of the '602 patent and it says or I say from figure 2, it does not show a layer exhibiting -- does not show a layer exhibiting an atomically joined intermetallic, yes.

Q So you would agree with me that your opinion is that figure 2 on the '602 patent does not show an intermetallic layer, correct?

A So the main message of figure number 2 as a nonsuccessful example in the context of the claim is meant to show not so much about the details of being intermetallic or not, but those regions which are intermetallic don't form a continuous layer. And the patent claims are very clear about stating you want a form in order to reproduce what we think would give you a good product, a more continuous layer structure. That is the purpose of figure number 2.

Q So your opinion is that figure 2 does not show a layer that meets your construction of intermetallic, correct?

A Correct.

Q That is based on your definition of the

term intermetallic, correct?

A What I had given you in my definition again to highlight this, I have not given you a stand alone definition of intermetallic, but explicitly I say in my paragraph I defined the intermetallic layer. So these things belong together in my definition.

Q So if you could pull up figure 2 of the '602 patent now.

A Yes.

Q You see the label at top right of figure 2 that says aluminum rich intermetallic layer?

A Yes.

Q So the '602 patent is saying that figure 2 has an intermetallic layer, but your definition does not cover the layer shown in figure 2, correct?

MR. LaMAGNA: Objection, misstates the document.

THE WITNESS: I'll say the figure legend that is given in figure 2 of the '602 patent says aluminum rich intermetallic and it uses the word layer. That means we have some kind of, you know, layered region, but the arrows point at certain positions which seem to indicate that these are aluminum rich intermetallics, right?

They are scattered and drifting in a wider

area that is called a layer. It's a compound layer I would call it, but the main teaching of the claim language in the '602 patent referring to figure number 1 is that these intermetallics should form a more continuous layer. That's why I think they added this counter example to show when that layer is not continued to show that's not what they meant. So it's overall still a layer, but it has scattered aluminum rich intermetallics in them as the legend is correctly stating.

BY MR. MONALDO:

Q So in your opinion, this layer of figure 2 has intermetallics in it, but it is not an intermetallic layer; is that correct?

A In principle, that is correct. It is not a continuous intermetallic layer. It has scattered intermetallics in it. And that's why I think they use it as a counter example what you do not want to have.

Q So in your opinion, this layer does not satisfy your definition of the term intermetallic layer in the '602 patent, correct?

A Right, that's correct.

Q Even though '602 patent itself calls it an intermetallic layer, correct?

MR. LaMAGNA: Objection, misstates the

document.

THE WITNESS: I think what the legend in figure 2 is telling to a person of skill in the field is that that person would directly see the big difference between these two figures. Figure number 1 shows clearly that sequence of these four very well-defined layers where one is an intermetallic layer with its continuity. And this is to what my definition also referred because it was meant to refer to the claims in the '602.

Now, figure number 2 would to a person of skill in the field at that time make clear that is a layer. There's a two dimensional layer of something, but that something is not a continuous intermetallic and that the person of skill in the field would read that patent of saying no, that's not what I want to have.

BY MR. MONALDO:

Q So you -- your opinion is that the '602 patent has to have a continuous intermetallic layer for it to be considered an intermetallic layer?

MR. LaMAGNA: Objection, misstates his testimony.

THE WITNESS: So, again, what -- first of all, I would take myself a little bit out of the line,

but say again refer to what the patent claim is very clearly stating. It makes a clear statement of this intermetallic layer and the features and how to arrive at this layer and that it must adhere to some features like continuity and things like that.

And to that claim, my clarifying definition tried to give a basis of what that means in view of the fact that Dr. Miles was ignoring that physics feature like ordering and so on and was setting it like a solid solution state.

And if that were true, you know, then there would be no difference between figure 1 or 2, right? In the language of Dr. Miles, that would be all the same, but we see very clearly in the claim language and in these pictures no, that is not the same. And that's why in my paragraph 120, I tried to give a definition that makes clear what is really meant to a person of skill at that time in this field how to read that patent claim pertaining to figure 1.

BY MR. MONALDO:

Q So would it be fair to say that figure 1 shows a layer with continuous intermetallics and figure 2 shows a layer with discontinuous intermetallics?

A I would even be careful calling this discontinuous. So, no. We are trying to play a little

bit with maybe two specific words here. I think I would see it a little bit more as a binary separation.

The first one is as you correctly stated more continuous layer in the successful example shown in figure number 1 while figure number 2 is more a highly scattered array. It's a patchy array. So I think you could even give it different words or terms, but I think the main teaching is not that we try to find five or six different words for this.

But the point is that this example shows that it's definitely highly interrupted, patchy, cloudy, lava lamp type of -- island type of scenario which you want to avoid.

And a person of skill in the field who is trying to make a product or turn this claim language into a successful product would maybe not spend much time of thinking, oh, is it a little bit less or more island-ish or whatever and would just see, no, it's not the layered -- predominantly layered two dimensional arrangement. And I understand that is the main message that got lost in the declaration of Dr. Miles.

Q Is there anything in the claim, in claim 1 of the '602 patent that mentions continuity?

A Let me read through that claim language.

(Reviewing document.)

It says very clearly in B and column -- that is column 15 and the second sentence starting with a B. An intermediate layer having a second mean and so on and so on. It says not intermetallic. It says intermetallic layer. And that's what I tried to convey also in my definition. A layer has a topological feature of being a continuous and expanded two dimensional strata or pancake type of structure or something like that.

So the term layer would speak very clearly to a person of skill in the field at that time that this is some kind of continuous two dimensional arrangement and definitely not some patchy kind of hazel nut pudding type of structure we saw in figure number 2. So I thought that is so clear and so implicit and that's why I referred my definition explicitly to that claim language.

Q And if claim 1 the term layer requires this continuity that you speak of, what does claim 2 of the '602 patent add when it mentions that the intermetallic layer is quasi continuous?

A Let me read quickly through that.

(Reviewing document.)

So claim number 2 adds the statement wherein the letters C and D are quasi continuous by

occupying at least 90 percent of letter corresponding to each of the layers C and D and wherein less than 10 percent of layer C is present. So that seems to me to be a profoundly different statement to claim number 1 because when you read that sentence, it says wherein less than 10 percent of layer C is present at an extreme surface of the product.

That would rather maybe tell me as a POSA in this case that when there would be some, you know, corrugation or undulated profile or whatever of that layer C, it would at some point maybe touch the very outermost surface. That's what the sentence is saying.

And the claim says that should obviously be below 10 percent. So it seems to me to be a quite different statement compared to claim number 1.

Q So claim 1 would cover a situation where more than 10 percent of layer C is present at the extreme surface, correct?

A No, that's not correct. Claim number 1 does not say that. Claim number 1 says an intermediate layer having, you know, a second mean iron content and so on. And claim number 2 speaks about a percentage of layer C that would touch the outermost surface. I thought these are two topologically different things.

MR. LaMAGNA: Sorry. Calls for a legal

conclusion.
BY MR. MONALDO:
Q So I'm trying to get an understanding. Claim 2 further defines claim 1 and it says that less than 10 percent of layer C is present at the extreme surface. So because that adds a requirement to claim 1, claim 1 is broader and would cover a situation where more than 10 percent of layer C is present at the extreme surface?
A Yeah, that's correct. So it is specifying what is said in claim 1. It's more the general setting of these layers. And the general definition in claim number 2 says adds a topological feature to it.
Q Okay. And how continuous does the layer have to be to meet claim 1?
A The claim language --
MR. LaMAGNA: Objection. Sorry. Hold on. Objection, vague.
THE WITNESS: So the claim language in, for instance, claim number 1 is not more specific than for a person of skill in the field at that time you have to be. It's very important that we zoom back in time and take the person of skill in the field. Plus the direct connection to this good and let's say less good example referring to figures number 1 and 2 and the person of

skill who is just trying to use that patent to make a good product would read, oh, look, there's an intermetallic among other things. And intermetallic layer I have to make sure I arrive at.

And the figure is telling very clearly that it has a certain continuity. I think -- I suppose that's why they added the microstructure figure, but it is at that point not quantitative as to how much that continuity and that strata has to be.

The qualification or the narrowing down comes in the second claim where it says, you know, when layer number C goes to the surface and makes if you want by that a topological interruption, then that gives you that quantification you were asking for that it should be obviously not more than 10 percent.

So I would add these two claims together to get a feeling if you want a quantitative number, that is the 10 percent interruption described in the claim number 2.

BY MR. MONALDO:

Q Can I turn you to paragraph 136 of your declaration?

A Yes.

Q Now, in paragraph 136, you talk about the Cornette reference and conclude that Cornette does not

disclose an intermetallic layer, correct?

A Let me read through that paragraph, please.

Q Yes.

A (Reviewing document.)

Yes. Okay.

Q So it is your opinion that Cornette does not describe an intermetallic layer, correct?

A Correct.

Q Okay. Can I have you pull up Exhibit 1029? And this is the final written decision in the prior IPR involving related patent, the '863 patent.

A Can -- say again please number.

Q It's Exhibit 1029.

A Okay. Yeah, I have it.

Q On the first page, you can see it's the final written decision in IPR 2019-01275 involving Patent Number 9,708,683.

A I see it.

Q Can I turn you to paragraph or page 17 of that document?

A Seventeen, so one one seven?

Q Seventeen, one seven.

A Okay. Got it.

MR. LaMAGNA: You say paragraph or page?

MR. MONALDO: Page.

THE WITNESS: Yes, I have it.
BY MR. MONALDO:
Q So the first full paragraph, you see the first sentence patent owner does not provide any constructions for the terms interdiffusion, intermediate, intermetallic or superficial that would modify term, correct?
A Correct. I read the sentence, yes.
Q So in the prior IPR, a patent owner did not provide a construction of intermetallic as you have done here, correct?
MR. LaMAGNA: Objection, calls for speculation.
THE WITNESS: So, again, that sentence refers -- exactly now I have to go back to which patent to -- let me say I have to read the complete document. The context is at the moment not entirely clearly to me.
MR. LaMAGNA: Speculation, lacks foundation.
BY MR. MONALDO:
Q This was an IPR of a patent related to the '602 and '227 patents.
A That's a different patent. We talked now about a different patent. Okay.

Q That's correct.
A Then that is the '683 patent. So I would -- should I now first read that patent or --
Q No. I think we can just stick to the decision. This was something that was cited in the record.
MR. LaMAGNA: The document says what it says for a proceeding he was not involved in.
MR. MONALDO: Okay. Fair enough.
BY MR. MONALDO:
Q So if we move to paragraph or page -- excuse me -- 39 of the document.
A Of the same document?
Q Same document, page 39.
A Okay. But I really -- I understand. Okay. That is a different patent. I then might have to study first. Thirty-nine.
Q If you look at the last two sentences on page 39.
A Yes.
Q If you can go ahead and read those two sentences.
A Sure.
(Reviewing document.)
I read the sentence, yes.

Q So your conclusion that we spoke about with Cornette and how Cornette does not describe an intermetallic layer is inconsistent with the finding set forth in these last two sentences of the decision, correct?

MR. LaMAGNA: The document says what it says.

THE WITNESS: I understand this document that you are now showing to me was not written by me, right?

BY MR. MONALDO:

Q That is correct.

A Then I would rather go to the original document which is a Cornette document because this sentence is clearly -- we just read both the same sentence and I have no reason to say that's not written there because it is written there. So of course agree that you correctly read that sentence that's written there, but I feel when we talk about a third party's view on Cornette, I rather would go to the original document of Cornette.

Q But you would disagree with the statement that Cornette discloses an intermetallic layer, correct?

A In my own report, I have stated clearly

that Cornette is not disclosing an intermetallic layer. And, again, I looked at the original and not at any third party's interpretation of things, but I looked at the original document of Cornette to arrive at a statement because this is just somebody making a statement, but I would rather look at the original Cornette document which I did when arriving at my statement that he did not reveal an intermetallic layer.

Q From your reading of this document, would you say it was consistent or inconsistent with your construction of the term intermetallic?

A Which document, Cornette or this one?

Q The one we've been referring to, the decision in Exhibit 1029.

MR. LaMAGNA: Can you restate your question?

BY MR. MONALDO:

Q My question is: In the portions of this document, the final written decision and the prior IPR involving the '683 patent, Exhibit 1029, are the statements about claim construction in Cornette's disclosure consistent or inconsistent with your construction of the term intermetallic?

MR. LaMAGNA: Okay. So that's compound.

Can you break that apart?
BY MR. MONALDO:
Q Dr. Raabe, we discussed the writing in this document at two different pages, pages 17 and pages 39. My question is: Are the portions of the document we discussed consistent or inconsistent with your construction of the term intermetallic?
MR. LaMAGNA: Objection, vague, compound. The document says what it says.
THE WITNESS: What I tell in my report is when analyzing as an expert in the field with many, many decades of doing this hands on that what Cornette is showing is not an intermetallic layer. So I stay firmly with my statement in my report.
Now you show me a different statement which is clearly written out here which we both can read and, yes, this is inconsistent with what I say, but I am quite sure that my statement is correct.
BY MR. MONALDO:
Q Thank you.
Do you have the Takagi reference available to you, Exhibit 1016?
A Yes, I have Takagi before me.
Q So earlier today when discussing the '602 patent, we discussed eight process parameters that were

described in the '602 patent. Do you recall that?

A I remember that, yes.

Q And the first parameter was the coating composition and do you recall that the '602 patent describes a coating composition of an aluminum alloy with 5 to 7 percent silicon?

A No. We said it was 5 to 11 percent, I think, not 5 to 7.

Q Sorry. I thought I said 11.

A Apologies. Maybe I misunderstood. Yes, then we agree.

Q I'd like to turn you to paragraph 13 of Takagi.

A Yes, I have it.

Q So the last sentence of paragraph 13 states that an embodiment according to the present invention employs heat resistance coated steel containing an additive of silicon approximately 3 to 11 percent silicon, correct?

A Correct.

Q That range is similar to the '602 patent that we just discussed 5 to 11 percent, correct?

A Correct. It's similar. It's 3 to 11, so the other one was 5 to 11. So there's some chemical similarity.

Q Excellent. Thank you.

So the next process parameter was coating thickness and you recall we discussed the coating thickness range of 20 to 33 micrometers in the '602 patent?

A No, it's not correct. You must be specific whether you talk about precoating or another coating.

Q Sorry. If we talked about precoating, it was 20 to 33 micrometers, correct?

A Correct.

Q Can I turn you to paragraph 35 of Takagi?

A Okay. Go ahead.

Q And paragraph 35 specifies a precoating thickness of 10 to 20 micrometers, correct?

A That's correct.

Q So the upper portion of Takagi's range overlaps with the lower portion of the range specified in the '602 patent, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: No, it's not correct. That's not a portion. That's a point. Twenty micron is a point. It's not a portion.

BY MR. MONALDO:

Q So 20 microns falls within the '602 patent's range and in Takagi's range, correct?

A No. That's not how you would say it in science and engineering. You would not say that falls into the range. You would say the outermost upper bound. And that paragraph 35 was 20 microns at the absolute maximum of a distribution function. It means it occurs very, very rarely. That has the same number, the same point as the minimum point in the '602 again having a distribution function and so on. So it's not overlap. It's not range. It's just one point where they meet, but they do not mathematically overlap.

Q So they both can include 20 micrometers, but that's --

A Exactly 20 microns, exactly. We totally agree exactly 20 micrometers, they both would include.

Q Okay. So if you had a precoating thickness of exactly 20 micrometers, that would be covered by the '602 patent and covered by Takagi, correct?

MR. LaMAGNA: Objection, incomplete hypothetical.

THE WITNESS: The Takagi 35 paragraph says the absolute extreme. What he's referring to is 20 microns. And the '602 says the absolute minimum extreme is 20 microns. So to an engineer or to -- again, we have to always read that for a person of ordinary skill in the field. They would say, you know,

you would not really go to these extremes. This is the absolute extreme where the likelihood of failure is of course much bigger rather than when you go in the middle.

And that's why, yes, they are coming close at 20 microns, but I would be not writing, oh, that's fully included or embraced. That's mathematically to me a little bit more first one and then the other. It's one exact number that is identical, but the distributions are totally different.

BY MR. MONALDO:

Q But there is one exact number that is identical in both --

A Correct.

Q -- disclosures?

A Correct.

Q And if I move to temperature, do you recall when we discussed the '602 patent, '602 patent described a temperature range of 880 to 940 degrees Celsius for the oven temperature, correct?

A Correct.

Q Can I turn you to paragraph 26 of Takagi?

A Yes, I got it.

Q Do you see temperature range in Takagi of 900 to 950 degrees Celsius?

A Yes. Let me just quickly read the paragraph.

(Reviewing document.)

I see. It's heated in the temperature range 900 to 950.

Q And you'd agree with me that that range overlaps with the range in the '602 patent that we discussed earlier?

A I agree.

Q In paragraph 26, it also specifies a time, a holding time of two to eight minutes.

Do you see that in Takagi?

A Yes.

Q In the '602 patent as we discussed earlier, the heating time was in a range of three to 13 minutes, correct?

A Correct.

Q So you would agree with me that the timing range specified by Takagi overlaps with the range specified by the '602 patent?

A Correct.

Q And then in the '602 patent, do you recall that we discussed a heating range of four to 12 degrees Celsius per second?

A Correct.

Q And then in paragraph 26 of Takagi, it specifies a range of one to 10 degrees Celsius per second, correct?

A Correct.

Q And you'd agree with me that that range overlaps with the range in the '602 patent?

A Correct, I agree.

Q As it relates to steel thickness in the '602 patent, do you recall that we discussed a thickness of 0.7 to 3 millimeters?

A That is correct where we must also consider that patent '602 gives very clear differentiation in making in its generic figure number -- I mean, in the '602 now, figure number 7, you see that they do not just say that is the thickness range, but they already make this nonlinear or very delicate connection that you must adjust your other process parameters such as temperature and heating, so in a much more specific way than Takagi according to that thickness.

The point is just that just looking for overlap in parameters again is not the point of the '602 patent, but the point of the '602 patent is to be specific how you have to adjust the other parameters. It's not just a copy, paste thinking of a picking a cherry here and picking a cherry there and linearly

connecting it like Legos, but the patent is with Exhibit figure number 7 in '602 very specific that you must adjust other parameters also, but otherwise you are correct. We see thickness statement, yes.

Q And so at paragraph 33 of Takagi, do you see a disclosure of sheet thickness of 1.4 millimeters?

A Yes, I see sheet thickness 1.4.

Q And you'd agreed with me that that falls within the range we discussed for sheet thickness in the '602 patent?

A It falls under this umbrella. Plus it lacks the information given in figure 7 of '602 which closely ties such statements to a differentiation what the means for the other parameters. Otherwise the information is useless and leads to false results as Takagi shows.

Q I understand your opinion on figure 7, but my question is simply does it fall within the range specified by the '602 patent?

A You're totally correct, but I feel I have the duty sitting here as an expert with 40 years of experience in the filed to make clear that this is not adding legal stone one to legal stone two. But the '602 patent makes this intimate connection. I just want to make sure that this connection of a parameter

like thickness to a clear statement how you have to adjust other parameters directly is that this link is not lost. Otherwise like Takagi's figure shows, you arrive at nothing. You don't reproduce not even an intermetallic or intermediate layer. So I just wanted to make that clear as an expert. I sit here as an expert.

Q I think that has been made clear throughout your testimony today. If you could just focus on answering our questions, that would be useful and help us get through the deposition much more quickly.

A Sure.

Q So in the '602 patent, we discussed earlier cooling rate of more than 30 degrees Celsius per second; is that correct?

A That's correct.

Q If I can turn you to paragraph 28 of Takagi.

A Yes, I am there.

Q In the second sentence, do you see that it concludes with the cooling rate in the range of 20 to a hundred degrees Celsius per second?

A Let me read that.

(Reviewing document.)

MR. LaMAGNA: Which paragraph are you in?

THE WITNESS: We are in 28. But, again, I feel very uncomfortable that you just pick a single number and that's not what this paragraph is saying. Again, I -- you say I just should answer your question, but then you must pose better question. This paragraph says much more.

It says when you read the sentence before it, it starts from a temperature range of 700 to 800, right? That's a profoundly different statement. To a temperature lower than or equal to 300 at that rate that you are quoting. And that is taken entirely out of context. It's a different statement.

It's like when I make a pizza and say I make a pizza at 20 degrees centigrade, it's a profoundly different statement. So what you say in quoting that number is totally correct, but it must be read in the context of the sentence above.

BY MR. MONALDO:

Q Are you disputing that the cooling step as part of the process of hot stamping in Takagi uses a range of 20 to a hundred degrees Celsius per second?

MR. LaMAGNA: Objection, vague.

THE WITNESS: What I'm saying is the word cooling rate is not -- it must be specified and Takagi is specific. So we should follow Takagi and not make

something up. Takagi says that applies when I come from a range of 700 to 800. Right before we were discussing an entirely different temperature range that went up 950. Now we talk about 700 to 800. That's what this paragraph is saying and it does not cool. It only cools down to 300.

When I am in a hot stamping environment, you typically would cool it maybe to room temperature. Otherwise you cannot handle it. You cannot even touch it. That means I just give you -- it's totally correct this number that you quote, but please in the context of Takagi is narrowing this down.

BY MR. MONALDO:

Q But you'd agree with me that the cooling rate that Takagi discloses is in the range of the cooling rate disclosed in the '602 patent, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: As an engineer, I have to repeat here. That is for that temperature range for that small temperature window that Takagi is talking about. He uses a specific temperature range that has an overlap with the '602 cooling range, but the '602 patent is not talking about cooling from 700 to 300. That's a different statement that you're making here.

BY MR. MONALDO:

Q So if I can turn you to the '602 patent column 7 line 41 to 45. So this is where we discussed the cooling rate of the '602 patent. And if you see that portion of the '602 patent, you see that a cooling rate of more than 30 degrees Celsius per second is the cooling rate, correct?

A You are in column 7 and which line?

Q Forty-one to 45.

A Yes. It says 30 degrees centigrade per second.

Q And so the last sentence says the cooling rate is defined here as the mean rate between the exit of the heated blank from the furnace down to 400 degrees Celsius, correct?

A Correct.

Q So in the '602 patent, it's talking of cooling to 400. In Takagi, it's talking about cooling to 300 degrees Celsius, correct?

A No, not correct because the starting point is also specified in Takagi.

Q I didn't ask about the starting point. I asked about the ending point. The ending point is 400 in '602 and 300 in Takagi, correct?

A Then my statement would be there's an overlap in the cooling rates for the ending points of

the cooling phase prior to 400 for the '602 and prior to 300 for the Takagi. That would be my statement.

Q Your statement is there is an overlap in the cooling rates?

A No, no. No, no. You are just picking one word of a sentence and I say, yes, there is an overlap referring to a last stage of the cooling down to 400 while Takagi puts it down to 300. And the cooling is when you saw that differentiation equation is an exponential decay function. It's not all the same. I'm totally fine with you, but let's be precise that these two documents give different starting and end points. Why do we drop this? I don't understand.

Q I'm just asking you the cooling rate that's described in the two patents. There's a different starting point, different ending point, but the cooling rate is overlapping, correct?

A How would --

MR. LaMAGNA: Objection, vague.

THE WITNESS: How would a person of skill in the field read that? Would a person of skill in the field who tries to make a product according to Takagi or to the '602, would that person look only at that single number of the cooling rate or would that person take into account the start and the end point?

Would a cook in the kitchen consider the start and end point and only the cooling rate? I doubt that. I'm just saying we have to be specific. I agree with you, yes, there's an overlap in the cooling rate within certain bounds that have to be added to the statement.

BY MR. MONALDO:

Q But within certain bounds, there is an overlap, correct?

A Within certain bounds as specified by the two different documents where the bounds are quite different, there's an overlap, yes. That we can add to the document.

Q So if I could turn you to paragraph 32 of Takagi. Paragraph 32 is the composition of the steel sheet, correct?

A Correct.

Q And that composition falls within the range we discussed earlier for the '602 patent, correct?

A Correct.

Q So as we discussed, Takagi describes all of the eight process parameters that we discussed for the '602 patent and it describes some level of overlap for each of those parameters, correct?

A Takagi describes some overlap of some of

the processing parameters where some of the processing parameters like we discussed before, the consideration of the effect that may have to be adjusted pertaining to the thickness of the sheet. I mentioned this before. There's a difference which is not specified by Takagi at all.

Takagi does not specify when we stick only with the process parameters, the end and the start points differently from the '602 patent. It's not again, as I said, the cooling rate, but you must say from where and to where you go. And thirdly the other process parameter that is not discussed by Takagi is the transfer time. There's some overlap, but there's also some difference in the processing parameters.

Q Okay. Is it your opinion that a person of ordinary skill in the art could not make Takagi's coating -- strike that.

Is it your opinion that a person of ordinary skill in the art could not make a coated hot stamped steel specified by Takagi although Takagi describes values for the eight process parameters we discussed for the '602 patent?

A When a person of skill in the field will take Takagi's document and as you say try to make a hot stamped coated steel, the person could do something

like that and arrive with some kind of hot coat of coated and hot stamped steel, but this has very likely nothing to do with the product you would get out of reproducing the '602 patent.

Q But you could produce a coated hot stamped steel according to Takagi as disclosed, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So we see in the Takagi document when we adhere to his as I said parameters, then he shows in his figure that you produce a certain product with a certain coating. So that's what we see in figure 2A of the Takagi document. We see a product with some coating. So the answer to your question is yes, a person could make a hot stamped product with some kind of coating.

BY MR. MONALDO:

Q Thank you.

Do you need a break at this time? Would this be a good time to break?

MR. LaMAGNA: Yes, this is great.

(Deposition recessed at 3:54 p.m.)

(Deposition resumed at 4:08 p.m.)

BY MR. MONALDO:

Q Dr. Raabe, do you have the Suehiro reference available to you that's Exhibit 1055?

A Okay.
Q If I can turn you to paragraph 9 of Suehiro. Do you see in paragraph 9 where it describes a steel plate that is about 1.4 millimeters thick?
A Yes, I see it.
Q You'd agree with me that 1.4 millimeters thick corresponds to the range set forth in the '602 patent, correct?
A Yes.
Q Let me move you to paragraph 14 of the Suehiro reference.
A Yes.
Q Do you see the first sentence there that says the surface plating of the steel sheet is an aluminum plating containing 10 percent silicon?
A Yes.
Q You'd agree with me that 10 percent silicon falls within the range set forth in the '602 patent?
A Yes.
Q Moving to paragraph 18, do you see that Suehiro describes that an aluminum plated steel sheet was heated at 900 degrees Celsius?
A Ninety degrees centigrade. Yes, I see it.
Q And you agreed with me that that falls within the range described by the '602 patent?

A Yes.
Q Let me turn you to paragraph 21 of Suehiro. Do you see the second sentence there says as for base metal properties, a part with uniform strength can be attained if a cooling rate of 30 degrees Celsius or higher is ensured?
A Yes, I see it.
Q And that cooling rate of 30 degrees Celsius per second corresponds with the cooling rate we discussed for the '602 patent, correct?
A Correct.
Q If I can turn you to figure 3 of Suehiro.
A Yes, I have figure 3.
Q Do you see at the upper right of figure 3 it specifies a heating rate of 10 degrees Celsius per second? That heating rate corresponds to the heating rate in the '602 patent, correct?
MR. LaMAGNA: Objection, vague, misstates the document.
THE WITNESS: What this document is showing is a heating rate related to this figure, but as we said before, it does not specify the starting point and the oven conditions. So not the shape, but it says a heating rate and that has an overlap.
BY MR. MONALDO:

Q Does the '602 patent specify the oven conditions?
A The '602 patent does not specify the oven condition specifically, but it makes clear that there are process parameters that are connected where you want to take such things into consideration, so --
Q And then in figure 3 of Suehiro, it mentions a temperature of 950 degrees Celsius, correct?
A Correct.
Q And that temperature is close to the range we discussed for the '602 patent, correct?
A The temperature 950 that Suehiro is showing here is a point of contact because in the '602 patent, the 950 degrees centigrade is the absolute outermost point described. It discusses -- the '602 talks about range from 880 to 950, right?
Q I believe it's 940 actually, but it's pretty close to 9 --
A It's close to it, but doesn't overlap.
MR. LaMAGNA: I'll just -- again, objection, vague.
BY MR. MONALDO:
Q And then it specifies a holding time of 180 seconds, correct, in Suehiro?
A Right.

Q And that would correspond to a holding time of three minutes, correct?

A Correct.

Q And that falls within the range of three to 13 minutes we discussed for the '602 patent, correct?

MR. LaMAGNA: Objection, misstates the document, vague.

THE WITNESS: So one point is that again it has a point of context and an overlap is an overlap of two functions. It's a difference in the point of contact. I tried make it clear before. So I would not call it an overlap.

The second thing is where the '602 patent is specific is that it makes clear that you have a, you know, soaking time. When you put your compound material into the oven, it takes time to ramp up and, again, as I said, that depends on several parameters again where here this document only talks about a holding time.

So for me, that is not clear what does it include or embrace holding and what from the start or from soaking to what temperature. I think it's not very specific. So it could also be that it is outside, further outside of the '602 patent. We just would need much more information to know what Suehiro means

holding time.
BY MR. MONALDO:
Q Would you understand holding time to be the time held at the temperature that's described?
A I don't know.
MR. LaMAGNA: Objection, vague.
THE WITNESS: Sorry. I'm not sure. I'm not Suehiro. I don't know. I only have this text and this text says holding time 180. And I would want to know which one. As a person of skill trying to make a product, I would want to know what does it include. Is it the total ramping putting a pizza in the furnace heating up holding or is it only the total holding when the product had reached the target temperature? I don't know that from this diagram.
BY MR. MONALDO:
Q What would a holding time conventionally be understood as in the art of hot stamping?
A Either way. Usually in many documents, you would try to specify what it means because in the practitioner's language, it can be either way. So when you really try to make a product, you typically would want to make sure and you would want to define what you mean by it. It is meant in both senses. The total time and often the time after you think you reach a

certain temperature and so on. It's hard to say from -- you are just asking me how I read it here from Suehiro. And here I would say I would read it with care. I don't know how he would define it.

Q But it would be one of those two interpretations?

A It would be a possible interpretation, but I don't know it.

Q And would you agree with me that given the description of these parameters we've discussed by Suehiro, a person of skill in the art would be able to make a coating as described by Suehiro?

MR. LaMAGNA: Objection, vague, incomplete hypothetical.

THE WITNESS: It's a little bit similar like your question about the Takagi before. That means we have here discussed a range of parameters and for -- so the documents gives two pictures and figure 12 and figure 15 which show both, yes, there is some kind of coating on the steel, that's correct, some kind of coating.

But when you see these two pictures are entirely different, they're completely different, that means it tells me was in that range of parameters that you have just read out to me. You obviously can get

anything. That's what Suehiro shows himself. So that means, yes, you are correct that you get some kind of coating, but do you get a coating in a specified repeatable way. I would highly doubt that because these pictures show the opposite.

BY MR. MONALDO:

Q Speaking of those pictures, I'd like to turn to paragraph 177 of your declaration.

A Got it.

Q Do you see in paragraph 177 you add an annotated version of Suehiro's figure 12 with two yellow arrows added to the figure?

Do you see that?

A I see it.

Q Okay. So my question is: In this paragraph, you refer to another layer indicated by different lighter shading and that is the layer that's pointed to by the two yellow figures, correct?

A By two yellow arrows, yes, I point as an additional layer, yes.

Q Is it correct that this other layer with the lighter shading is a superficial layer?

MR. LaMAGNA: Could you repeat that question?

BY MR. MONALDO:

Q The question is: Is it correct that this other layer pointed to by the yellow arrows with the lighter shading, is that a superficial layer?

MR. LaMAGNA: Objection, vague.

THE WITNESS: What I tried to discuss with this picture by Suehiro in the interpretation of Dr. Miles, right, what we see here is not the exhibit of Suehiro because it's the exhibit of Dr. Miles because it has this red colored legend to it. In there, Dr. Miles said he gave us an arrow and said indeed he calls it a superficial layer, right, this darkish layer with a legend attached to it.

And then in his declaration, his report, Dr. Miles said, yes, that is a superficial layer, but in his document, I found a contradiction where when he was asked do we not agree that the superficial layer is the superficial layer in the sense of the outermost layer, that's exactly what the word says.

He says, yes, we agree on that, but then he points in his own interpretation to the layer beneath the outermost layer. So I got very confused by that. That's why I had us pointing back to that figure that we see look -- the yellow arrows point at more bright colored outermost superficial layer where first Dr. Miles said, yes, we agree, outermost is -- superficial

is superficial, but then he says, no, that's the second layer that he called superficial layer.

That's why I got very confused and wanted -- in my perception, the superficial is really this outermost layer in Suehiro while he described the second layer beneath it as in his words superficial layer. So that's why I got back to that. I simply did not understand his interpretation. And he contradicted himself in his own report in that respect.

BY MR. MONALDO:

Q So how many layers do you see and can you identify in Suehiro's coating in figure 12?

MR. LaMAGNA: Objection, vague.

THE WITNESS: In Suehiro's picture when you refer to that figure number 12 because we said he has two pictures, but you mean really this very picture, right?

BY MR. MONALDO:

Q Yes, this figure 12 picture.

A So for me, it's really hard to decipher or recognize what really the layers are. We see in a strict sense not layers, but we see a certain varying change of the shading, right? You see first when we go closer to the base steel, I see something like a brighter shade which then transitions into a somewhat

more darker shading. Then we're turning to a brighter shading that is more similar to the first one going back to a darker shading which again Dr. Miles called the superficial layer and then returning to a brighter color.

So when I only follow Dr. Miles here, then I would say, look, okay, there's one bright, then one transition or darker area that would be number 2, then the brighter one number 3, then the darker one number 4 and then the superficial one number 5 where again that is a very logical description.

Q So if I would move Dr. Miles' top arrow for superficial up one layer to the lighter shading you identify with the yellow arrows, you would agree that that is the superficial layer in the coating?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So I would not move Dr. Miles' interpretation at all because I'm not Dr. Miles. That is his interpretation, not mine.

BY MR. MONALDO:

Q But you would consider that layer to be the superficial layer, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: The point I tried to make here is that first in the documents, we agreed Dr.

Miles and I that we have the same perception of what a superficial layer is namely what exactly the word is saying. It is the outermost layer that sees the environment. And in the interpretation, he did not indicate that very layer as superficial layer, but the layer below.

So if somebody would show me Suehiro's picture with no legend and no interpretation of Dr. Miles, then I would say there is the most outer superficial layer and I would call it the most outer superficial layer. I would not follow any of Dr. Miles' interpretation here.

BY MR. MONALDO:

Q At the bottom of Suehiro's figure 12 coating, there is a first lighter region, correct?

A Yes. You mean the layer that is closest to the steel. There's one shading, one bright shading with a couple of pores in it and that transitions with some gray shading gradient into a darker area. Are you referring to this?

Q Yes.

A Okay.

Q So there's a first layer with a lighter region and that transitions to a dark region immediately above it, correct?

A Correct.

Q Now, would you interpret those two layers to be part of one layer where they are each -- strike that.

Would you interpret the lighter and darker regions we just discussed closest to the base steel as being sublayers that are part of a single layer?

A So this is very hard to interpret, but I would say no. As you just described was something very constructed and complicated. You asked me whether I take this right and transition with pores and gradient to the darkish region whether I see this as one layer. Is that your question? And my answer is then no. I would not see it because these regions seem to be very different just from the color coating.

And, again, the '602 patent makes very crisp statements about the nature and the standing of these layers, but in Suehiro, I only see gray shading. And you asked me to summarize them in a more or less arbitrary way and I think, no, no POSITA would do that. Nobody would do that.

Q Can we turn back to figure 1 of the '602 patent?

A Yes, I got it.

Q So in the '602 patent, layer A is listed as

the interdiffusion layer, correct?

A Correct.

Q And layer B is listed as the intermediate layer, correct?

A Yes, correct.

Q And if I'm looking starting from the steel substrate going up, the interdiffusion layer appears to have a lighter shading that transitions to a darker shading; is that correct?

A No, because that's what I see in the interdiffusion layer in A because that I understand is what you are referring to. There's not such more or less arbitrary gray shading transition, but it seems more to be a more crisp transition.

So I would see that not in the same way as the Suehiro picture which seems to have a broader gradient of this gray shading, but it seems to me in the Suehiro picture much harder to say what is what. I just see a gradient transition.

Q But you do see a different color between what is listed as the interdiffusion layer in figure 1 of the '602 patent and the intermediate layer of the figure 1 of the '602 patent, correct?

A So in the '602 patent, the interdiffusion layer has a different shading or different white color

than the intermediate layer, yes.

Q And between those two layers, there appears to be a third shading. It goes from near white to a lighter gray to a darker gray, correct?

A There are some features pertaining to this interdiffusion layer which are changing inside of the interdiffusion layer when it comes close to the intermediate layer. Slightly the color changing, correct, but it's a very tiny region can be due to preparation or whatever.

Q And those would be considered two sublayers of the interdiffusion layer, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So I think the patent is very clear on that because the patent by purpose does not make that mistake to go into these subcategories. There's maybe a subshading here and maybe a subshading here. That is not the point of the claim language. When I asked a POSA in that field try to make my product, take that '602 patent, I would try to adhere to the crisp definition that is given in the claims.

When there might be a final later tiny gradient of whatever in a micrograph, so be it. The point is I must make sure I get my intermetallic layer and the interdiffusion layer and so on correct

according to the patent description.

So the patent did I think in a reasonable way not go down this rabbit hole and talk about minor second order gradients, but the main punchline was get these layers more or less continuous as we described before within these bounds and limits described by the claims, make sure you get your intermetallic.

So you are correct there are second order tiny features in color shading also inside one of these layers, but this is not the main point of the claim. And it's definitely not of the order of magnitude like in Suehiro which has that gradient more or less across the entire thick layer and also on top of it, there's no definition of that layer given by Suehiro.

The patent is very clear of describing and pointing the layers in that nature and character and how you arrive with this. Suehiro does not do any of that. That's not an intermetallic. There's nothing that has similarity to the '602.

BY MR. MONALDO:

Q Okay. So if you pull up the '602 patent column 12 line 45, you see it's talking about layer A, the interdiffusion layer and the second sentence says this layer is itself composed of two sublayers, correct?

A The interdiffusion layer or intermetallic layer. Yes, I see it.

Q So shading that we just talked about in figure 1 could be representative of the two sublayers described in column 12, correct?

A No. That is I think very speculative because in the -- the main point is that is a subtlety of an observation in one specific example where they obviously say, look, there can be maybe subfeatures in that layer. But in the claim, they are much more specific and say the main point is to have that intermetallic and interdiffusion and so on layer.

That does not mean it generally excludes that there may be subfeatures, but it's not part of the claim where Suehiro gives us kind of the opposite. It does not give any explanation or description of what the nature of these layers are. Are they intermetallic or what do they consist of? It's just a gray shading.

And the gray shading is not representative of structure and it is not representative of a layer structure. It is not representative of any atomic bonding. It's just a gray shading and many different types of layers can give you all kinds of shadings while the patent is more clear on saying what the nature of these layers is. And you're correct. They

can have -- in one of the example, yes, they have a subfeature, totally correct.

Q And that's covered by the claims of the '602 patent, correct?

A The claim --

MR. LaMAGNA: Objection, calls for a legal conclusion.

THE WITNESS: The claim is not making a statement about sublayers. The claim is making a statement about the main layers like intermetallics, interdiffusion and so on.

BY MR. LaMAGNA:

Q But in your opinion, it could -- strike that.

In the claim, it doesn't specify whether there's sublayers or there's not. So your understanding is that the claim covers a layer that does not include sublayers and also covers a layer that does include sublayers; is that correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So, again, as a POSA when I take the '602 patent and try to make a product, how I would have to read it is that I really first follow these recipes to reach the claims. And the claims itself as we discussed before make a clear statement

about the nature and the physics behind these layers.

And then secondly it makes a dependent statement about the topology, this 10 percent interruption maximum that we discussed before. The claim itself does not per se explicitly exclude that you may have a sublayer variation and one example indeed suggests you may have, yes, but as long as you have an intermetallic and interdiffusion and so on and you can show that, then you stick to the claims. So I think that is not a contradiction at all.

BY MR. LaMAGNA:

Q So in figure 1, do you see the interdiffusion layer including sublayers?

A You say figure 1 in the '602, right?

Q Correct.

A And whether I see the interdiffusion layer and the intermediate layer or what is the question?

Q The question is: Does the interdiffusion layer as depicted in figure 1 include sublayers?

MR. LaMAGNA: Objection, vague.

THE WITNESS: This is to me -- again, I would be as a representative of a POSA or even as an expert, whatever hat I have on would in either case would be very careful to jump to such a conclusion because I would know from my education and experience

that this could be of different origin, yes.

Like in example 2, there might be a variation, a gradient or whatever it could be, but I understand it is not mentioned or pursued further in the claim language and hence that would be for me if you want a certain second order effect, it is not part of the claim language while in Suehiro, I would feel when I know I'm exposed to this document, I feel kind of the exact opposite.

It just leaves me with even a shading that is changing from bright to dark to bright to dark. I don't know what to make of this. It does not tell me is it intermetallic. Is it just mixed? Is it from polishing? I don't know.

So I think Suehiro shows shadings, but saying they look kind of similar to the shading changes of the interdiffusion layer in figure number 1, I would clearly say no, it's not looking the same. And I think the nature like the patent is very clear the '602 is also very different.

BY MR. LaMAGNA:

Q I'm not asking you about the claims of the '602 patent.

A Okay.

Q I'm asking about figure 1 specifically.

And in figure 1, do you see the interdiffusion layer depicted as two sublayers?

A In figure 1, I see in the interdiffusion layer several features. I see a certain region with a very bright color shading. I see a very minor change of that shading where it transitions into the intermediate layer. I see veracity in that layer. So I see several features.

Q So that second feature, the change as it enters in the intermediate layer, would you consider that a sublayer?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: As a practitioner, I must tell you for this tiny detail, I would maybe not care too much as long as I see, oh, look, there are very crisp, very well-defined layers. I know the nature of what -- I know the nature. I know how they come about or I know how to reach them.

Whether there's this tiny gray shading in the transition between interdiffusion, intermediate would be for me as a practitioner to make a product honestly, I would simply not ask that question. The answer is, yes, you're correct. There's a minor change of the gray shading. Yes, that is correct.

BY MR. MONALDO:

Q That would be a sublayer, correct?

MR. LaMAGNA: Objection, asked and answered.

THE WITNESS: Say again.

BY MR. MONALDO:

Q Yes or no, that would be considered a sublayer?

MR. LaMAGNA: Asked and answered, vague.

THE WITNESS: That is for me nothing I could answer. It's not a yes, no question. I would simply say if I'm forced to answer, I would say, yes, it could be. And like example number 2 in the patent makes a statement that yes, they can be a subcategory. So why would I not trust the inventors?

Whether exactly what I see in this figure 1 is what they mean by the subcategory, honestly I don't know. And maybe with one or two additional tries and experiments, I would be more than happy to double-check that if I would want to make a product, but I think qualitative wise, it is entirely different playground compared to the shading analysis in Suehiro which goes all over the place. These gradients I mean.

BY MR. MONALDO:

Q If I'm looking at Suehiro's figure 12,

couldn't the bottom two layers be interpreted similarly to what we describe? So in considering the third layer that you mention, the intermediate layer, and I look at figure 12 of Suehiro, it seems like you have a lighter shading. You have a transition to a little bit darker before you hit the intermediate layer and then you also have the porosities that you noted also in the '602 patent.

So my question is: With that structure, couldn't that be similar to the interdiffusion layer in the '602 patent and include two sublayers?

MR. LaMAGNA: Vague.

THE WITNESS: I must say that is not how you work in this field. So when you decide about embarking on such a product development and you plan to make 200,000 tons of steels per month, then you don't start with such ill defined maybe questions. That's very dangerous.

So you would want to have a document, a cooking recipe, a process recipe that is much more specific. I could take many, many pictures from the literature of the past 40 years and say let's start to interpret what these colors mean or not mean or what these gradients mean or not mean, but this is pure speculation on which you do not make any investment.

The investment to make is single line of that category that cost you about maybe 600 to $800 million, right, and you don't do that by just saying, oh, it could be. That is not specific enough. If you told me that to a nonexpert, a non-POSA of that field, it looks like it's a logical similarity.

But we must remember we talk about the dimensions of half or third of that total coating of the human hair. What we do here is absolute surgery calibrated by the quantity of several hundred thousand tons of steel that have that coating. And then having this maybe type of augmentation can be extremely dangerous, yes.

There are gray shading variations from bright to dark, from bright to dark and then again some ill defined superficial layer where the own Posco expert contradicts himself in the same report and on this, I would sure not build half a billion investment, no. I would want to have a more crisp description.

BY MR. MONALDO:

Q But you'd agree with me that it's possible it could be interpreted in the way that I described earlier where there's two sublayers at the base of the steel, but you don't have enough detail to make that determination, correct?

A So, again, I would be extremely careful of making such conclusion. When we look in Suehiro's document, in the same document, he shows us in figure 15 another example of realizing his suggestion or his cooking recipes and then you again find something entirely different. That means this seems to be so vague that I would be very careful in following your suggestion here.

I would think we totally agree that this figure number 12 shows a variation in the gray shading, yes. I fully agree. What that means whether this has any protective, you know, means, whether this fulfills all these criterias I would need for product, I would say I have no clue. I simply don't know and this interpretation I would not want to embark on while in the '60s, things I think are described. The nature of the layers is described and Suehiro fails entirely to do that.

Q Okay.

MR. LaMAGNA: Just as a side note, how long do you anticipate continuing? I'm just wondering.

MR. MONALDO: I asked the court reporter for a time earlier. I don't know if you've gotten that how long we've been on the record.

(A discussion was held off the record.)

BY MR. MONALDO:

Q Dr. Raabe, you're looking at figure 12 of Suehiro. Do you see an intermediate layer?

A In figure 12 in Suehiro, I don't know. He is not specifying any of that. I don't see -- in this picture, I don't see any legend.

Q But would you consider any of the layers to be an intermediate layer in figure 12 of Suehiro?

A No, I wouldn't.

MR. LaMAGNA: Objection, vague.

THE WITNESS: I would not do it because we are here now using language of the claim of the '602 and Suehiro is not making use of that language. So I was saying I take the information or legend from the '602 patent and apply it more or less artificially or without a clear crisp definition to figure 12 is not what I would do. And it's obviously not what Suehiro did because in his figure 12, I see no legend, no information, nothing. So when he did not do that, why would I do it?

BY MR. MONALDO:

Q So the third layer you identified the lighter gray in the middle of the coating in Suehiro. Assuming that third layer had the composition specified for an intermediate layer in the '602 patent, would you

consider it to be an intermediate layer?

A When you are referring now to figure number 13 I suppose where some chemical line features are given, is that the --

Q I'm making an assumption about figure 12 and that assumption is that the third layer, the one in the middle that you identified earlier, that layer has the chemical composition of the intermediate layer in the '602 patent. With that assumption, would you consider that layer to be an intermediate layer?

A The clear answer would be yes. It could be an intermediate layer. It could be anything. But, again, I feel uncomfortable because we are imposing the language of the '602 patent to an ill defined figure in a different document like figure 12 here. And you could call something like, yes, an intermediate because it has a certain position in between something else, but what it lacks is the definition what it is and how it is made, how you arrive there and what the other layers are.

MR. MONALDO: Let's go ahead and take a break.

(Deposition recessed at 4:46 p.m.)

(Deposition resumed at 5:03 p.m.)

BY MR. MONALDO:

Q So, Dr. Raabe, could you pull up the Cornette reference which is Exhibit 1014?
A I got it.
Q I'd like to direct you to page 9 of that document.
A Yes.
Q And so the figure on the right column of figure -- of page 9, figure 21, that shows a base coated use of bore 1500 steel that is heated for five to ten minutes between 880 and 950 degrees Celsius and then hot formed and quenched in a dye, correct?
A That's what the figure legend is saying.
Q And those heating temperature five to ten minutes overlaps with the range described in the '602 patent that we discussed earlier, correct?
A That's correct. I just would add this certain limitation that we say. It's here not well defined what does it include, the ramp, the holding. It just says heating and like I mentioned before, heating is a very general term that could embrace holding plus ramping, plus cooling. I assume we don't know. It just says heat, heating.
Q And the temperature range 880 to 950, that overlaps with the range in the '602 patent, correct?
A Correct.

Q And so the bottom right of page 9, there's a section entitled description of the coating, correct?
A Correct.
Q And so the -- this description, the second sentence talks about an average layer of thickness of 25 microns, correct?
A Let me read.
(Reviewing document.)
Correct, yes.
Q And so the next sentence says you heat the precoated boron steel generally 900 degrees Celsius for five minutes and that creates an alloying reaction between the substrate and coating which leads to a hard multiphase alloyed layer, correct?
A Correct.
Q The layer they describe in the next sentence is the iron aluminum silicon layer that is typically about 40 microns at the steel surface, correct?
MR. LaMAGNA: Vague, misstates the document.
THE WITNESS: Aluminum silicon layer is typically about 40 at the steel surface, correct.
BY MR. MONALDO:
Q And then on the top of page 10, do you see

a figure of that coating after the heat treatment and in that photo, the coating layer is about 40 microns, correct?

A The coating layer is 40 microns in the figure in -- in the upper figure of page 10?

Q Yes.

MR. LaMAGNA: Objection, vague.

THE WITNESS: The coating layer measured from where? This is a very, very rough surface. So from where do you mean it is measured the 40 microns?

BY MR. MONALDO:

Q From the steel surface to the outer edge of the superficial layer.

A Because that is a really, you know, extreme hilly, very rough appearance. You take the absolute outermost highest point for your measurement or which point is your reference?

Q Maybe let's do the highest point.

A Okay.

MR. LaMAGNA: Again, vague.

THE WITNESS: I just want to be a bit more careful with that statement because a layer as we said before has a certain topological feature. The question is that means to you that very patchy, rough thing at the surface is for you now a layer because for me, that

is not qualifying as a layer. It more looks like the hemalio (ph). I'm just trying to understand what is now in your language layer.

BY MR. MONALDO:

Q Let's go back to the page 9 description at the lower right. You agree with me that at the bottom, it says that the coating layer is about 40 microns at the steel surface after heat treatment, correct?

A Yes. It says a layer is to be about 40 microns at the steel surface, yes.

Q And then previously the precoating layer thickness was described as 25 microns, correct?

MR. LaMAGNA: Objection, misstates the document and misstates the testimony.

THE WITNESS: Let me read that passage. The average layer thickness showing the best compromise between protection where ability is 25 microns, but that would mean to an expert or to a POSA, that would mean when he speaks here about corrosion and weldability. That must be the final product. You just said precoating, but this text does not talk about precoating. That's the final product. Otherwise you would not weld it, right, or it has no corrosion feature, so that is a mistake.

BY MR. MONALDO:

Q So to achieve a 40 micron layer at the steel surface, how thick would that precoating layer need to be to achieve that?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: In that document, I don't know how these people arrived at this photo because the -- in stark contrast to the documents that we discussed or see in the '602 patent, there is no information how they treated the material. It just says heating where we agreed before that the heating is very unspecific. No information about ramping, weighting, holding or nothing, just a total rough time range and temperature range.

So in other words, I don't have any recipe information that is specific enough to allow me conclude how from a 40 micron like hemalio type of structure that they show in the picture. They started from which kind of precoating because of the 25 micron they said obviously before also seems to be a final coating because they seem to weld it and test it for corrosion. So I'm not sure. I cannot make this inference. I cannot say what they did. There's no information here.

BY MR. MONALDO:

Q Would it be consistent for a 25 micron precoating thickness to result in a 40 micron thick layer after heat treatment?

MR. LaMAGNA: Objection, incomplete hypothetical.

THE WITNESS: So from this document, I simply have no clue and no expert can draw any conclusion whether this would be feasible or what would be your precoating because again the information given about the treatment process is very, very schematically unprecise. It's just this simple schematic picture. It means I don't know how they treat the material.

And secondly they give me two values. They give me 40 microns and in the sentence before, they give me 25 microns. And thirdly I'm a bit skeptical when I look at the photo and see that has really not much similarity to any of the other photos that we have seen before because it has this extremely rough surface.

So when you asked me to make a statement what a precoating would have to be to arrive in their document to 40 microns, I simply must tell I don't know. I cannot make that statement.

BY MR. MONALDO:

Q The precoating thickness of 25 microns

would be within the range of precoating thicknesses described in the '602 patent, correct?

A No, that's not correct.

Q I thought we discussed earlier that the '602 patent described a precoating thickness in the range of 20 to 33 microns, correct?

A Oh, yes. In the '602 patent, yes. Sorry. The 25 precoating thickness and the '602 patent falls within the range of precoating, but this has nothing to do with what they say in the Cornette document.

Q My question was not the Cornette document.

A Sorry. Because you said we talk about Cornette. Sorry. I misunderstood.

Q And then coating thickness after heat treatment of 40 microns would fall within the range described by the '602 patent, correct?

A In the '602 patent, 40 microns fulfills the claim, yes.

Q So in the '602 patent, you could have a 25 micron precoating and after heat treatment, that 25 micron precoating could grow to 40 microns, correct?

A When you adhere to the cooking recipes described by the patent '602, then, yes, with a precoating of 25 microns following the patent description, yes, you could arrive at 40 micron final

coating thickness and of course always in concert with the very well described microstructure and the intermetallic formation.

Q And so in the '602 patent, the concept of the precoating thickness growing during heat treatment is one that you'd agree with, correct?

A In the '602 patent, there's a relationship, yes, correct, between the precoating which then grows following the recipe of the '602 into the fully grown post heat treatment and post stamping coating plus the strict connection to the nature of that coating described in the claim.

Q So in the '602 patent, if you have a range of precoating thicknesses, you would expect those precoating thicknesses after heat treatment to grow to a thickness greater than 30 microns, correct?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: Just for me to clarify, I understand we are now talking only about the '602?

BY MR. MONALDO:

Q That's correct.

A Okay. And in the '602, you're asking whether when I start with the 25 micron precoating whether I can arrive at a thickness of the final

coating above 30 microns or is that your question or was 40 microns or something like that?

Q My question was the range of thicknesses in the '602 patent in arriving at a coating thickness of 30 microns or more.

A Yes. The patent gives us -- the '602 patent gives us a range of admitted or suggested starting precoatings which is between 20 and 33. So that a value like 25 or 28 or 27 would be within that range, yes. And also, yes, indeed it grows when you adhere to the recipe of the '602 into a final coating that should be larger than 30 microns including 32, 40 or something like that plus the necessity when you match the claims of the strict microstructure that we have in claim number 1.

Q Thank you.

Can I turn you to the GMW specification and that's Exhibit 1026?

A Yes. Give me a second. Yes, I got the GM.

Q So in your experience, what would you consider this document?

A Let me very quickly recap. So GM material is specification metals. So that I would see that is a document from GM as an engineering standard for their production guidelines, something like an internal GM

document or something like that.

Q Would GM in your experience be motivated to provide this document to manufacturers of their products?

A Say again. Whether GM would be motivated to what?

Q Provide this document to manufacturers of their products.

MR. LaMAGNA: Objection, calls for speculation.

THE WITNESS: So, again, I don't work for GM. I don't know how they typically do it. I only can reflect on my own experience that when you are a project partner or when you are an original equipment manufacture when you have a contract with GM, then it is very likely that they share such a document with you. Otherwise you don't know what your target is. So, yes, I would find it likely that they shared with companies say one parts from or material from.

BY MR. MONALDO:

Q And would -- have you worked with GM in any of your research projects?

A No, I have not worked with GM.

Q If I can turn you to page 7 of the document.

A Yes.
Q Do see at the top table 6?
A Yeah, I see it.
Q And so in table 6, it says prior to hot stamping, you want a coating thickness between 20 and 33 microns, correct?
A Correct.
Q And so that range 20 to 33 microns is identical to the range we discussed in the '602 patent, correct?
A That coating thickness that GM here puts in their internal specs is, yes, it's the same like in the '602.
Q And so the condition following hot stamping specifies a coating thickness of greater than 35 microns, correct?
A Correct.
Q And that greater than 35 microns is also consistent with the post heating thickness described in the '602 patent, correct?
A Exactly correct. In the '602, the requirement is being thicker than 30 microns.
Q And so when viewing this table, you would expect the coating thicknesses prior to hot stamping to grow to a coating thickness greater than 35 microns,

correct?

A So you say when I read this document, then I would assume that this precoating range given here would grow into something like greater than 35. Is that your question?

Q That is correct.

MR. LaMAGNA: Incomplete hypothetical.

THE WITNESS: I would be a bit more careful here. What GM is doing is that they put in a table something like they want a certain thickness of the coating. They make no statement whatsoever or what you infer how they arrive at that growth. We know for that growth to happen, you need a very complicated heat treatment. You need to know exactly what you're doing.

When you do it at inadequate temperatures of times, you don't get anything. You don't get any growth because atoms need a certain temperature to get mobile. Otherwise there is no growth.

Secondly when I do it too long and so on, then there's no effect at all or it might break off or peel off or liquefy. So I don't know what that means. It just seems to me that for some reason they want those thickness values, yes, totally correct, but whether this thickness value following the hot stamping is following from a growth process in the sense of the

'602 is not said here. It says following hot stamping. It does not say it's following any heat treatment or something like that in a specified way. They just give us numbers, but nothing more.

BY MR. MONALDO:

Q So if you followed the hot stamping process parameters set forth in the '602 patent, would you expect that the coating thickness prior to hot stamping described by GM would result in the greater than 35 micron coating thickness following --

A Sorry.

MR. LaMAGNA: Incomplete hypothetical.

THE WITNESS: No, no, actually not. That is a complete misunderstanding of the physics behind these processes. So, again, when you have a growth, then this growth comes from interdiffusion like explained in the '602 patent. So the atoms must according to the equation must have mobility and they get mobile and so on and so on.

It's a very complicated process. Otherwise you don't have growth. You don't have intermetallics. You have nothing. So in other words, I could do a hot stamping by, for instance, what is in industry sometimes called the flash heating. That means in order to save money, you heat it very quickly and put

it in the hot stamping process immediately, right, because you save a lot money, but then you don't have time that anything is growing. So the growth process for that you must really have an understanding of time and temperature, exposure time. So in other words, you of course can do hot stamping without layer growth.

BY MR. MONALDO:

Q My question assumes you'd use the process parameters described in the '602 patent. So under that assumption, what would your answer be?

MR. LaMAGNA: Objection, incomplete hypothetical, vague.

THE WITNESS: So you're saying that the GM documents ask that the '602 guidance should be applied? Where is that said?

BY MR. MONALDO:

Q It's not said anywhere. It's in my question. My question assumes that applies the '602 guidance. In that case, would you expect --

A Sorry. I misunderstood. So no. You know, that I cannot take any suggestion from an automotive maker and say they for some reason want to have a higher thickness. And then of course I could take any other document and apply certain heat treatments and see what's happening, but this is a gross

oversimplification and it is absolutely no guarantee that you arrive either at the desired thickness for the reasons I just mentioned or that you arrive at this very well described nature of these intermetallic layers that give you the product quality you want.

Also as an POSA in that field, honestly I would be very -- would have been very careful with that statement here because as we discussed earlier today, when you just make things thicker as the auto people here want, the risk of just having liquid aluminum is very high and you ruin your equipment.

So in other words, I agree to you, yes, one could take that starting and precoating desire or statement here from GM and apply a heat treatment from whatever document and see what's happening. But as we also learned from the '602 to which you suggest me to apply it here, we have that crisp statement to the many parameters. You must know what thickness you're talking about. You must know about which aluminum. You must know about what heat treatment. So I think you could arrive at any result.

Q My question is assuming that you follow the process parameters of the '602 patent, the same ones that they described in terms of thicknesses of coatings, compositions of materials, heating, cooling,

the same exact parameters. Would the coating of 20 to 33 microns result in a coating of greater than 35 microns following hot stamping?

MR. LaMAGNA: Objection, incomplete hypothetical, compound, vague.

THE WITNESS: Honestly I simply don't know because in hindsight, that always looks simple. I say okay, now we have all the information from the '602 patent with all this enlightenment and the nature of what these layers are made of and at what point they are available and give corrosion protection and all these other things and with that knowledge in our backpack of course it's always easy to say it's so obvious. Just do the same thing without having that patent, but that's not how things work.

The automotive maker in my 40 years of experience, they of course just say, oh, could we not just make it thicker. Thicker is better for whatever reason. You must ask GM people. But just imposing or automatically assuming that in hindsight using that recipe of the '602 would give you exactly that result, I would be very reluctant and careful to draw that conclusion.

BY MR. MONALDO:

Q If you applied a precoating thickness of 20

to 33 microns and you employed the exact process parameters described by the '602 patent, you would get a coating, a final coating as described by the '602 patent, correct?

MR. LaMAGNA: Objection, compound, calls for speculation, vague and incomplete hypothetical.

THE WITNESS: What I understand the question properly then, this means I zoom now back completely into the universe of the '602 patent. And what you are simply asking if I understand you correctly say you now live in the '602 world. You have 20 to 33 starting precoating thickness and you do exactly as the '602 tells you with exactly the parameters, the alloy composition of the coating, et cetera, then, yes, you would arrive according to the recipes of the '602 at the results that the '602 is describing. That is correct, but this has nothing to do with the GM document. It says nothing of that.

BY MR. MONALDO:

Q But you would arrive at a coating with the thicknesses described by the '602 patent?

A When you live entirely in the '602 world and adhere to their recipes, then, yes, you have that chance without undue experimentation to arrive at their suggested bigger than 30 microns final coating

thickness and complex intermetallic microstructure.

But, again, I understand now we are back to the '602 patent that has not much connection to the GM. The GM guys only seem to say prior to hot stamping, I want this coating thickness and following hot stamping, not even mentioning any heat treatment. They want this thickness and this is all that this table says. So it's not specific.

Q You'd agree with me they want the same things in terms of the preheating -- the precoating thickness and the final coating thickness as the '602 patent, correct?

A I don't know. That is a complete speculation. I'm not GM, but -- so the patent is so specific that they worked out over many years that they must fulfill a broad variety of they call it resistivity for the nugget size, for the spot welding, for the paintability, for the adherence, all of these many, many things that they describe very well that their product must fulfill.

What GM at that time wanted from its product, I have absolutely no clue because, for instance, you could also bolt parts. There are parts in a car that you even don't weld. You have products at that time in a car which you don't subject to a

careful painting. I don't know what GM people wanted to do with that part.

So just transferring the portfolio of properties to that GM document from these two lines I think is complete speculation. I don't know what these people wanted with the product. You can make a hang on part on a car that doesn't have it. It doesn't need all of that.

BY MR. MONALDO:

Q You'd agree with me they wanted a coating thickness prior to hot stamping in the range of 20 to 33 microns? That's what the document says, correct?

A That's what the document says, yes.

Q They want a coating thickness following hot stamping to be greater than 35 microns, correct?

A After hot stamping, they obviously wanted something thicker than 35.

Q So if I was trying to meet the desires of GM, I would be motivated to try to achieve a coating thickness following hot stamping that's greater than 35 microns, correct?

A If I want to sell according to this document of parts to GM, I would maybe be motivated to try to adhere to their suggestion, yes.

Q So -- so I'd like to turn back to the '602

patent. Do you recall that claim 10 of the '602 patent requires that the interdiffusion layer must be less than 10 micrometers?

A Maybe if you could point me to that paragraph.

Q This is claim 10 and that's in column -- the bottom of column 15.

A Bottom of 15.

Q Do you see claim 10 at line 65?

A Yeah, I see it.

Q In that claim, the interdiffusion layer has a thickness of less than 10 micrometers, correct?

A Yes, I see it.

Q Does the '602 patent describe how to manufacture an interdiffusion layer that is less than 10 micrometers?

MR. LaMAGNA: Objection, vague.

THE WITNESS: I would read this portion of the patent as being one of the outcomes of this heat treatment and the precoating and the other parameters that we have described and that's how I would read this. Whether there is a specific cooking recipe that goes down to that very detail saying that exact variant gives you this result, I am not so sure. Could be, yes. I wouldn't exclude that, but --

BY MR. MONALDO:

Q But you would agree that that claim is enabled by the description of the '602 patent, correct?

A Correct.

Q And the person of skill would be able to arrive at a layer -- strike that.

A person of ordinary skill in the art would be able to arrive at a coating where the interdiffusion layer is less than 10 microns, correct?

A Yes. Yes, I agree, correct.

Q How would a person be able to understand the recipe needed to achieve that layer of thickness for the interdiffusion layer?

MR. LaMAGNA: Objection, vague.

THE WITNESS: So the -- that is now a very, very fine subdetail of the description of the outcome of this layer of thickness of the layer A. And a person of ordinary skill in the field who would want to take that patent to make a product would primarily first for sure make a first order approach and say can I reproduce this main claim number 1 with the nature of this -- this protective nature of the intermetallics.

While later of course it's specified further things like hardness or thickness, what you were just citing, and my reading of this document is

that when you adhere to these bounds and recipes given that one consequence would be these other claimed items described here. So I think when I would as a POSA start reproducing this, I would maybe not start from the second order or later descriptors, but I would rather start from do I at all get in the first place the intermetallic microstructure and so on. And then of course I would double-check whether I get these other aspects also fulfilled without undue experimentation of course.

BY MR. MONALDO:

Q If we could go back to column 12 line 45. In example 2, the interdiffusion layer is 17 microns thick, correct?

A Yes.

Q So the process in example 2 would not yield the interdiffusion layer less than 10 microns as required by claim 10, correct?

MR. LaMAGNA: Objection, vague, misstates the document.

THE WITNESS: In line 45, we are reading interdiffusion layer or intermetallic layer 17 micrometers thick. The layer is itself composed of two sublayers and one could read that passage in a way that when the author said themself this interdiffusion layer

or intermetallic layer that they together hold 17 micrometers thickness and so for the moment, I would as a POSA and say I'm working on this product. Say, okay, they were in this very specific example obviously not entirely sure and then I could still be in the bounds because they say or.

BY MR. MONALDO:

Q So your interpretation of line 45 is that the combination of the interdiffusion layer and intermetallic layer is 17 micrometers thick; is that correct?

MR. LaMAGNA: Objection, misstates his prior testimony.

THE WITNESS: I would as a typical example of a POSA now saying my job would be take this patent and make a product. Then I would stumble over the sentence and say, okay, interdiffusion layer or intermetallic layer was 17 micrometer thick. I honestly would say, okay, this specific sentence and this specific example honestly is not hundred percent clear to me. Okay?

And -- but that would not be my job. My main job would be kind of reproduce this microstructure described in claim set number 1, but this very cherrypicked example from example number 2, I honestly

say a little bit unclear sentence which is a bit vague. I would not read as a first order target, but the first order target is do I get the microstructure described in claim 2. So I find this a little bit hard to interpret.

BY MR. MONALDO:

Q So you don't read the or as being one or the other in the sentence at column 12 line 45, correct?

MR. LaMAGNA: Objection, asked and answered.

THE WITNESS: That is now again a very specific example. Out of the universe of cooking recipes which again all have the same very well described claim 1 target and this single sentence I would be careful at the moment to interpret whether they measure interdiffusion and intermetallic layer here as a summation that gives you together 17 microns although whether they mean one layer honestly, I find this a little bit difficult to follow. I must honestly say that -- and I have the head on now from the POSA, so a person of ordinary skill and say I would not go further here.

BY MR. MONALDO:

Q Okay. So if you go down to line 52, you

see intermetallic layer appearing as a pale phase 8 micrometers thick.

Do you see that?

A Appearing as a pale phase, yes, 8 micrometer thick. Yes, I see that.

Q So does that influence your interpretation of the statement at line 45 of column 12 that the interdiffusion layer or intermetallic layer 17 micrometers thick?

A That could mean that this intermetallic one is here 8 micrometers thick because that is a specific statement.

Q How thick would the interdiffusion layer be in example 2?

A It could be a subtraction where we say, okay, then that would leave us with 9 micrometers for the interdiffusion layer because 9 plus 8 is 17.

Q You're saying that example 2 meets claim 10 because this sentence about 17 micrometers is something you would subtract the 8 micrometer thickness of the intermetallic layer from?

MR. LaMAGNA: Objection, vague.

THE WITNESS: I think again the reading here would be when -- and B, it says intermediate layer is 8 micrometers thick. Then in C, it says

intermetallic layer is 8 micrometers thick. And above they say interdiffusion or intermetallic layer is 17 micrometers thick. Then at least I would assume, okay, we have 8 plus 8 is 16. It's not so far away from 17, so I think that is okay with me.

BY MR. MONALDO:

Q And if you're looking at figure 1 of the '602 patent, the layers A, B, C and D are well defined, correct?

A Yes, correct.

Q And layer A is the interdiffusion layer, correct?

A Correct.

Q Why wouldn't you expect the sentence at line 45 of column 12 that starts with in layer A, interdiffusion layer to that layer being 17 micrometers thick?

A I don't see where in the caption does it say that this picture is example 2. I missed that text somewhere. Where is the text saying this is example 2?

Q Three lines above at line 42, example 2, it says it's illustrated at figure 1.

Do you see that?

A Okay. So let me go back because -- okay. So let me have -- the column was column 7, right? No.

Q Column 12 line 45.
A And 45.
Q Forty-two is where it mentions figure 1.
A Got it.
Q So would you understand when it's referencing layer A, it's referring to the interdiffusion layer and that layer is 17 micrometers thick?
MR. LaMAGNA: Objection, misstates the document.
THE WITNESS: Like I said before, so when I have this figure plus the statement and I have that scale bar indicating 10 microns, then I would maybe make sure first I apply the same whatever statistic of the measurement and try to extract what the joined thickness of these two layers is and see whether this makes up 17 or 16 or what is described in the text that we just discussed. I would for sure make sure I compare this and see where I land.
BY MR. MONALDO:
Q Okay. So can I turn you to figure or to column 13 and at line 4 the sentence that starts moreover? Would you agree with me that that sentence says that the interdiffusion layer 10 micrometers thick in contact with the steel substrate is thinner than in

the previous case of figure 1?

A It is in this coating. Is it now also still example 2, right? So we are example 2. In this coating, the pale intermetallic layers, C is not continuous and appears to be scattered within the coating while 50 percent of the layer is present and at the extreme surface of the part. Ten micrometers thick and contact with the steel substrate is thinner. This is figure 1. To which figure does this refer now to? So which figure is it?

Q I don't see a reference to the figure in this paragraph talking about the coating and it being 10 micrometers for the interdiffusion layer and that is thinner than what is shown in figure 1, correct?

A The statement here says 10 micrometers is thinner than what is shown in figure 1. Yes, that is what the sentence is saying.

Q At the bottom of column 12, it specifies different conditions where the blanks with the same base material and precoating parts were furnace treated in different conditions. The blanks were heated to 950 Celsius for seven minutes. This is including the heating phase. The heating rate was 11 degrees Celsius per second. I believe the coating discussed at the top of column 13 relates to the conditions set forth at the

bottom of column 12. Would you agree with that?

A Let me read the context.

(Reviewing document.)

So they seem to report to this specific heat treatment described here, yes.

Q And that gets you an interdiffusion layer that's 10 micrometers thick, correct?

A Yes.

Q And claim 10 as we discussed before said less than 10 micrometers, correct?

A Correct.

Q This coating at 10 micrometers, would that be covered by claim 10?

A I see here it is maybe just only touching as we discussed before the -- as you correctly say, the claim 10 says you want to be whatever -- what does it say? Less than 10 microns and here obviously they just hit 10 microns, so it's really -- it's not exactly obviously in the middle of things, but it's also not a different planet, not a different universe. I think for such a super complicated process honestly again applied to thousands of tons, it's to me not surprising that it's 10 microns.

Q Okay. So you'd expect that if you do the process described at the bottom of column 10, you'd

have situations where the interdiffusion is less than 10 micrometers, correct?

A I would say in that single example number 2, they might maybe for a reason to show look -- we get now more to the, you know, parameter ranges to see you can get close to these more extreme values or limits. I would not exclude that they want to show that with an example, but, again, when I would be a POSA, I would probably then learn from that because it enlightens me and tried to get closer to the middle of things. So that's how would I read this as a POSA, not as a negative, but as a teaching.

Q If the listed 10 micrometers was slightly different let's say 10.1, 10.3, would that change your opinion of this description?

A This is extremely hypothetical. We can now go through each single parameter or value for more examples and say, okay, I give you a variation of 10.1 or so and 10.2. And that sounds to me to be very speculative and outside of the scope of what I am supposed to opine on because when things are kind of what we said nonlinearly connected and the process as we agree is really, really complicated, then I would be careful in saying it does not matter at all or it's all the same.

I have the feeling these teachings from the authors tell us, you know, make sure there are certain maybe less favorable regions of our recipes and more safer regions from the recipe. That's how I would read it, but I would not really follow you and say let's bury all of these parameters by one or ten or whatever percent. I think that is for me very speculative as an engineer. I would maybe not do that.

Q But from the teachings of the '602 patent, your opinion is that a person of ordinary skill in the art would be able to arrive at a coating that has an interdiffusion layer where the thickness is less than 10 micrometers, correct?

A Correct.

Q And they'd be able to do that by looking at some of these examples and modifying the recipe or process parameters that have been described by the '602 patent, correct?

A Can you again repeat the question that you say yes with the certain -- I maybe have to do one or two more experiments as the POSA to say, you know, that I stay within the suggested specs. And, yes, I think I would do that and would find it reasonable when one or two more experiments would be done. That's totally okay, yes.

Q Now, in arriving at an interdiffusion layer that's less than 10 micrometers thick, would you expect the compositions to be the same as those set forth in the earlier example?

MR. LaMAGNA: Objection, compound, incomplete hypothetical.

THE WITNESS: So, again, just for me to understand your question correctly, you say when we have now this little bit larger or thinner than 10 microns? Is that what you're asking whether then the compositions would vary or --

BY MR. MONALDO:

Q Yes.

A Got it. When there is a minor variation of that thickness of that intermediate layer, it could be that you also have a likewise minor change of the exact chemical composition. That is indeed conceivable, but again as a POSA, you would not go into such maybe third or fourth order aspects. But the main soul you take away from this thing is you would first target to make sure you have that intermetallic layer and the other specs fulfilled.

And when indeed like you say when then there's a minor thickness variation in that second or third order point, yes, it is not to be excluded that

this might translate into minor chemical variations also, but they would not be maybe game changers pertaining to the main claim number 1 as the nature of intermetallic. That's again with the hat on of the POSA how I would approach this problem.

And then I would maybe add on one or two more reasonable experiments to make sure I'm having a robust process. Again, this is very, very important to consider. You have 30,000 ton type of thing and you modify with metallurgical surgery something that is in partner what we discussed as thousands of the human hair and on a hundred thousand ton product.

Just to balance it a little bit, the playgrounds on which we act here. So you first go for the main target and, yes, minor variations then might require a few add on experiments to optimize.

Q Can I turn you to paragraph 271 of your declaration?

MR. LaMAGNA: Last paragraph.

THE WITNESS: 271.

BY MR. MONALDO:

Q So my question is: Do you think that use of bore was commercially successful after the '602 patent?

A Let me quickly read and refresh my

recollection.

(Reviewing document.)

There was definitely upswing in the commercial success and industrial need for such a product that adheres to the '602 patent, yes.

Q So was use of bore steel successful because of the specific 20 to 33 micron precoating thickness described in the '602 patent?

MR. LaMAGNA: Objection, vague.

THE WITNESS: The inventors are very specific why such a need existed pertaining to industry and they are very clear in describing it in the patent as I also recapitulate here in the document, in my document that they needed better and more robust availability, paintability and all the things that we know the product delivered.

And I think they saw that need and that was later rewarded by a corresponding market growth and the number of customers. And I thought that was a very good motivation.

BY MR. MONALDO:

Q Would that be because of the thicknesses and compositions described in the '602 patent or simply because press hardened steel generally makes cars lighter?

MR. LaMAGNA: Objection, compound, vague.

THE WITNESS: The main point is no. The main progress indeed comes through this complex microstructure of the layer which lends the otherwise already pretty good press hardening steel. The steel which is the standard in the industry lends it exactly those additional properties that particularly the car industry needed, right, because the steel in itself is a great stuff. It's very, very good stuff. You can make it very hard and et cetera.

You can make it (inaudible), but only the recipe plus the features that you correctly describe the thickness, the nature of the layer, all the things that we have in the patent turn it into that product that fulfills with reproducibility, robustness and reliability again on a thousand ton type of level. The needs of the industry pertaining to availability, paintability, corrosion, resistance and so on.

So I think it's really that connection between this add on quality of that base steel that made the product so successful.

BY MR. MONALDO:

Q Are you aware of any customer who bought steel specifically because of the composition value specified in claim 1 of the '602 patent?

A That is for me a little bit speculative again because I don't work directly in the auto industry and I was more meant to opine on the quality and nature and specific of that '602 and '227 patents. But as a POSA or somebody working closer with the car industry, I could tell you that the desire for having such an improved product is immense because I don't know how old you are, but at my age when we are young, all the cars corroded.

You spend a lot money. You buy a used car. Everything corrodes and that was a huge problem. And all the younger generation grows up and sitting in at least 1500 cage that saves their life every day plus it does not corrode away like you spend your last dime on a new car. So I think, yes, that is a huge success story and every car maker would want to have such an added benefit for sure.

Q When was use of bore steel invented?

A Off the top of my head, I'm not exactly sure. The use of bore steel alone is older. I don't know. I would really have to look it up. It was definitely preceding the event of '602 patent for the steel, the press hardening principle as we discussed before.

Q And was use of bore invented by the

inventors of the '602 patent?

MR. LaMAGNA: Objection, compound.

THE WITNESS: The use of bore I think is even a pound name if I remember it correctly which consists of ingredients like USI for Usinor. Usinor was I think one of the preceding companies and, B, standing obviously for the boron addition and so on. So, yes, this invention had the contribution of I think inventors from the preceding company Usinor in France, I think, but I would have to double-check the details of this very early invention.

BY MR. MONALDO:

Q In your opinion, how long does a need need to exist before it is considered to be long felt?

MR. LaMAGNA: Objection, calls for a legal conclusion.

THE WITNESS: Say again. I honestly did not fully understand your question. I did not understand. What is your question?

BY MR. MONALDO:

Q In paragraph 271, you mention there was a long felt need satisfied by the claimed invention. My question is: How long does a need need to be felt for it to be considered long felt?

A Now I see. Sorry. That is a term which we

use as a POSA or as experts in the field when obviously there is a need. Say corrosion, right? You don't want your product, your home, your bridge, your car, your train to corrode. We don't want that. That is totally clear. That means it's a very long felt requirement by every consumer, every customer.

The second however boundary condition is that somebody must invest in the time and effort and so on to make an invention that improves that product with respect to these features to only stay with corrosion and the same applies to availability and so on. That often is in the field before you have it mature enough to unleash it in such a huge scale industry as I pointed out before.

It is often that you need many years to have that invention mature enough to cross into the patent and so on to have it tested like the inventors did. So I would give it several years and the long felt need is often dating back much longer because I think since the iron age beginning, people didn't want their products to corrode, I suppose.

Q The only evidence you cite in paragraph 271 of your declaration is the '602 patent itself, correct?

A Yes.

Q Would you consider comments that are

provided by an inventor trying to secure a patent to be biased?

MR. LaMAGNA: Objection, calls for speculation, lacks foundation.

THE WITNESS: That depends on the inventor because I would always seem -- if you are biased or not is not the point. You guys are the lawyers. I'm just a little engineer, but whether you are biased or not, does it help you when getting a patent granted? That would be new to me, but you are the lawyers.

BY MR. MONALDO:

Q I guess my question is would it be in the best interest of the inventor to overstate his or her contributions in trying to secure a patent?

MR. LaMAGNA: Calls for speculation, lacks foundation.

THE WITNESS: So you're asking me now about the personality of the inventors which I'm afraid I don't know that personality to answer that question. In my field or in this field of engineering, gross overstatements are a big mistake because you lose your credibility. When you promise you sell a new mobile phone, a new plan and you say it fulfills hundreds of criteria, if it does not, then you lose credibility.

So typically in our field, inventors maybe

tend to be quite realistic, so -- but you're asking me about many details that maybe the inventors can only ask about their own character. That is a bit hard for me.

BY MR. MONALDO:

Q But you didn't cite any other evidence to corroborate the statements made by the inventors, correct?

A That is correct. That was my job, my 40 years of experience in doing exactly this.

MR. MONALDO: I think it would be a good time for a quick break.

(Deposition recessed at 6:06 p.m.)

(Deposition resumed at 6:13 p.m.)

MR. MONALDO: I don't have any questions and I'll pass the witness.

MR. LaMAGNA: Let me go back for just a second and collect my notes and then we'll come back. Give us like maybe -- I'll be back in like ten minutes.

MR. MONALDO: Okay.

(Deposition recessed at 6:13 p.m.)

(Deposition resumed at 6:25 p.m.)

EXAMINATION BY MR. LaMAGNA

Q Thank you again for your time today. I just have some wrap up questions.

Can you turn to Suehiro which is Exhibit 1055 which is probably in this pile somewhere?

A Suehiro?

Q Let's look at the page that is marked page 2.

A Um-hmm.

Q And you see the header there that says base material properties on page 2?

A Is it maybe -- yes, I got it. Sorry.

Q And if we go down, that's section 4 of Suehiro, correct?

A Right.

Q And if we go down here to section 4.2, what is the header there called?

A 4.2, quenching properties.

Q And you see a paragraph number 7 there?

A Yes, I see.

Q And what is that paragraph describing? Take a moment to take a look at it and tell us what it's describing.

A (Reviewing document.)

So what this is describing is the so-called CCT curve. That's a continuous cooling curve for the base steel which is something that the practitioner would use to inform you about what happens to a steel

when you cool it down at certain rates or when you render it austenitic and quench it and so on.

Q When we go on then to page 4 of Suehiro, we have several figures including figure 3. Do you see those?

A Yes.

Q What is it that we are cooling in those figures? What are the holding times or cooling times and so forth referring to?

A That is always referring to the co-called CCT type of diagrams which again is a standard tool in steel design and process design. This is referring to the base steel, in this case the press hardening steel.

Q Is that what's happening during the hot stamping process that's described in the '602 patent?

A No, no. That is not what you do in the '602 patent because again this is more a textbook analysis of -- what you do is when you kind of cool it with these different rates, the base steel material, not the compound material, so that is not related to the '602 patent.

Q So figure 3, figure 4 and figure 5 are not referring to cooling that occurs subsequent to hot stamping; is that correct?

A No. It has nothing to do with the '602

patent because in the '602 patent as we discussed in the morning today, you are cooling during stamping and forming. You are cooling a compound product. That means the steel has a complex layer on top of it which affects as we discussed this morning the cooling rate, the heat connectivity, all these things. So these diagrams don't show that. These diagrams only show the reaction of the naked base steel without any coating.

Q So this is cooling and quenching that occurs prior to the aluminum coating being applied, correct?

A Except here there is no aluminum at all involved.

Q Well, let's go down to figure 12 and I guess we can look at figures 12 and 13. We had -- you offered some testimony earlier about the almost white color layer that is sort of at the top of the coating that is shown in figure 12. Do you recall that?

A Yes.

Q And I believe there's some question as to whether or not that was a superficial layer or not. Do you recall that?

A I recall it.

Q It's your testimony that that is superficial, is it not, insofar as that layer is the

layer that is exposed to the atmosphere? Is that your view or what is your view in that regard?

A So as we discussed this morning particularly in reflection of the statements of Dr. Miles where there was this contradiction and the report of defining what a superficial layer is, on the one hand, we totally agreed it's the outermost layer. It's the one that sees the oxygen, the environment and so on, the harsh environment conditions. And so it must be physically topological wise the outermost layer.

Q So is what we see here as white sort of above the layer that Dr. Miles identified as layer number one, is that the outermost layer?

A So that's a contradiction that we tried to clarify today because in Dr. Miles' report and also in the data, in the composition data that we see plotted in figure 13, this very outermost layer is not discussed or ignored.

So Dr. Miles in his analysis for some reason took the layer beneath it, so not the outermost layer, and coined it superficial layer although before he agreed the superficial must be the outermost layer. So that is something which I think where Dr. Miles was incorrect.

And secondly we found that interesting to

see that when you look at the chemical analysis and it starts with layer number one in Suehiro, that is actually not pertaining to the outermost superficial layer. So we don't know what the nature is.

Q So, again, just to be clear, when you say the outermost layer, are you referring to the sort of white layer or the lightly dark gray layer? Which layer is the outermost layer?

A So the outermost layer is this very white, very upper part of the material.

Q And does that qualify in the patent, in the '602 patent, claim 1 as being the superficial layer in claim 1?

A So in the '602 patent, the outermost superficial layer is very well defined of being required to be an interdiffusion related layer. That means it's there by purpose. It is a designed layer that results from interdiffusion. And in that context, that has nothing to do with what we see here which is not described. We cannot see where that comes from diffusion or where it comes from at all. So it's in nature a very different animal than in the '602 patent.

Q Are you saying it may come from diffusion, but it might not? You don't know?

A I don't know. There's no description

given.

Q What about figure 13, isn't there a compositional data there in figure 13?

A No. The compositional data in 13 according to Suehiro do not relate to this outermost layer, so we simply don't know whether it has to do with diffusion or not.

Q Why do you say that the outermost layer is not included in the -- in figure 13?

A So in figure 13 when we follow that numbering, you have the iron, the base material and then we follow that description like it's described in this document. And it stops in that -- you know, the layer number one and there's this gray region that you see beneath that superficial layer. And that also the one that Dr. Miles in his report coined as the superficial layer and that's where the chemical analysis stops.

Q We see the layers here in Suehiro look at least to my eye topologically, they go left to right fairly consistently. Is that fair to say?

A That is okay to say in that gray shading, yes.

Q And you remember there was some testimony where there was some questions as to -- about how

continuous a layer needs to be in order to qualify as a layer in the context of the '602 patent claims, correct?

A Correct.

Q So do you need -- to qualify as a layer in the context of the '602 or '227 patent claims, do you need to have 100 percent continuity without interruption from left to right?

A No. The '602 patent is not so strict. We had discussed today before that there are certain interruptions even stated in the dependent claims, so there's no need to have something like hundred percent continuity. That's not requested, no.

Q But here you don't challenge the continuity of these, correct?

A No. I don't question the continuity, no.

Q So which layers here in Suehiro are you contending that it's not clear whether they're present or not? Which layers do you take an issue with?

A I take a big issue in the fact that the nature of these layers are simply not revealed or not mentioned or not understood at all particularly not the intermetallic layer because that's one of the very essential ingredients of the '602 patent that lends this product the advantageous properties and there's no

mentioning of this mechanism or such a layer at all in Suehiro.

Q Now, if we look over for a moment at Takagi Exhibit 116. Can you identify multiple layers in Takagi?

A No. So --

Q In figure 2A.

A In figure 2A, that figure does not tell us anything. That is just run by region which relates obviously to some kind of coating, but then it shows us a couple of legend items from inner layer to three types of intermediate layers to the outer layer. That's the language of Takagi.

But in the figure, there's no distinction. That seems to be entirely arbitrary, so I would not know how he at all arrived at this conclusion that there are several layers because the image does not show any distinct layers.

Q You're not disputing the continuity of the layers there? You're disputing whether or not there are layers?

A Exactly.

Q Let's look at -- let me ask you -- go in a different direction. In the '602 patent, you talked about a number of different parameters today, correct?

A Correct.

Q And many of those parameters, there were ranges?

A Correct.

Q If I were to take, for example, in each one of those parameters and pick one point in the range and combine it with any other point in the next parameter and then combined within any other point in the next parameter, just picking points, would I necessarily then if I practiced -- you know, performed hot stamping according to those parameters, would I necessarily end up with the claims recited in the '602 patent?

A No, you would not. And that's something we discussed a couple times today where I tried repeatedly to make clear that the interdependence of these process variables is really complex and just picking a few points like label stones do not necessarily bring you to the result of the '602.

Q I guess what I'm not understanding is let's say you have a particular time range and you have a particular temperature range, shouldn't -- isn't it the case where I could pick any time I wanted that was within that range and combine it with any temperature that's within that range and still land inside the claims? Is that what would happen?

A No. That would not bring you inside of the claims. To give you a very simple example again is assume you take the outermost variance of the range and bind them all together in a linear thinking. Then it could happen that you get, for instance, a lot of Kirkendall porosity and your layer consistency would entirely get lost or you get like we saw in some of the Suehiro document, we saw after five minutes all of these distinct layers are completely gone. It's kind of one source, one layer. So you must very carefully adhere to the recipes described by the '602 to make sure you get this consistent formation of these layers in the claim 1 description.

Q Is there any guidance in the '602 patent that allows you to select from the different ranges for the different parameters and determine what will work?

A Yes. The patent, '602 patent is very specific and where it differs profoundly from the prior art in this field that it narrows down the ranges and the recipes considering also the finer details and particularly their complex interdependence.

Think alone of the dependence on the thickness that it tells you directly you have to adjust temperature or things like that according to the thickness of your material. Otherwise you don't arrive

at your desired coating microstructure.

Q Let's look again at GMW. That's Exhibit N26. And look on page 7.

A Okay.

Q There is a range of thicknesses from -- for precoating from 20 to 33 microns.

Do you see that?

A Yes, I see that.

Q Would it be the case that if I start with 20 microns or I start with 33 microns or anything in between as my precoating, would it be the case that I would necessarily end up with a structure that meets the limitations of the '602 and '227 patents?

A No, you would not. Like we discussed before, not even that you would not very likely arrive at these desired layers according to the '602 claim description if you do not fully follow the recipes described therein, but it could even like I said in the beginning for cost reasons be a motivation to make that heating so short that you even do not get the growth.

It is really a very complicated process and just giving numbers and picking certain numbers where you as a customer desire to be does not let you in for back how the process should be made, so you need the patent.

Q Let me understand this. If I were to start with just say a precoating that's 20 microns, isn't it true that I would get no matter what to 30 microns when I'm done with the heating during hot stamping?

A No.

Q Why not?

A So when you start with something like 20 micron precoating and do some kind of heat treatment or so as I said, when you do not follow the '602 patent, you could get all kinds of, you know, effects when you heat. At a too low temperature, you don't get anything. When you heat at the right temperature but far too long, you get Kirkendall porosity.

When you maybe heat too rapidly, maybe you get the wrong intermetallics or no intermetallics at all. I think there are so many parameters where you finally must adjust your process parameters to arrive at this protective coating system that the claim describes.

Q Could I start at say 20 microns as prior to hot stamping for the coating and end up after hot stamping with only 26 or 27 micron thick coating?

A You could end up with anything. It's very hard to predict. These numbers from GM only tell a desired thickness for a reason that does not include

any art how to arrive there. That means if you do not follow the recipes of the patent, it could -- you know, you could end up with more or less any number in a certain range or with nothing.

Q Speaking of the recipes of the patent, now the patent you said requires an intermetallic layer, correct?

A Correct.

Q What are the GMW requirements for the intermetallic layer?

A There's no mentioning at all of any intermetallic layer or any microstructure at all. There's nothing in that GM document.

Q Well, so let me clarify that. What internal microstructural topological requirements does the GM document set?

A The GM document does not make any statement about any microstructural guidance or microstructural requirement. So the -- related to the patent and to the coating. So there's no information.

Q So if I have a -- prior to hot stamping, let's say I had a 30 micron precoating and after hot stamping, I had 37 microns, would that meet the GM specification required here on page 7?

A Well, when you start with a precoating

prior to hot tamping of 30 microns, that would fulfill their spec, yes. And after hot stamping, you say you would arrive at 37 microns. Then this would meet these specs because it said you should end up above 35.

Q Would that then necessarily also fulfill the requirements of the '602 or '227 patent?

A Not at all because the '602 patent is very specific and saying, you know, if you want to have all those benefits that we discussed today at length, you would need these different layers to be formed in the respective, you know, state that we discussed, the intermetallic layer and so on, these interdiffusion layers. Otherwise you don't have the protective benefits. You might have a thick layer, but that does not give you any advantage.

Q Let's look at Cornette. Let's look at page 10 of Cornette -- I'm sorry. Page 9. Now, page 9, the -- do you see that section where it says description of the coating?

A Yes.

Q It says the average layer thickness showing the best compromising corrosion protection weldabilities is 25 microns, correct?

A Correct.

Q And what coating do you understand that to

be referring to?

A My reading would be here and I think that of any POSA in the field would say they talk about the best compromise in their own words between corrosion protection and weldability. And that means it must be the final product. Otherwise you don't weld it. You don't test corrosion properties. You know, why would you do that? The point is that you need a final part that the customer then has to weld onto, for instance, his car.

Q But the last sentence here refers to a final -- a product that has a final coating of 40 microns and how can that be if they said that they got in the prior sentence 25 microns? I guess I'm confused. Can you explain that to me?

A First of all, I'm also myself not hundred percent sure what these authors were exactly referring to. The point is as any POSA or any expert would read that document that this might just be due to a variation in their test portfolio that they might have had products where they had the 25 percent coating, tested it for corrosion, corrosion and weldability. And likewise they might have other variance again which are not described by this one simple schematical picture -- we don't know -- that have maybe 40 microns.

So we simply don't know. We cannot conclude that.

Q When we look here at the -- the prior sentence says the average layer thickness showing the best compromise between corrosion protection, weldability.

Do you see that sentence?

A Yes.

Q The reference to the average layer thickness showing the best compromise, does that suggest to you that there was a range of experiments that they ran at different thicknesses?

A Yes. When they used the word average layer, they might have a wide spread of possible layers they arrived at, yes.

Q And do we know which of those might be referred to in the last sentence?

A So which of these tests out of this broader range of possible tests they have run, I don't know. They refer to an average of 25 microns and one example they are more, you know, referring to -- the last sentence refers to a 40 micrometer example, but they don't add the word average here, so it might be one out of a range of possible tests they did.

Q So if 25 is the best, presumably then 40 would not be the best, correct?

A At least in their own words, they are clearly stating 25 is the best. That's their own wording.

Q Let's go to the next page, page 10 and look at the figure in the upper left-hand corner. Is there anything about that figure that suggests that that coating might not be the best for the purposes of corrosion resistance?

A When I look at that picture as we discussed today already, then we see a very, very rough surface with many spikes and more like a mountainous area rather than as a consistent layer. And I think that compared to all the other experiments we have does definitely not represent the best possible example because it could fail. It could break. It could give you insulation that you don't want. So I would definitely not touch such a material.

Q So in your view, to what extent would the -- what we're seeing here imaged in this figure on page 10 of Cornette in the upper left-hand corner, to what extent do you think that would embody the best compromise between corrosion protection and weldability?

A I think in their own words, that's not very likely that this picture is the best possible example

because they in their own words say that the 25 micron result is the best, gives them the best compromise between these features while the 40 micron example is in my perception pertaining to what we see here and the roughness and unevenness would be maybe more a risky material, maybe also crack initiation and things like that. So I think that's not maybe the best practice example I would guess.

Q If it's brittle or cracks become easily initiated, how does that impact corrosion resistance?

A When you have embrittlement and parts break off, then you lose the protective -- your corrosion protection where you lose your coating. You have no corrosion protection and even worse you have something we call a carbonic element. That means it's like a different charge and can accelerate corrosion.

Q Couldn't this very mountainous topography that we see at the surface here, couldn't this just be an artifact of sample preparation or something else?

A Yeah. It could be more or less anything because the document is not specific. We have only couple of sentences about something as complex as we have described over the day today described in the '602 patent. That's what these authors here in four or five sentences with no description of the preparation or the

background of this roughness and so on, I think that is definitely not the basis of again starting a multimillion dollar operation to make better car parts.

Q Now, is there a layer here in this SEM that you can identify as the -- as an intermetallic layer?

A No.

Q Is there any disclosure here in Cornette that you can see that uses the word intermetallic?

A No. It's not mentioned at all.

Q What about in, for example, Takagi? We looked at Takagi earlier. Doesn't Takagi mention intermetallics?

A No. Takagi does not use the word intermetallic at all.

Q Let's look at the '602 patent again. Let's look at column 1. Early on in your deposition -- you may have forgotten because it's been some hours ago -- we had a discussion about different references that may have been part of, you know, what -- part of the patent or discussed in the patent. Do you recall that?

A I recall that, yes.

Q Let me just, for example, draw your attention to column 1, the paragraph beginning at line 46.

A Column 1. Forty-six, yes, I got it.

Q Is there -- do you see anything there in that paragraph that would refresh your recollection about whether or not there were references that you were referring to?

A Yes. So I have to maybe correct what I said before that when referring to one specific parameter being the dewpoint, then I would have to take more time to refresh my recollection where exactly the dewpoint was mentioned, where that might be in one of these references inside of the patent or somewhere else. I do not exactly remember that.

However, my message before was that we have a certain range of parameters that the '602 patent explores very well and some of them are really essential. And those are the ones that the patent maybe elaborates about. My point was only that we have to know or a person of skill in the art would know there a few more that was reasonable experimentation you could adjust and dewpoint is such a case.

Q When you were referring to the notion that there were other, you know, references that were incorporated into the patent, what was it that you were talking about?

A So here in the patent, I would refer to these references that are given in that flow text that

we see here and there mentioned and those were the primary ones that you would adhere to.

Q Okay. We had some discussion earlier about intermetallics versus intermetallic layers. And just to correct any confusion, is there a difference between saying an intermetallic versus intermetallic layer?

A Yes. The -- that is a quite important aspect of the patent because the patent '602 explicitly talks about this intermetallic layer. That means they combine the structural and bonding and chemicals, bonding conditions of defining an intermetallic together with the fact that it should form in the form of a layer, of a continuous lateral type of strata.

Q Okay. So is there a difference between there being an intermetallic compound and an intermetallic layer?

A Yes. You can have intermetallic compounds that are scattered that assume an island form or so, but the patent explicitly talks about having a primarily two dimensional expanded kind of layered structure of these intermetallics.

Q So I guess what I want to understand is there is -- is there a distinction between the -- an intermetallic isolated as a compound or a molecule and an intermetallic layer? What is the distinction

between those two?

A Right. So the term intermetallic as a stand alone term as we discussed today also in light of the existing literature from that time can be used in an atomic sense, in a molecular sense that you really have atomic ordering of a small, tiny crystal at atomic scale or an atomic structure like A, B, A, B or something like that. That does not automatically mean that this expanse over, you know, meter wise with like a coating steel product. So these are two different things.

Q So when you see an intermetallic layer, is it sufficient that you have say two metals, iron and aluminum as isolated molecules in the same layer? Does that make an intermetallic layer?

A No, it does not. And that was a misunderstanding to which I referred to when reading the report of Dr. Miles because that distinction was not made and that was a motivation to add such a more crisp definition to my own report because it's a difference when you bring two or three molecular or atomic substances together that they can like I refer to the coffee, milk example mixed in a random way, in a disordered way or they instead like an intermetallic can atomic-wise assume a more ordered state and that is

a big, big difference.

Q And so when the patent refers to an intermetallic layer, which is it referring to, the milk and coffee or the more ordered state?

A It is definitely not referring to the milk and coffee where you just have composition insides. No. It must assume this ordered structured state like described in the patent. And that's why I think they purposely used this word intermetallic and not just intermetallic, but intermetallic layer to make clear it must expand over a wider pancake type of structure.

MR. LaMAGNA: I have no further questions. Back to you.

MR. MONALDO: Can we take a few minute break? I have a few questions.

(Deposition recessed at 7:00 p.m.)

(Deposition resumed at 7:05 p.m.)

FURTHER EXAMINATION BY MR. MONALDO

Q So, Dr. Raabe, I'd like to start with the Suehiro reference which is Exhibit 1055.

A I got it.

Q During your testimony, you mentioned that the Suehiro reference does not provide composition values for the outermost layer; is that correct?

A For the very outermost superficial layer

indeed, yes.

Q I'd like to turn to figure 13 of Suehiro.

A Yes.

Q So in figure 13, the bottom access states that's the distance from the surface, correct?

A Correct.

Q And at the very left-hand side, the value is zero, correct?

A The value of what is zero?

Q The distance.

A I mean, the distance. Sorry. Yes, yes, correct.

Q So a distance of zero from the surface would be the surface, correct?

MR. LaMAGNA: Objection, vague.

THE WITNESS: No. You must be careful with that. You just put a zero where you start your measurement, right? You automatically imply that they put the zero to the outermost superficial surface, but that's not what this data is showing. They could have or they seemed to have put the zero not at what we see as the superficial layer, but rather like Dr. Miles defined it in that gray layer beneath what he called the superficial layer. That's where my confusion came from.

BY MR. MONALDO:

Q But figure 13 says it's the distance from the surface, correct?

A It says distance from the surface, but, again, it's a little bit a definition which is not revealed in figure 12 where they have defined the surface. This is a chemical definition of the surface, but in a remeasurement, you would exactly show where the measurement started in the real picture, right?

Q Let me just -- let me ask another question here. So in the graph on figure 13, there's a range that goes zero to the line -- the first vertical line labeled with the number one in a circle. Do you see that?

A Yes.

Q That's specifying a distance from zero to a certain micrometer value, correct?

A Correct.

Q In your opinion, that is not a distance from the surface to the certain micrometer value, correct?

A I followed here the description of Dr. Miles who had placed that into that gray layer beneath the outermost layer and that's where my question came from.

Q You're reviewing figure 13 based on Dr. Miles's interpretation of figure 12; is that correct?

A No. I see it with my own view, but when I saw and I had to react to the description that Dr. Miles had chosen for his interpretation, I could only see that he had shifted that zero point not where we see the outermost layer. But he had shifted that into the gray layer beneath it.

And when you look back into his report and look at this red color coated legend, he said the superficial layer was the gray layer beneath it and that's where then I assume the zero point is starting. So, again, in my perception, I was not sure where the zero point is really placed in that microstructure.

Q But if you were reading Suehiro irrespective of what Dr. Miles did in his declaration, where would you think the zero place would start?

A You asked me to opine on something where very limited information is only available. So for me, the safe holding point would probably be the base here. So I would start from the other side.

Q But because Suehiro says distance from the surface, they would be starting from the outermost surface, correct?

A No, that's not correct. That is only an

interpretation because again where we have seen before that in some of these micrographs when you think also of the Cornette micrograph, it was in part very ill defined starting point to go to the surface because these surfaces are interpreted differently by Dr. Miles, maybe differently by Suehiro and so on.

So that's why I suggested why not take the safer starting point starting from the base steel. When you remember the picture in Cornette, that's I asked you before where do you start in this mountain area to say that is my starting point of a chemical analysis. I found it very ill defined and so I find it here very ill defined.

Q We were earlier discussing Suehiro figure 12. You mentioned that you saw five layers in that figure, correct?

A Correct.

Q And so why do you not think the data in figure 13 which lists five layers corresponds to the layers you identified in figure 12?

A Because as I said, there is no automatic relationship between this chemistry which is shown in figure 13 and this gray shading and ill defined surface topology shown in figure 12. That is not automatically the same. From a certain chemical composition, you

cannot automatically infer that this translates to a certain gray scale.

So my recommendation was just to be very careful with that analysis bringing it in a court. And I was really confused by Dr. Miles' report why he then had started to put that starting point in the layer beneath and not at the very surface.

Q Wouldn't a logical reading of figure 13 be that the five layers listed in figure 13 correspond to the five layers you identified in figure 12?

A The reason why I'm a little bit careful is translating the chemistry directly into layered appearance is as we have discussed before, you have not a very clear layer distinction. We have different color shadings and we saw that we have gradients even across individual layers.

So it is totally okay to assume that the different layers that we see in this gray shading and in that micrograph figure have something to do with chemical changes. It's totally okay, but where exactly the starting point is and why there's this discrepancy in the definition of the superficial layer I found a little bit hard to follow.

Q Can I turn you to paragraph 177 of your declaration?

A Yes.
Q So in paragraph 177, you see the second sentence states that Dr. Miles points to for the superficial layer is not at the surface, correct?
A Correct.
Q When you say at the surface in that sentence, what do you mean?
A So the superficial layer, the real outermost surface is where -- that's not what just I'm saying, but where we both agree because Dr. Miles in his report first has the same definition saying the outermost layer is the superficial layer. There comes nothing above and just the oxygen, the environment.
Q So when you refer to the surface here, you're referring to the outermost surface, correct?
A To the outermost layer and that's where my -- what I indicated here by these yellow arrows and that's where my confusion came from because suddenly in contrast to his own definition, Dr. Miles had chosen to define the layer beneath, the gray layer beneath these outermost layer as the superficial layer and I found that seems to me to be a contradiction.
Q When you say the surface here, you're referring to the layer at the outermost surface?
A The outermost surface, correct, yes.

Q And so if we go back to Suehiro, figure 13 uses the same term at the bottom access. It says distance from the surface. So when you read that, would you read that consistent with your use of the surface in your declaration as being the outermost surface?

A For that I would have to speculate because my long experience in this field has taught me that sometimes researchers or documents or so when they try to bring an optical micrograph together with some chemical information like here, they do not always make clear where they put the needle, where they choose the starting point that they call zero here.

And so because this information I don't know, so that's why I say would have reversed it and measured from something that is defined namely from the steel base.

And the second thing is we see that the outermost surface, the superficial region is also not entirely flat. So where was that picture taken? Where is that segment coming from? You could take it from any of these positions and it would likely look different. So that's where I just, you know, said I want to be careful with interpreting too much into this figure.

And the second thing is it lacks making any translation to what the patent requests namely to show that it is intermetallic as we discussed before. The chemical composition is not an intermetallic. These are two different things.

Q Does Suehiro discuss anything that would make you suggest that the surface refers to anything other than the outermost surface?

A No. It's the other way around. This document does not automatically convince me to assume that this was the very outermost surface as obviously also Dr. Miles. So Posco's own expert was not convinced because he had chosen to take the layer below as a starting point. So I think the question could also be asked to Dr. Miles why he had chosen to do that.

Q So in your opinion, does Suehiro in its figure 13 analysis have an additional layer that's not depicted?

MR. LaMAGNA: Objection, vague. Depicted where?

THE WITNESS: So my suspicion is or my assumption is that it might be that this very outermost layer, the superficial layer might be or might not be included in this chemical analysis.

BY MR. MONALDO:

Q It might be included is your testimony?

A I don't know. I don't know because I cannot say that because the document does not make a statement where exactly that measurement was taken. That was argument number one where I tried to be careful. And argument number two, I was put in that direction of becoming skeptical when Posco's own expert, Dr. Miles, does not pick the superficial layer as a starting point.

And also these two aspects showed me that even their own expert was not convinced that this outermost layer is the starting point for this measurement. Otherwise he would not have made that statement.

Q In your experience, if a reference provides compositions of layers, is it common for that reference to leave out a layer?

A The problem with layer analysis is what we have discussed in the Cornette document also is that you have certain problems that is not done necessarily by purpose or because people are sloppy or something like that, but often from the preparation or from the fact that these layers are so corrugated or so rough as we saw in part or so variable that often they choose to

start from say a more safer point to give a chemical analysis.

So just in my experience, I have seen when it comes to layer composition you better need to define a little bit in a more detailed way where you have taken the measurement or where your exact starting point was or something like that.

Q Just to confirm, when Suehiro says zero as the distance from the surface, you do not consider that to be the outermost surface?

A Correct. I would be suspicious that it might be not the outermost or most superficial surface as particularly was also emphasized and pointed out by Posco's own expert by Dr. Miles because he took the starting point beneath.

Q Can we move over to the Takagi reference?

A Yes.

Q So in your testimony, you mentioned that you did not believe Takagi had a disclosure of layers; is that correct?

A That is correct.

Q If we're looking at figure 2A, you'd agree with me that there are five layers labeled in that figure, correct?

A I agree with you that there are five lines

given with a legend next to it, but I cannot discern anything there. It's just the white pancake. That's all I can see. So, yes, you're correct there is a legend pointing out five regions or layers and that's about all, but it has nothing to do with the figure. Where do you see layers in the figure? I don't see any layers.

Q So earlier today, we talked about labels in the '602 patent as being important to your analysis as compared to some of the other figures in other references that lack labels; is that correct?

A Yes, that's correct.

Q But in this case, you don't find these labels to be informative in figure 2A of Takagi?

A In figure 2A of Takagi, I found these labels to not, you know, give me any insight because, yes, Takagi gave names to five different layers. But if you look into figure 2A, there are no layers. So that's as an expert the only thing I can do. I can look at what he wrote and see, yes, he gave the baby a name, but there is no baby.

Q Okay. So can I turn you now to figure 4 of Takagi listing table 1?

A Figure 4, yes, I got it.

Q So in figure 4, can you identify layers in

Takagi?

A In the table, table 1 and figure 4 in Takagi, he is giving us several positions indicated by a number one through five and then he gives us chemical data for some of these regions which he again coined by different layer names.

Q You would agree with me that Takagi in figure 4 chose five layers, inter one, inter two, inter three and outer with corresponding chemical compositions, correct?

MR. LaMAGNA: Objection, misstates testimony.

THE WITNESS: What the table is showing are regions of a -- equipped with a spot information about chemical composition, but there is no associated -- at least for two, three, four and five, there's no associated microstructure first of all. So I don't know whether it's just a random spot taken or we do not know whether it is a layer that we look up.

It could be clouds, patchy regions. It could be a lava lamp type of arrangements. We simply don't know that. It's pure speculation. And third we have several spots in that table which are actually empty. So there is no information. So I don't see that at all as a proof of any layering.

BY MR. MONALDO:

Q So in that column, it mentions coating layer structure and composition, correct?

A Correct.

Q So when Takagi teaches coating layer structure and then lists five layers, wouldn't you consider that a disclosure that five layers are present?

A No, I would definitely not do that because I must see these data in conjunction with the figure that the same author is giving to me, right? And then the figure, you do not discern anything. There is no layer. I can only repeat there's no layer shown, no discernible feature at all.

That means -- that tells you that it is not a completely patchy arrangement. It could be putting hazel nut type of structure. We don't know that. It's a complete speculation that these point data where many data actually missing are translating to what he claims are layers because his own figure number 2A shows exactly the opposite. There are no layers.

Q If figure 2A didn't exist and we're only looking at table 1 in figure 4, would you agree with me that table 1 purports to show five layers?

A I definitely would disagree with you

because what table 1 is showing when we have no such figure as in Takagi which we discussed at length showing not any discernible layer features, why would I infer that table 1 refers to a layer structure just because the heading says so?

It could be again I have seen that in my long practical and academic life very often that people without seeing the real correlation as we see, the correlated analysis to see the microstructure and then make a measurement and prove that the structure was a layer, how often have I seen that they take a spot-wise chemical measurement and it was just as we call a duplex structure, a hazel nut structure. You cannot infer that from these few data points that it is automatically in a layer topology. That's pure speculation.

Q In figure 4 of table 1 when it says coating layer hardness, it mentions an average. In that case, would you consider it to be a layer?

MR. LaMAGNA: Objection, form.

THE WITNESS: So that would be for me the same, you know, reservation that I expressed before when that table shows only a point information of a hardness. And even if you do some statistics or so, that does not automatically translate, oh, this must be

a layer. A layer is very well defined object of having, you know, two dimensions, a thickness, an expansion and connectivity and things like that, but nothing of that can be inferred from a single hardness or chemical measurement point. That's like when we have stones in the creek to jump across it to cross the creek. That does not jumping from stone to stone make a layer. It's not.

BY MR. MONALDO:

Q If we can turn to paragraph 38 of Takagi.

A Yes.

Q In paragraph 38, Takagi is describing table 1, correct?

A Correct.

Q And in that description, it mentions five layers, correct?

A Correct.

Q And so you'd agree with me that in paragraph 38 is a disclosure of five layers, correct?

A No. I disagree. There's a text about five layers. There's no disclosure. There's no revelation. There's no proof. There's only text that claims that he has layers. But, again, he had chosen as a first picture to show the micrograph that shows exactly the opposite. There's no single layer visible. So that's

what makes me a bit skeptical of following his narrative here.

Q So if we go back to the '602 patent, what proof in the '602 patent is there for the '602 patent describing an intermetallic layer?

A The figure, the micrograph figure number 1.

Q So you can discern from figure number 1 that there is an intermetallic layer in the '602 patent?

A You don't have as a person of ordinary skill in the field when you want to reproduce a patent, you don't have to go through the exercise of having to prove what, you know, the exact nature is. You have to follow the patent. You could of course do a few experiments if you want to do to scrutinize what the exact intermetallic state and so on is, but the patent is very explicit of saying it is intermetallic.

Q So you're going by the text in the '602 patent, correct?

A It's not just the text. When you compare this figure number 1 in the '602, you see a very distinct layer structure and we discussed it at length before. In the Takagi document, he had chosen to put by his own free choice a picture which shows the exact opposite. There's not a single layer feature visible.

That means I do not just go by the mere one sentence or one word.

But there's a complete connectivity and context speaking out of the '602 that would as a POSA convince me to say, yeah, that's very plausible and hence I follow that recipe in the '602. And Takagi is doing exactly the opposite.

Q Is it possible that Takagi's figure 2A was just poor quality?

A That is something I don't know. You would have to ask Takagi, not me. So I can only use -- as an expert in the field, I can only use the documents that are put before me to opine, to form a scientific opinion. And when I would have to choose, do I take the recipe of Takagi making these claims and showing in his picture the exact opposite of having a clear layer structure? No mentioning at all of intermetallic.

You asked for proof. I even asked for mentioning. He doesn't even mention anything like that. So I would for sure rather adhere to the '602 patent which is much more specific in all of these details.

Q So in the '602 patent, you're using the text of intermetallic to determine that there's an intermetallic layer in the '602 patent, but in Takagi,

you are disputing the text that there are layers in Takagi; is that correct?

MR. LaMAGNA: Argumentative, asked and answered.

THE WITNESS: In the Takagi, my dispute was more that first of all something like an intermetallic that seems to be crucial in the '602 patent is not even mentioned. I'm not disputing that Takagi has certain weaknesses on the intermetallics. So there is no intermetallic neither mentioned nor measured nor claimed nor shown.

BY MR. MONALDO:

Q You said earlier that you dispute the fact that Takagi describes five layers, correct?

A I'm not disputing this. When you take a simple view at figure 2, then you must convince me where do you say layers. I don't see any layers. I'm not disputing. I'm just reporting what the figure is showing.

Q But table 1 in figure 4 shows layers and the description of Takagi in paragraph 38 that we discussed also describes layers, correct?

A No, that is incorrect as I pointed out before. The fact that you add to your table the claim, oh, this is a layer, but showing your figure the exact

opposite namely no such thing as a layer means, no, there is no proof of a layer. There's only a spot-wise measurement of some chemical data. And I have nothing against this. I don't dispute that. I just dispute the fact that this translates automatically into a layer structure. There's not a single proof of it.

Q Let's move on. Can you pull up Cornette for me briefly?

A Yes.

Q So if you can turn back to page 9.

A Let me find where's Cornette. I have Cornette.

Q So in the lower right-hand side, it mentions description of the coating, correct?

A Correct.

Q It says the coating made of aluminum and silicon is applied with a hot dipped process, correct?

A Correct.

Q A hot dipped process would be a precoating, correct?

A Correct.

Q Okay. So we know we're talking about a precoating in the first sentence on -- in the section of page 9, correct?

A The first sentence talks about a hot dipped

process and that would refer to a precoating, correct.

Q So the next sentence says the average layer of thickness showing the best compromise between corrosion protection and weldability is 25 microns, correct?

A That is correct.

Q So we're talking about a precoating in one sentence and in the next sentence, we're talking about a thickness of 25 microns, correct?

A Together with the statement of the corrosion protection and weldability feature which a hot dipped product does not have and is not tested for. So the context obviously is a very different one. It happens to come in the next sentence, you are correct, yes. On the content connection, you're not correct.

Q Can you open the GMW reference, Exhibit 1026?

A Sure.

Q So in your testimony, you mention that GMW specification does not describe microstructures, correct?

A Correct.

Q Can I point you to page 1? On the right-hand side, there's a paragraph labeled 1.1.3.2 precoated products?

A I see it.
Q So at the last sentence of that paragraph, it says the microstructure of the finished parts shall consist of martensite and bainite, correct?
A That's correct.
Q So there is some discussion of microstructures in GMW's specification, correct?
A There's a description of microstructure features of the basic base hot stamping steel. That has nothing to do with the '602 patent which is about coatings. Bainite and martensite are exclusive features of a transformed hot stamping steel. It has absolutely nothing to do with any coating.
Q But it is a precoated product, correct?
A No. So it's -- the heading says it's a precoated product. That's what the heading says. You are totally correct. On the last sentence, the sentence is by physics very well defined. Bainite and martensite you only form in this base steel. You cannot form martensite in aluminum. It's impossible. So it's very clear that this statement can never refer to any aluminum or aluminum silicon or aluminum silicon iron product. Impossible.
Q But the '602 patent also refers to martensite, correct?

A It refers to the formation of martensite related to the base steel material, but the reason why the GM is discussed at all as a reference referred to the coating and this microstructure sentence is exclusively and only about the base steel. Again, it has nothing to do with the coating.

Q If I can turn you to page 6 of the GMW specification.

A Page 6. I got it.

Q And at the very bottom, there's a table 5?

A I see it.

Q And that is an aluminum silicon coating bath analysis, correct?

A Correct.

Q And it says the coating bath has a percentage of 85 to 95 percent aluminum and 5 to 11 percent silicon, correct?

A Correct.

Q And that would be the chemical composition of a coating, correct?

MR. LaMAGNA: Objection, outside the scope of redirect.

THE WITNESS: So what this table says in the heading is aluminum silicon coating bath analysis and you want to be careful with saying that is the

chemical analysis of the coating. The bath is a liquid top through which you pull the sheet, right, the steel sheet.

And then you have a so-called base transformation from the liquid into the solid and that is associated with something that we call partitioning. That means the concentration in the bath is not identical to the concentration of the solid that forms on the steel. So you must be very specific and say, no, that is telling you a composition of the bath, not of the coating.

BY MR. MONALDO:

Q But it provides some information of the coating, correct?

A It provides some information about what could finally end up in the coating, totally correct, but it's incorrect to say that this is the composition range of the coating. That is incorrect.

MR. LaMAGNA: Objection as outside the scope.

BY MR. MONALDO:

Q And I just want to confirm that the 5 to 11 percent silicon matches the range described in the '602 patent, correct?

MR. LaMAGNA: Outside the scope.

THE WITNESS: In the '602 patent, the authors write about the chemical composition of the coating. This table from the GM spec talks about the composition of the bath for which later you produce a coating and that is not the same thing.

BY MR. MONALDO:

Q I understand that, but I'll just confirm again. So the range described here for the bath of 5 to 11 percent in GMW's specification is the same as the range described for the coating of 5 to 7 percent silicon in the '602 patent, correct?

A That's correct.

Q And then I did want to ask you about some testimony you gave about the '602 patent. In your testimony, you stated that the '602 patent if you chose points within each of the ranges in the '602 patent, you wouldn't necessarily end up with the coating from the '602 patent. Do you recall that testimony?

A I recall it, yes.

Q But you then testified that given the ranges disclosed by the '602 patent, a person of ordinary skill in the art would be able to manufacture the claimed coating, correct?

A Correct.

Q You'd agree with me there are several

different ranges for the different processing parameters described in the '602 patent, correct?

A Correct.

Q So a person of ordinary skill in the art would be able to choose the right point from within each range to manufacture the coating claimed in the '602 patent?

MR. LaMAGNA: Objection, vague, incomplete hypothetical.

THE WITNESS: The point of the '602 patent is that it realizes and embraces the complexity of that entire process with the subtle interdependence of these parameters and gives recipes. It give examples and so on to make -- to enable a POSA to arrive at the desired product described in the claims.

And that would not exclude that you here and there have due to the complexity of the process to have to make a few, you know, additional experiments to make sure you arrive at the best practice.

BY MR. MONALDO:

Q So picking a point within the ranges would require some experimentation, correct?

A It could happen that you might be confronted with a situation where you are directly spot on when you follow the patent. So it could also happen

that you have minor variations which might require a bit of further experimentation. Both is possible.

The big advantage of the patent is that it is the first document that makes the complexity of the interdependence more clear and gives much, much better descriptions of how to arrive at the processing window to reproduce the described microstructure including, for instance, the intermetallic layer.

Q But you'd agree with me that the '602 patent doesn't describe exactly how you would select the right point in each of the ranges it discusses?

A No patent describes exactly automatically a spot on result in this field of coating or microstructures. So it's I think not so uncommon that you would assume that you might have to do one or two or whatever more experiments if you are not spot on. And that depends also certainly a bit on the academic equipment, experience of the POSA who is embarking on this project.

Q So the person of ordinary skill in the art would use their background and knowledge to select points within the ranges and if those points did not yield the product they were seeking, they would be able to use their background and experience to experiment and find the correct points; is that correct?

A Correct.

Q How much experimentation would you expect it to take to identify those points in the '602 patent?

A That is of course very speculative. As I've mentioned before, it is also conceivable that when you have a certain experience in this specific field, you could already have a spot landing without much experimentation because the patent reveals the complexity and narrows down the spec ranges to give you a really good opportunity to arrive at a good product.

That is also shown by the fact that so many users later picked up a license and made the product. That tells you that it was obviously doable without undue experimentation. It could also be that when somebody has less experience, that person might need to do a few more experiments.

Q You used the termed undue experimentation several times throughout this deposition. What is your understanding of undue experimentation?

A The term undue experimentation would mean that a description is maybe so far off to bring you close to the target described in the patent claims that you might maybe have to translate this into maybe several persons and years and laboratory tests and so on.

The exact number from the top of my head, I cannot tell you. For sure, I would be more happy to follow up on that and do calculations like that, but undue experimentation means at some point, there's a certain limit at what point it is still commercially viable to do it, but obviously the market has shown otherwise because the market picked it up. We drive around in these products. Most cars make use of this product.

MR. MONALDO: No further questions.

MR. LaMAGNA: Unfortunately I have a few follow-up questions which I will try to keep relatively narrow.

FURTHER EXAMINATION BY MR. LaMAGNA

Q Let's go back to Suehiro again. Do you see in figure 13 of Suehiro -- do you have Suehiro there?

A Yeah, I got it.

Q There's a line scan there in figure 13, correct?

A Correct.

Q And that line scan says that it's taken from figure 12, correct, in the legend?

A Correct.

Q And where in figure 12 is that line scan taken?

A I don't know.
Q I'm sorry?
A I don't know.
Q Does it identify where it's taken?
A No.
Q Let's look at the reproduction -- let's look at your report at paragraph 176 and 177 on page 82 of your report.
A Yes.
Q You reproduce there the imaging that the annotations that Dr. Miles reproduced for figure 12, correct?
A Correct.
Q And you see there what he identifies as layer one in figure 13 is pointing to the darker gray area, correct?
A Correct.
Q And then above it, there is a lighter colored area, correct?
A Correct.
Q And in some places, that lighter colored area is thicker than in other places, correct?
A Yes, it's correct.
Q If you were to do a line scan of that lighter colored area -- of going through the lighter

colored area, how would the relative thickness or thinness of that affect the results of the line scan?

A It depends on where you put your starting point and, you know, in which area of that superficial layer you do your measurement whether it's a thicker or thinner area. And that would of course have a relevance for the chemical analysis.

Q So if you do it at a place where that top layer is very, very thin, how would that report on line scan?

A It would be very hard to pick this up on a line scan.

Q And, in fact, as you testified, we don't know where that line scan was taken from, a part where it's thicker or a part where that top layer is thinner, correct?

A Correct. We don't know where it was taken.

Q And if we look at these -- if we go here in the side, you said there was five layers that you identified, correct?

A In Suehiro you mean?

Q In Suehiro.

A Yes, correct.

Q And we see that Dr. Miles has four arrows, correct?

A Correct.
Q And figure 13 in Suehiro identifies five layers, correct?
A Correct.
Q And if you look at Dr. Miles's identification, he combines two of those layers in order to show four layers; is that correct?
A That's correct.
Q So when you identify five layers, you are identifying an extra layer than what he has red arrows pointing to, correct?
A Correct.
Q And that extra layer is the layer that Dr. Miles identified as the layer above the one he identifies as the superficial layer, correct?
A Yes. So he actually did not really identify it. He just used the layer beneath it to coin it superficial layer while I from inspecting it said, no, there is yet another layer above it.
Q But do you recall if he had any commentary to make about that layer above what he identified as the superficial layer in his deposition?
A In his deposition, I think we agreed that the superficial layer is exactly what the word says. It must be the most outermost later. We agreed on

that.

Q Now, when we see these different color gray scale difference between something closer to white and a darker gray, what does that mean about the overall composition that's being imaged?

A First of all, from the pure gray scale, it is very hard to say. It's just likely when there's such a clear transition between what Dr. Miles calls a superficial layer and what I identified by the yellow arrows to be yet another real superficial layer because it's simply the outermost layer and has a different color coating. I would infer it could also have a different chemical composition.

Q Because it is imaging on the SEM as a different color, correct?

A Correct.

Q If we go to figure 13 in Suehiro and we look at the elemental results of the line scan for zone -- what is identified there as layer one, do you see a difference there in that compositional analysis that would show you two different compositional constructs?

A No.

Q What does it look like there for the results identified in figure 13 for layer one? Does it

look like you're looking at one layer or two layers?
A That just looks like one layer.
Q Let's take a look at Takagi. So look at the figure 2 -- do you have Takagi there?
A I think I have it, yes.
Q Look at figure 2A again.
A Yes.
Q We've -- I see that there's a bunch of sort of little black dots in the coating layer at -- on figure 2A. Do you see that?
A I see that.
Q What is that?
A So these black dots I would interpret as a Kirkendall porosity.
Q And so are there any conclusions that you can draw from those black dots as to whether or not there are four layers as the term layer is used in the '602 and '227 patent?
A Yes. When I would -- I would be given some room for a scientific discussion, I definitely could infer a lot from the distribution of these parts, yes.
Q What would you conclude as the presence or not of the layers as required by the '602 and '227 patent?
A For that, first one must understand a

little bit what a Kirkendall porosity is. A Kirkendall porosity means you have free volume that resides from different rates of the different diffusing atomic species. And when one species diffuses faster than another species, that translates to a mismatch of free volume. And that condensates and forms this porosity what is called Kirkendall porosity.

Now, when this is scattered all over the place, that means there is no distinct layer formation to be expected when the porosity assumes such a statistic pattern. That would mean to me that this Kirkendall effect resulting from this mismatch in the atomic diffusion flux must have been quite similar everywhere. And that again would underpin the fact there is no such thing as a set of layers.

Q So in summary, is the porosity that we see here in Takagi figure 2A consistent with or not consistent with the layers that are required in the '602 and '227 patents?

A It's not consistent. It is again fueling my skepticism from this text and from the table where layers are claims, but, again, the opposite is shown in terms of the cross and in terms of the Kirkendall porosity statistical distribution and that is different in the '602.

Q Let's take a look at figure 4 real quick.
A Figure 4 in Takagi?
Q Yes, Takagi. Do you know what polka dots are?
A What?
Q Polka dots.
A Polka dots?
Q Yes. Do you know the term polka dots?
A No. I know Pokemon.
Q Do you know Tufin (ph)?
A Tufin. No, no, no.
Q Hold on.
A Tufin. Tufin is Austrian. It's Austria and German. Do you mean --
Q Kaputin (ph)?
A Kaputin. Yes, Kaputin is correct.
Q Okay.
A I know this.
Q Now you know the pattern I'm talking about. So when I say polka dots, what would the German word for polka dots be?
A Could be Tufin or Fliken (ph) or patches, something like that.
Q Okay. So now let's go back to figure 4 again with that foundation in mind. When we see the

compositional reports that are here in say -- let's just look at table 1, you know, number 1. We see different what are labeled as coating layer structure. Do you see that?

A Yes.

Q Could those numbers be consistent with a line scan that went through a series of polka dots?

A Yeah. That could be when you run such an analysis and have polka dots and islands, patches and Tufin and things like that. Then you could arrive at such a distribution of chemical footprints again like we discussed before. There's no indication that this would automatically qualify as a two dimensional layer.

Q So in Takagi, is this reference originally in English?

A No. Originally I guess it's in Japanese.

Q Okay. So part of the issue here as I understand it is you're looking to see whether layers as that term in the '602 or '227 patent are -- as it is used in those patents is present in these prior art references, correct?

A Correct.

Q You testified earlier to your understanding of the term layer in the context of the '602 and '227 patent, correct?

A Correct.

Q But is it fair to say that we don't really know how Takagi is using the term layer here?

A Correct. We have seen -- that's a good point. We have seen several issues associated with translation. Another example you remember is Suehiro who is repeatedly in the English version calls these coatings plating. Plating is something entirely different in the metallurgical sector. It has nothing to do with what we call coatings.

And so we have many such issues where in part maybe inadequate wording has been used. I don't know whether they in the original Japanese description maybe had not meant layers. I don't know that.

Q So we can't here confirm what Takagi means by a layer because he hasn't shown us a picture of layers, correct?

A I would even emphasize the statements would say he has shown the opposite. He has given us as a primary picture as a grand entry, as a start of the opera. He has given us the exact opposite. He has given us a picture which shows nothing like a layer.

Q Is there any data that Takagi reports that is necessarily consistent with layers as that term is used in the '602 and '227 patent?

A No. There's not a single hint that gives me any reason to assume that we are dealing with layers except this English translation of these headings of the table. There is no proof, no hint, no image, no measurement, nothing.

MR. LaMAGNA: I will pass the witness again.

FURTHER EXAMINATION BY MR. MONALDO

Q If we're looking at Takagi figure 2A, your opinion is that you cannot discern layers within that figure despite the labels that are shown in figure 2A, correct?

A Say please again.

Q You cannot -- so Takagi's figure 2A, you'd agree with me it has labels saying that there are layers in that figure, correct?

A Correct. The legend talks about layers, but the picture does not show any.

Q So you mention in your testimony just now Kirkendall voids within figure 2A, correct?

A Correct.

Q And so you -- your testimony is that the Kirkendall voids are clear enough to see, but the layers themselves are indiscernible, correct?

A No, that's not correct. I just said that

is an additional indication that the underlying diffusive processes seem to be not so different in different parts of this coating. That's what I said.

Q All right. Does the '602 patent describe Kirkendall porosity?

A The '602 patent talks about Kirkendall porosity, yes.

Q Can you show me where it mentions that?

A Let me go back to the '602 patent. Maybe it talks about porosity, but I believe it talks about Kirkendall porosity. Again, my computer for the fast Adobe or PDF screening is down. Maybe I'll try to ramp it up again. Computer is not coming back up.

MR. LaMAGNA: I don't think that's going to --

THE WITNESS: Maybe I use this --

MR. LaMAGNA: Are you aware of a particular citation?

THE WITNESS: Let me check this one.

MR. LaMAGNA: The reason I ask is rather than at this late hour play go fish, if we're collectively not aware of where expressly the words Kirkendall or porosity appear in the '602, maybe we just agree that we're not aware of that.

THE WITNESS: Maybe it's just porosity.

MR. MONALDO: I'm not aware of it. I don't believe it's described.

MR. LaMAGNA: I don't know that those express words appear. I'm just saying that rather than do a live reading of the patent, maybe we could just --

THE WITNESS: It might be in the patent only for the word porosity, but I have to read through the patent now.

MR. LaMAGNA: Like I said, I don't know that it's worth you -- I don't want to cut in on counsel's time. I'm merely saying I don't know that it's worth going --

THE WITNESS: No, no. It's not the main thing because as I said repeatedly over the day, the main thing is that the grand entry picture of Takagi shows exactly the opposite of layers. I can only repeat this. There's not a single layer revealed or shown in any of the measurements.

And the porosity distribution is an additional indication that such a crisp layer formation is not likely to have taken place, but maybe when we can just search in the PDF for the word porosity, that might help us also.

MR. MONALDO: Okay. I'm searching in the electronic document and the word porosity does not

exist.

MR. LaMAGNA: I will take his word for it. I'm sure if we find otherwise, we'll bring it to --

THE WITNESS: Totally fine. Then when you didn't find it, then for sure I also wouldn't. And then it might be in the secondary literature that is cited inside of the document. And as I said, that was for me admittedly a second order indication when this is so equally distributed, that does not talk for a crisp, you know, physics separation of this process.

BY MR. MONALDO:

Q And if the Kirkendall porosity is described only in the second literature, you'd viewed that similarly to your view on dewpoint in that a person of ordinary skill in the art would understand?

A Yes. That is something a person of ordinary skill in the art would know what Kirkendall porosity is from the indication. And they might also get suspicious when they see more continuous distribution that this might also at least not underpin the claim that there are crisp layers when again the figure 2A shows absolutely nothing like a layer.

Q In figure 1 of the '602 patent, do you see voids created by Kirkendall porosity?

A In figure 1? In figure 1 of the '602

patent, you can see an array of voids that are formed in the interdiffusion layer. These are the black dots beneath the intermediate layer.

Q Are those the only voids shown in figure 1?

A There might be further voids which are however maybe a little bit harder to discern because here the black to gray to dark gray contrast is a little bit more intense. So it might be that it is hard to discern some of the voids in this specific dark layer, but we see a very nice linear alignment of these voids in the white interdiffusion layer where when we compare to the white region of the entire coating of the Takagi image, there's not such a linear alignment. There is a more scattered distribution of these voids and this was only a second order indication that the layers might be not so as the text is claiming.

Q Do you see voids in the intermetallic layer in figure 1 of the '602 patent?

A In the intermetallic layer from the resolution and quality of the picture that I have here, I find it hard to see these Kirkendall voids in this dark gray because the voids might also appear dark.

Q Do you see the superficial layer of figure 1 of the '602 patent?

A Please say again. Would I see voids in the

figure 1 in '602?

Q The superficial layer in figure 1 of the '602 patent.

A In the superficial layer, it's from the dark contrast maybe or from the somewhat gray contrast and surface area. It's a little bit harder to see that.

Q But you believe there are voids throughout the four layer structure, correct?

A No, that's not what I said. What I said is only in the area where I can discern voids. And that is as I said the interdiffusion layer because it is appearing quite white. There is not just Kirkendall porosity, but my argument was there's a linear array.

So there's a certain linear pattern pertaining possibly to the layer formation diffusion effect which in Takagi is scattered all over the place. And this just was a second order aspect which I thought would be worth mentioning to not underpin or support the opinion that Takagi shows any layers at all.

So I tried just to help you guys by saying if there's any indication, but even these porosity do not give us any indication of a linear arrangement.

Q But earlier you testified in figure 1 that there might be voids in the intermetallic layer and the

superficial layer, but they might be darker in color and just more difficult to discern, correct?

A Exactly. That would be for me at the moment speculative to talk about voids that I cannot discern here, but I would testify that in the interdiffusion layer where the contrast is nicely visible, these voids assume a certain alignment, a certain pattern.

And that is different in the Takagi image which does not show any layers, just a white contrast coating region in which these voids do not assume any linear pattern or so and that was just a difference I found worth mentioning.

MR. LaMAGNA: Have we beaten him up enough?

MR. MONALDO: I think we have. No further questions.

MR. LaMAGNA: Thank you for your patience, Dr. Raabe. We appreciate it.

THE WITNESS: Thank you guys very much for your patience and for the nice discussion.

(Deposition was concluded at 8:09 p.m.)

CERTIFICATE OF DEPONENT

I hereby certify that I have read and examined the foregoing transcript, and the same is a true and accurate record of the testimony given by me.

Any additions or corrections that I feel are necessary will be made on the Errata Sheet.

_____

Dierk Raabe, Ph.D.

_____

Date

(If needed, make additional copies of the Errata Sheet on the next page or use a blank piece of paper.)

ERRATA SHEET

Case: Posco Co., Ltd, V ArcelorMittal

Witness: Dierk Raabe, Ph.D. **Date: 01/15/2026**

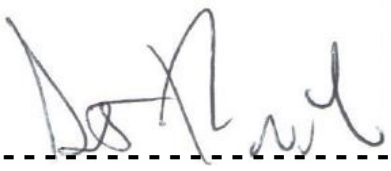
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I, Steven Poulakos, registered Professional Reporter, the officer before whom the foregoing proceedings were taken, do hereby certify that the foregoing transcript is a true and correct record of the proceedings; that said proceedings were taken by me stenographically and thereafter reduced to typewriting under my supervision; and that I am neither counsel for, related to, nor employed by any of the parties to this case and have no interest, financial or otherwise, in its outcome.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my notarial seal this 15th day of January 2026.

My commission expires:
August 20, 2027



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