UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

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Investigation of: *
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ENBRIDGE - LINE 6B RUPTURE IN * Docket No.: DCA-10-FE-007
MARSHALL, MICHIGAN *
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Interview of: AARON SUTTON

Enbridge Headquarters
Edmonton, Alberta
Canada

Thursday,
December 8, 2011

The above-captioned matter convened, pursuant to notice.

BEFORE: MATTHEW NICHOLSON
Investigator-in-Charge

APPEARANCES:

MATTHEW NICHOLSON, Investigator-in-Charge
Office of Railroad, Pipeline, and
Hazardous Materials Investigations
National Transportation Safety Board
[redacted]

RAVINDRA CHHATRE, Chair
Integrity Management Group
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Materials Lab
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Administration (PHMSA)
[redacted]

JAY JOHNSON, Supervisor
Audits and Inspections
Enbridge Pipelines
[redacted]

I N D E X

I N T E R V I E W

MR. NICHOLSON: This is NTSB Pipeline Case Number DCA10MP007, Enbridge Energy July 2010 crude oil release in Marshall, Michigan. These are the Integrity Management Group interviews being conducted in Edmonton, Alberta, Canada, Enbridge Headquarters. Today is Thursday, December 8th, 2011.

This interview is being recorded for transcription at a later date. Copies of the transcripts will be provided to the parties and the witness for review if transcribed.

For the record, Aaron, please state your full name, with spelling, employer name, and job title.

MR. SUTTON: My name is Aaron Craig Sutton, A-a-r-o-n, C-r-a-i-g, S-u-t-t-t-o-n. I am currently an employee of Enbridge Pipelines, Inc. in the materials group, or I guess the crack management program now, I guess, is what we're called. I've been here for almost 3 years. My predominant roles are dealing with fatigue analysis and collecting our pressure data as well as being a line subject matter lead.

MR. NICHOLSON: Okay. And can you just give us a contact phone number and e-mail address?

MR. SUTTON: E-mail is [redacted] and my phone number is [redacted]

MR. NICHOLSON: Okay. Aaron, you realize you're allowed to have one other person of your choice present during this interview. This other person may be a friend, attorney, family member, co-worker, or nobody at all. If you would, please indicate whom you've chosen to be present with you during this interview?

MR. SUTTON: I've chosen no one.

MR. NICHOLSON: Okay. We'll go around the room and have each person introduce themselves for the record. My name is Matthew Nicholson, M-a-t-t-h-e-w, N-i-c-h-o-l-s-o-n. I am the NTSB IIC. My phone number is [redacted]

MR. FOX: Matt Fox, NTSB Materials Lab, M-a-t-t, F-o-x, phone number is [redacted] e-mail is [redacted]

MR. JOHNSON: Jay Johnson, Enbridge Pipelines, [redacted] Cell: [redacted]

MR. PIERZINA: Brian Pierzina [redacted], B-r-i-a-n, P-i-e-r-z-i-n-a, [redacted] Phone number is [redacted]

MR. CHHATRE: Ravi Chhatre. I'm with NTSB and Integrity Management Group chair for this investigation. My e-mail is [redacted] Phone number is [redacted].

INTERVIEW OF AARON SUTTON

BY MR. NICHOLSON:

Q. All right, Aaron, I guess we brought you up here to kind of walk us through FlawCheck and show us -- actually we're interested in the 2005 data, maybe just walking us through how fatigue counts are done using FlawCheck.

A. Okay.
Q. We've seen CorLAS earlier, so --
A. Great.
Q. -- we've seen that demonstration. So go right ahead.
A. Okay. Do you guys want background kind of relating to how we get our pressure data and clean it and manage it like that as well, or --
Q. Well, we've heard some of that. If you want to give us a --
MR. CHHATRE: Quickly, yeah.
MR. SUTTON: Sure.
BY MR. NICHOLSON:
Q. -- high level, that wouldn't hurt.
A. So if we go to –- where do we have it now?
Q. Is something you would do, Aaron?
A. Yeah, this is something that I'm responsible for.
Q. Oh, okay.
A. I'm just going to pull up a couple different things here.
Q. Sure. Take your time.
A. Okay. So in this one spreadsheet here just demonstrates, I guess, how we go about pulling our pressure data. So in the first column it just states what the pressure trend's user tag number is that we reference out of our SCADA data; the time period that we want to pull the pressure data for, the start

and stop; what we're saving the data as; where we're saving the data; along with some of the pipe properties. So we've just got the nominal diameter, the grade, the wall thickness, as well as in this folder or this file -- I've updated it with the pressure, the maximum pressure that's observed in this time period that we've pulled.

So what we'll do is we'll take this file and run a macro that will pull all our data out of a SCADA and create these files that we've specified here under this name and directory. And then when we actually go into those folders, we save it as a CSV file. And so that file just states the tag that we've pulled up at the top, the time period that we've pulled, so the start and stop, the number of data points, the time stamp and the corresponding pressure at that time.

This zero column we have here is just used for formatting in our FlawCheck software. It just uses that to know when to terminate.

Q. Why do you have to go to the first spreadsheet just to dump the CSV? Why couldn't you just pull the PI data right out to a CSV?

A. That's what we're doing.

Q. Oh.

A. That's just, I guess, the input to say where to save it and where to be pulling it from.

Q. Oh, okay.

BY MR. CHHATRE:

Q. How frequently are you collecting pressure data?

A. We do it on a quarterly basis. So every 3 months, we'll go through and pull all the data.

Q. But from the transducer, how often?

A. How often does it read?

Q. Yeah.

A. Transducer, I believe, reads every about 4 seconds or when there's a delta P of greater than 2 psi.

Q. Okay.

A. It'll take a measurement.

Q. And so your last numbers, they include every single data point that the transducer provided in 3 months?

A. Right. We will go through the data once it's pulled and we'll scrub it to remove any, what we're classifying as noise. So any delta P's less than 2, we'll remove that just to say, oh, we don't need to have 50 data points saying that the pressure was held constant for 2 hours. We'll remove it and just have a start and stop.

So once we have, I guess, our pressure data we'll go through and we'll do a manual review on it so I should manually clean the data to remove any bad data points. So this is the spreadsheet that we use. And this just has an example of a potential bad data point, just one random point off on its own. So what we'll do there is we'll actually go back into our SCADA data and all of our pressure tags that we have -- we have multiple tags monitoring the same location.

And so this is just showing the same thing here. This is that pressure spike right here that we're questioning whether it was valid or not. And if we actually zoom in to that point, we can see here that both the teal and pink transducers did not see that pressure spike. So we'll say that that is an invalid data point, and we'll remove that data point. So we'll go through all our pressure data that we collect and do this.

MR. NICHOLSON: You do that manually? The macro can't just say I've got two out of three that are valid, dump the last value?

MR. SUTTON: I guess not with the current software that we have, we can't do that. But there's not usually a lot of data points that need to be removed. And a lot of them usually are pretty obvious. Sometimes it'll be like a pressure point of a thousand or a million psi or something. It's like, I'm pretty sure that's a bad data point.

MR. NICHOLSON: Um-hum.

BY MR. CHHATRE:

Q. Did you say that -- this is Ravi-- you said if you have whole set of data points with the same numbers of -- you delete those?

A. Right. So we'll just keep kind of the endpoints. If the delta P is less than 2, we'll dump all those data points.

Q. So, for P analysis, wouldn't you need some time in the future to see how often a certain pipe segment is cycling?

A. Right. But I guess we're only removing it basically when we're saying that the line isn't cycling.

Q. Okay. All right. But how do you compare the two lines when one is more cycling than the other after -- massaging the data this way, all you are going to see really, is really similar lines, right?

A. No, because all you're doing here, I guess, is removing data points if you're -- say you were shut down or something and holding 50 pounds at your discharge, or whatever, and it was just transducers bouncing back and forth between 50, 51; 50, 51.

Q. Okay.

A. We'll just flat-line that at either 50 or 51 psi.

Q. Okay.

A. So, I guess that's how we do our manual review of our data and clean it before we do our fatigue analysis.

MR. NICHOLSON: Is that a -- this whole scrubbing process, is in a PI standard, or --

MR. SUTTON: Yes.

MR. NICHOLSON: Oh, it is? Okay. What's the -- the tabs that say Weighting Factors, is that of any significance?

MR. SUTTON: I believe this is -- this is before my time when I was here. I know -- I think this was something that Sean Keane was using more so when he was monitoring this. We're not using this, though, for our current programs.

MR. NICHOLSON: Okay.

BY MR. CHHATRE:

Q. But you do not know what the weighting factor is? Use it or not use --

A. No, I don't use that at all.

Q. But do you know where it comes from, I guess? I realize you might not use it anymore.

A. No. I'm not even sure where it comes from.

Q. Oh, okay. All right.

A. I know these two tabs, what's on them don't influence what I'm doing up front here.

Q. Okay. Okay.

A. So I guess what we'll do once we have our pressure data is we'll do rain flow counting on it. I believe this -- use the template. I'll bring up the other one as well.

So this one here just shows, I guess, what the numbers are we're putting in on this rain flow and what they represent. So the first part is just the string, what we're naming this file. Then we're defining whether it's a metric or imperial file. The load type, so when we pull our data we pull it in pressure. This row here is just if you're using another type of load type, but we're still using just the standard defined ones. We just put one there. Our bin size that we're using is, we use a bin size of 5 psi. Our ratio bin size, we set it to unknown. We have bin size zero as well.

We do use, sometimes, a severity spectrum indicator. So, what this will do is it will go through the rain flow analysis. And what we break it down to is quarter yield cycles. So we'll tell it to go through -- it'll add up all the cycles that are there, and then it'll try and break all those cycles down into what's defined as a quarter yield cycle. So it might take a cycle that's 500 psi and it'll turn that into the equivalent number of cycles, the equivalent number of quarter cycles that will cause the same amount of damage on the same size of flaw.

MR. PIERZINA: I think that's important to understand that. So what does that -- so that takes a severe cycle and converts it to a comparable number of smaller cycles, or --

MR. SUTTON: Right. Or scaling your smaller ones to a bigger one. Basically what you're trying to accomplish with that is changing it into a repeatable cycle. So you're saying I'm having this many quarter yield cycles. So you're doing a repeated cycle of the same amplitude over and over again.

BY MR. NICHOLSON:

Q. Instead of one large swing, one cycle --

A. Right.

Q. -- break it into four equivalent? Okay.

A. Right. So it's just another way of doing, I guess, if you wanted to do a constant amplitude loading. But we're saying that constant amplitude loading is a quarter yield cycle. This actually doesn't have anything to do in with the fatigue analysis itself, it's just another way that you can potentially compare a line to another line and compare, well, how many of the same size of cycle is it having?

Q. Okay.

A. So here we're just defining -- here's our wall thickness for Line 6B. A quarter inch is our nominal wall thickness, our nominal diameter of 30 inches. We're assuming a crack growth depth of 20 percent.

Q. So go back to your wall thickness. This is a fatigue analysis that was used on the 2005 USCD run?

A. Yes.

Q. So you don't use the wall thickness off the tool?

A. Off the joint itself. No. Because what we're creating here is just the spectrum file that we're going to use for the fatigue analysis of all the features. This portion down here on the chart is actually only used for the spectrum severity indicator.

Q. Oh.

A. So if we didn't want to use that, we don't have to put that data down here. So we're just defining, I guess, a 20 percent deep crack, two-square root DT length, the same as we do in our pressure cycle monitoring. That was just our yield strength of the pipe. We're defining it as a quarter yield cycle, so 25 percent.

And then here we're just saying this is where the files are that I want to use and these are the two files that I want to use for this rain flow count that I am doing.

MR. PIERZINA: Oh. So, from where are we looking -- where we're looking at the spectrum severity factor data, or the data that's going in just for that?

MR. SUTTON: All that there from row 9 to row 15.

MR. PIERZINA: And row 8 is just -- is just --

MR. SUTTON: It's just, do you want to do this?

MR. PIERZINA: -- saying whether you want to do it or not?

MR. SUTTON: Right.

MR. PIERZINA: Okay.

BY MR. NICHOLSON:

Q. Aaron, if -- back on the pressure bin size, if you wanted to, say, compare a fatigue calculation for a 5 psi bin like you're using to a 25 psi bin or a 50, would you just redo this with a different bin size and then --

A. Yeah. You would just copy the same column that you've got, paste it over and then instead of 5, you just put 25. And then it would spit out your two spectrums using your different bin sizes.

Q. Okay. So each column's going to give me another spectrum?

A. Yeah. Each column will give you one spectrum.

MR. PIERZINA: So, are you going to do that? Or you've already done that for the 5 psi bin, I'm sure.

MR. SUTTON: Yeah.

MR. PIERZINA: I would have an interest, if it's not too difficult, to compare, say, a 5 -- you know, 5, what you've done, to say a --

MR. CHHATRE: 100?

MR. PIERZINA: No, 50, for sure, maybe 25.

MR. SUTTON: Sure.

MR. PIERZINA: I don't know if that --

MR. SUTTON: I just got here -- I guess this is just -- this one's just a template showing what the values are. And then this would have been what we actually did for the input. So I can just change this.

BY MR. NICHOLSON:

Q. Well, what are your two spectrums? What's the difference between your two columns there?

A. Between these two that I have here?

Q. Yeah, A and B.

A. The only difference is the pressure data that I'm using.

Q. Oh, okay.

A. So with this first one, I'm only using the pressure data from Marshall discharge for 2008, quarter one.

Q. Okay.

A. Whereas in the second one I'm using from 2005, quarter four, until the end of 2010, quarter two.

MR. CHHATRE: So you just give the second one, I guess. Right?

MR. NICHOLSON: Oh, yeah, what do you want to do with -- which one are you going to use for your bin comparison? Worst case, or --

MR. PIERZINA: Fifty -- I think I'd like to use 50 because that's kind of close to the FlawCheck default, right?

MR. NICHOLSON: But what pressure?

MR. FOX: But which --

MR. NICHOLSON: Which pressure cycle?

MR. FOX: -- which date range?

MR. PIERZINA: Oh.

MR. SUTTON: The pressure data from 2008, quarter one, is actually more aggressive than --

MR. NICHOLSON: Right. It's -- right.

MR. PIERZINA: As long it's compared to the same --

MR. SUTTON: Same thing.

MR. PIERZINA: -- pressure data, that's really what I'm looking for.

MR. SUTTON: Okay.

MR. FOX: So, let's do it for the quarter one 2008.

MR. SUTTON: And then you said you wanted to do 50 psi bins?

MR. PIERZINA: Yes. Well, if you can do it for both?

MR. SUTTON: Yeah. I've actually got the one for 5 already created. Or do you want me to run that one as well?

MR. PIERZINA: No, we can do it -- we can demonstrate it with this one then if you've got the other one already run.

MR. SUTTON: Sure. So we'll just go into FlawCheck. We run it and we select the type of analysis that we want to do. So here we're just doing rain flow counting, so it's just a little characterization.

MR. NICHOLSON: So the rain flow counting is done within FlawCheck?

MR. SUTTON: Yes.

MR. NICHOLSON: Okay. We're going to want to save these too, because you'll be sending them out to us afterwards. So, just FYI if you want to put it --

MR. JOHNSON: As you save them, maybe give them a name that --

MR. NICHOLSON: Yeah, put them in a directory.

MR. JOHNSON: -- so when we give it to them, they'll have a pretty good idea of what it is.

MR. SUTTON: Okay.

MR. JOHNSON: Like Brian's Request 1, Brian's Request 2. I see that's where we'll be going.

MR. NICHOLSON: Start a spreadsheet for this.

MR. SUTTON: It might take a little bit to run here.

MR. JOHNSON: Huh. You got a correction?

BY MR. PIERZINA:

Q. So, have you -- Aaron, have you ever done any work to try and fit a failure analysis to -- you know, and pressure to come up with C and M values that, you know, more closely match, you know, a failure?

A. Right. Personally myself I've never done that.

Q. No? Okay.

A. I guess while we're waiting for that, we can go over --

Q. Okay. One other question related to that. Would FlawCheck allow you to do that? Could you calculate a C or M value based on, you know, holding the other values?

A. Right. I'm not aware if you can do that in FlawCheck. I know in FlawCheck, though, you can vary what your C and M values are. So you can, I guess, guess and check kind of thing just --

Q. Sure. Iteration to --

A. To get it to fit.

Q. Thanks.

MR. NICHOLSON: So we're waiting now for the rain flow --

MR. SUTTON: Right.

MR. NICHOLSON: -- to finish? Okay.

MR. SUTTON: I'm just going to pull up, I guess, our fatigue templates that we use. And all of these too I'm showing you guys the templates. You can also do all this manually in FlawCheck. I guess when you're running thousands or hundreds of thousands of features, though, it makes a lot more sense to be using these batch files. If we're just having to do one or two calculations, we'll go in and do it the manual way, but otherwise it's just too long for time.

So I guess this here is our batch template, then, for actual fatigue analysis. And so below I've just got the example data that we'll be running through. This is the joint where we had the failure on Line 6B. So this is a couple of different ways that we have run the feature that itself failed, as well as the other features on the joint. So just in the first column here, we've got just what we're naming it. So here we always usually specify the line, the station and then whatever the unique feature identifier is that we get from our ILI vendor.

Then we just state which standard we're using. So we always use the VS7910 level 2 analysis for ours. Then we're just defining our units that we're using for defining our features as well as in our pressure spectrums, whether we're using a curve shell or flat plates. We'll use a curve shell.

This is our flaw type. So we use a surface flaw in this case. The analysis type; so we're using internal pressure for our pressure data. The surface location, just inner/outer. All of these ones happen to be outer surface features. The flaw orientation, they're axial flaws. Flaw location, we have them entered as base metal flaws. Orientation, we have parallel to our weld. But again, this value here, some of the columns are highlighted here with orange. And they're only for the failure aspect of this.

So when we're doing our fatigue analysis, we first run through CorLAS to determine what our critical crack depths are. So that's where we're using our fracture component to this. We're just using this for strictly the fatigue analysis of it. So, in this spreadsheet we can actually specify what our critical depth is, and so to stop there instead of using the VS7910 to do failure calculations where it's doing fatigue growth and failure calculations at the same time. So we'll just specify, well, we want it to stop at this point based on our CorLAS calculations.

Then just the depth of our feature that we're inputting. The length of our feature. When we're doing our fatigue analysis, we cap the length of the feature to 2 square root DT. The reason why we're using this is it's outlined in TTO5 that cracks that grow by fatigue are somewhere in the range of square root DT to 2 square root DT in length when they're growing. So we just stop it at that length there.

When we do our CorLAS calculations, though, we do use the full length that the ILI vendor provides.

MR. NICHOLSON: I'm sorry. You cap it at 2 square root DT?

MR. SUTTON: Yes.

MR. NICHOLSON: Okay.

MR. FOX: And the depth is -- that's the depth that comes from either the profile or the bin?

MR. SUTTON: Right. So, yeah, it'll give you your max profile depth, your max bin depth, your max bin depth plus bias, whether you're using just the tool bias or whether you want to throw some more bias on there because you've done some digs and can see the tools trending non-conservatively.

MR. FOX: So for the rupture flaw, there's three depths there?

MR. SUTTON: Right.

MR. FOX: Or and then we've got -- you know, this is the first three and there's two that are at 097 and then one that's 071?

MR. SUTTON: Right. So I guess the difference between these three is Steven Bott showed you guys, I believe, some critical crack growth curves here the other day, yesterday? Two of them show the feature when we assessed it at the 97 thou deep and one of them was for the 71 thou deep. So what we did for difference here is, these two for the 97 thou are run using different pressure spectrums. So the one uses a spectrum from 2008 quarter one, whereas the other one uses the entire spectrum from the tool run, so just to give the different curves there. And then this one here, I believe, uses also the spectrum from 2008 quarter one, just with a different starting depth.

So then we've just got our nominal --

BY MR. NICHOLSON:

Q. I'm sorry. What are the starting depth? The 097 is with the bias, I think, and --
A. Yes.
Q. Okay.
A. And I believe this one was just with the tool reported depth. So, I'm not sure whether that was just max bin depth or max profile depth. I'm not sure offhand.
Q. The methodology and the values you guys are using, the limitations, like a cap, that's unchanged, right? And that's how you would have done it in 2005?
A. Yeah.
Q. Okay. Except the bias was not part of this --
A. Right.
Q. Okay.
A. So then we've just got our nominal diameter. Our plate width or cylinder length, we just put it to the default of 40. When this comes into play is if you're using a long flaw, and what it'll assume there is that your flaw is the length of whatever you're defining your cylinder as. But in this case, all of our features are shorter than that.
MR. NICHOLSON: Well -- I'm sorry --
MR. CHHATRE: Well, you just --
MR. NICHOLSON: -- if we have a flaw that's 51 inches --
MR. SUTTON: Right. But when we're doing --
MR. NICHOLSON: Because you cap it?

MR. SUTTON: Yeah, because we cap the length.

MR. NICHOLSON: Okay.

MR. FOX: No, the plate thickness is the 28 PI?

MR. SUTTON: Right. And I believe this was the USCD wall measurement that they had used in their initial analysis.

MR. FOX: Okay.

MR. CHHATRE: But I thought earlier you said you always use .25 nominal?

MR. FOX: That's for the severity.

MR. SUTTON: That was just when we're doing the severity indicator for this line. We'll use what the nominal wall thickness is for that segment.

MR. CHHATRE: Okay.

MR. JOHNSON: Brian, request him to -- no, have you done 250, you know, the nominal wall thickness fatigue life calculation?

MR. SUTTON: I don't have it with me here, but we can definitely run it.

MR. NICHOLSON: Yeah. Yeah, we want it. And can we -- I mean, you can just add rows at this point, right?

MR. SUTTON: Yep.

MR. NICHOLSON: Yeah. So why don't we -- why don't you get all your iterations out there now, Brian, and we'll load the sheet up.

MR. JOHNSON: Yeah, we -- yeah.

MR. NICHOLSON: So we'd like to see 250 --

MR. CHHATRE: And .071, right?

MR. PIERZINA: Well, actually for each of those rows that you did, if you could just copy them --

MR. SUTTON: And just do the same thing with --

MR. PIERZINA: -- and make new rows with 250?

MR. SUTTON: Sure.

MR. CHHATRE: But, now, question, .097 was with bias. They didn't use bias in --

MR. PIERZINA: Right. We'll have that --

MR. CHHATRE: You have (indiscernible) --

(Simultaneous speaking.)

MR. PIERZINA: -- we'll have that example, right?

MR. CHHATRE: Okay.

MR. NICHOLSON: You're going to get both here. You're going to get 071 and you're going to get bias.

MR. JOHNSON: Right. You'll get no bias and bias.

MR. CHHATRE: Bias, okay.

MR. JOHNSON: And 285 and 250.

MR. NICHOLSON: And 250.

MR. SUTTON: So then here you just define whether it's an embedded flaw or not. And ours aren't; they're surface breaking, or we're assuming surface flaws. Just our materials name, X52. Our fatigue growth constants that we have, so we use 8.61 times 10^{-19}. And as well --

MR. CHHATRE: Well, where does that number come from? I'm sorry.

MR. SUTTON: This number? It's out of API 579.

MR. CHHATRE: Okay.

MR. NICHOLSON: And it was in 2005 as well?

MR. SUTTON: Yes.

MR. NICHOLSON: That didn't change? Okay.

MR. SUTTON: No. And then the M that we use is 3.

MR. CHHATRE: What is that 3 number? Oh, the constant?

MR. SUTTON: Yeah. Yeah, both of these are your material constants.

MR. CHHATRE: So they are material -- based on material properties?

MR. SUTTON: Yeah.

MR. CHHATRE: Okay. And they are both from API?

MR. SUTTON: Yes.

MR. FOX: That's the C and -- C and M values.

MR. CHHATRE: Oh, okay. C M (indiscernible) -- okay. All right.

MR. SUTTON: Here you can define other ones, but since we don't use a threshold value for our fatigue analysis, we ignore these and just stick with the one value that we have. And it's just our yield, then; tensile strength, ultimate strength of our materials that we're using. All these columns here from Y to AF -- actually, even farther than that -- are all corresponding to the failure. So if we're doing fracture mechanics, if we're using the VS7910 model for failure -- some of them we do have populated. It doesn't use these, though, because we're only running the fatigue aspect of it since we're using our CorLAS to do our failure calculations.

This is just referencing the pressure spectrum that we're using. So in this one, we're referencing the 2005 quarter four to 2010 quarter two. Our membrane transfer function, which is just our radius divided by our wall thickness. And there is a bunch more columns related to your failure pressure, or your failure calculations, not your fatigue.

The only other ones that we use for our fatigue analysis is the critical depth that we calculate through CorLAS, as well as the software gives you the ability to cap a life on your features. So, if you didn't want your analysis to run for 3 hours on one feature, potentially, you could say, oh, I can run my life for 30 years and that's sufficient for my purposes. I'll stop there instead of having it run 200 years.

MR. FOX: So we may have -- some of those depths are going to be different probably for --

MR. SUTTON: If we change the wall thickness.

MR. FOX: Where we change the wall thickness.

MR. SUTTON: Yeah.

MR. NICHOLSON: That's right. Except he calc'd that. We've got that number --

MR. FOX: Yeah, we've got the calculations, so --

MR. NICHOLSON: -- on the spreadsheet.

MR. FOX: I mean, we did the calculations.

MR. NICHOLSON: I can find that spreadsheet.

MR. SUTTON: I might be able to pull it up too. I might have it on my computer, so --

And then the rest of this is actually just more dealing with the failure aspect. We're doing fatigue on more complex structures. So, this software wasn't just specifically designed for pipelines. It's also for offshore steel structures or ships or if you've got some sort of complex geometry from your weld you can factor in all of that with different stress intensity factors here. But for our purposes we don't use those.

So, again, this is just that same thing copied over, just remove the top headers and this is what your inputs would actually look like. We'll have to reference, I guess, these bottom three -- potentially calculate different critical pressure for them or critical depth. And I can show you the result of that.

So this here is your different fatigue lives for the different ways that we've set up the features. So there's your initial depths, initial lengths, and then the final depths which were the critical depths that we terminated that.

MR. FOX: We don't have -- those are the initial ones that we put in and --

MR. JOHNSON: Yeah, not the 250s?

MR. NICHOLSON: No, this is just from the past. He's just --

MR. FOX: From previous, a previous --

MR. JOHNSON: Oh, okay.

MR. SUTTON: This is from previous. I didn't just run this, no.

MR. FOX: From the previous -- oh, okay.

MR. JOHNSON: Oh, he said yours. I thought he meant Brian.

MR. SUTTON: No.

MR. PIERZINA: Or you could ask --

MR. NICHOLSON: No, you can just --

MR. PIERZINA: So the initial length for the top row, that's the 9.3-inch long defect, right, for that --

MR. SUTTON: The top three rows are, yeah, the feature that failed, I believe.

MR. PIERZINA: Oh, the feature that --

MR. NICHOLSON: Yes. Yeah, that's the feature --

MR. PIERZINA: So --

MR. SUTTON: Yes.

MR. PIERZINA: So we have an initial length of 5.8 for -- what does that refer to?

MR. SUTTON: That's just that 2 square root DT where we'll cap our length for fatigue.

MR. PIERZINA: You have -- it's saturation. I'm just trying to think. And this is the failure -- failed feature, right?

MR. SUTTON: Right.

MR. PIERZINA: Which was 51 inches long?

MR. SUTTON: Right.

MR. NICHOLSON: Yeah.

MR. PIERZINA: But we're taking, we're taking --

MR. CHHATRE: Only five.

MR. PIERZINA: -- only five, like just almost six inches of that?

MR. SUTTON: Right. Even if you see here -- this one's showing your final length -- the length of your feature hasn't changed much. Once it hits that, kind of at 2 square root DT, that's almost your cap that your feature's going to grow in length.

MR. NICHOLSON: Two square root DT, I guess diameter times wall thickness square root times 2?

MR. SUTTON: Twice your diameter --

MR. NICHOLSON: Oh, twice your diameter --

MR. SUTTON: Yeah.

MR. NICHOLSON: -- times wall thickness, square root of all of that?

MR. SUTTON: Two times your diameter, times the square root of DT. Yes.

MR. NICHOLSON: Two times your diameter times the square root?

MR. PIERZINA: Times the square root of?

MR. SUTTON: DT.

MR. PIERZINA: DT. Which is diameter times wall thickness?

MR. SUTTON: Yeah.

MR. FOX: No, it should just be 2 square root of DT.

MR. NICHOLSON: Yeah.

MR. SUTTON: Or, sorry. Sorry. Yeah, sorry, it's just 2. Sorry.

MR. FOX: Yeah, otherwise you got --

MR. PIERZINA: The square root of 2. Okay. All right. Well, that --

MR. NICHOLSON: I was getting 5.48 -- I was getting something different.

MR. FOX: That's why I asked.

MR. PIERZINA: So that's obviously some type fracture mechanics principle or property that I have no clue about. I don't know.

MR. CHHATRE: I just want to know like where it comes from, (indiscernible) API?

MR. NICHOLSON: I get 5.48. He's got 5- --

MR. SUTTON: It's in TTO5. That's where we reference from.

MR. CHHATRE: Okay.

MR. FOX: Is it -- are you using the 285?

MR. NICHOLSON: Oh, that's, that's the problem. I'm using quarter inch. Got you. Yeah. Okay.

MR. CHHATRE: So with your 50 psi bin, you are getting much longer life than the --

MR. JOHNSON: No, that would be --

MR. SUTTON: We haven't ran it yet with this 50 psi --

MR. CHHATRE: Oh, I see.

MR. SUTTON: So we can go and set --

MR. JOHNSON: Ours. It's our 50 psi data, Ravi.

MR. CHHATRE: Yes.

MR. SUTTON: So we'll go and set that up, I guess, then. So now when you want to run it for the 50 psi bins, you want to do it for all three again, for the top three of the failed feature? So like with the --

MR. PIERZINA: Yes. Yes.

MR. SUTTON: Or I guess you only need two then. It's the different starting depths because the difference between one and two was the different pressure spectrums.

MR. PIERZINA: Right, different pressure.

MR. CHHATRE: What is the frequency of cycles you are using?

MR. SUTTON: The frequency?

MR. CHHATRE: Yeah.

MR. SUTTON: It'll be just actual pressure data. So it'll be random depending on how the line operated.

MR. JOHNSON: Right. Everything that happened in those 3 months, just --

MR. NICHOLSON: Run through rain flow counting.

MR. JOHNSON: Right.

MR. NICHOLSON: And then into the FlawCheck.

MR. JOHNSON: Yup.

MR. NICHOLSON: So it goes through that rain flow counting that you heard.

MR. CHHATRE: (Indiscernible), right.

MR. NICHOLSON: Yeah.

MR. PIERZINA: So it's whether, you know, if they had three shutdowns every day then, you know, it would show all the cycles. If they had, you know, went for 2 days without a shutdown and steady state, you know, may very well cycle.

MR. SUTTON: By any chance, do you guys have what the critical depths would be if we did use quarter-inch wall?

UNIDENTIFIED SPEAKER: Did you write those down?

MR. PIERZINA: I don't know that I wrote down the critical depths. I don't know, did we get them?

MR. NICHOLSON: Yeah. Had them side by side on that Excel spreadsheet, remember?

MR. PIERZINA: I just remember the different failure pressures, but I didn't remember --

MR. FOX: Yeah. I wrote down the pressures, but not --

MR. NICHOLSON: I actually did it twice: once for everyone, and then once for Ravi.

MR. PIERZINA: If we just has a little faster delivery on those IRs, we'd --

(Laughter)

MR. JOHNSON: You got to put them in first.

Come on, Ravi, come through for us here.

MR. NICHOLSON: There's no way to -- can you just run it?

MR. SUTTON: Yeah. I can just run it.

MR. NICHOLSON: I mean, it was really pretty quick. We ran it in Excel, in Excel front-end for CorLAS.

MR. SUTTON: Right. I don't know if I have access to that right now, though.

MR. NICHOLSON: Oh, okay.

MR. PIERZINA: Well, you can -- you could still run the FlawCheck and --

MR. NICHOLSON: The .285 case.

MR. SUTTON: Using the quarter-inch wall but just the critical depth is what it was for the thicker wall?

MR. PIERZINA: Yeah.

MR. JOHNSON: And skew it, as much you want.

MR. FOX: Yeah.

MR. PIERZINA: I don't want that.

MR. SUTTON: No?

MR. FOX: No.

MR. JOHNSON: No, don't run it if it isn't going to --

MR. NICHOLSON: He could run your analysis where you do the 50 bin compared to the 5 bin.

MR. JOHNSON: Do that with the 285. Just run the 50 --

MR. SUTTON: Yeah.

MR. JOHNSON: -- but don't try to run it without the right numbers. See if Steven's still around.

MR. NICHOLSON: Sorry, Aaron. Does that make sense?

MR. SUTTON: Yeah, yeah. No, for sure.

MR. FOX: And there might -- I mean, considering the start, you know, we need to know more about the tool and what it's detecting to know what our start depth is with the .25 wall. Is it percent of the --

MR. NICHOLSON: Yeah.

MR. FOX: -- the total wall thickness, or is it the remaining ligament, or -- as I understood it, you know, you've got the remaining ligament that's just going to push the number way down if you've got a quarter long --

MR. NICHOLSON: What do you mean the remaining? You have a decent amount of (indiscernible) --

MR. SUTTON: So when you're running FlawCheck it's much the same, just instead of picking the load characterization you're just saying fatigue analysis. Counting bin psi --

MR. JOHNSON: That would have come up a lot sooner if I was doing it, I can tell you that.

MR. SUTTON: I might be telling it to look in the wrong spot.

(Pause)

MR. PIERZINA: Probably -- found the problem that fast?

MR. SUTTON: Hopefully.

MR. PIERZINA: It's running, huh?

MR. SUTTON: Slowly.

MR. JOHNSON: You don't have to wait until 7:30. You can do home --

MR. PIERZINA: Oh, I still have some stuff to do. Thank you.

MR. SUTTON: So when it's running here it's actually spitting out crack growth curve for every feature that we're running.

MR. NICHOLSON: I didn't see it, but you have to run the rain flow separately?

MR. SUTTON: Yes.

MR. NICHOLSON: And it saves the rain flow file somewhere and then it grabs that --

MR. SUTTON: Yeah.

MR. NICHOLSON: -- for the next analysis?

MR. SUTTON: Yeah.

MR. NICHOLSON: Okay.

MR. FOX: So the rain flow --

MR. PIERZINA: That's what you did right away for us, right?

MR. SUTTON: Yeah. What --

MR. PIERZINA: That first 50-pound bin?

MR. SUTTON: Yeah, that 50 pound one, I just let it run on the background, but yeah.

MR. NICHOLSON: Well, what's it save it as? Just a CSV?

MR. SUTTON: A spectrum. It's essentially a CSV file, but they call it a spectrum file. It's in a CSV format, though.

MR. NICHOLSON: But it's not CSV? Okay.

MR. SUTTON: I'll just open one and show you.

MR. NICHOLSON: I'm just curious about that.

MR. FOX: So the rain flow had finished running in the time that we've been --

MR. SUTTON: Yeah. Yeah, the rain flow doesn't usually take too long depending on how many files you want though.

MR. JOHNSON: I suppose if you were doing 4 years worth of -- it would take four times, or (indiscernible) --

MR. NICHOLSON: Can you plot the rain flow against the raw data, and does it look different?

MR. SUTTON: Yes. Once you --

MR. NICHOLSON: Okay. I'm just curious.

MR. SUTTON: -- are using -- I'm just wondering if it's safe for me to use these.

MR. NICHOLSON: Oh. We can just (indiscernible) --

MR. JOHNSON: Steven's gone home already.

MR. SUTTON: I think I've got just a redundant one I can pull up.

MR. JOHNSON: Correction. He's on the bus heading home, so he's not home. He's in transit.

MR. NICHOLSON: Who is? Steven Bott?

MR. JOHNSON: Steven Bott. Because I thought if he was here --

MR. NICHOLSON: Just say, it was the path to that file.

MR. JOHNSON: I copied him on it. Sean just said he's gone. Steven may -- you know, if he responds in transit, you can ask him that, but --

MR. SUTTON: So I guess this is just one of your spectrum files opened up. So what it's saying here is the version of the software that we used.

MR. NICHOLSON: Okay.

MR. SUTTON: -- the number of files that we appended. It was 55 in this case. And then all the files that we used.

MR. NICHOLSON: Oh, I see. Okay. Then you get a pressure and a frequency.

MR. SUTTON: Right.

MR. NICHOLSON: That's all you need, Matt?

MR. SUTTON: So it just spits out, I guess, the units, the duration of the data that you're using, the max flow that we see, the max delta P, what your average load was, what properties you were using if you're doing your spectrum severity indicator. And then it just says, okay, well, this is a 5 psi bin; I had this many features fit into that -- or this many cycles fit into that bin. And then it just goes down.

MR. NICHOLSON: What's all this at the bottom?

MR. SUTTON: This is something that is incorporated with the new version of the software, but it's not leveraged in the software yet. This gets into, I guess, loading rates as well. So once you do your rain flow analysis, you lose all your loading rates because it's just breaking your cycles down into the bins, but you don't know how many of those cycles were loaded how fast. So it doesn't factor that in into the process yet.

So this is -- they kind of added this in for future use in the software. Say, if you're maybe wanting to do something for SCC growth, or whatever, well now you've got your pressure spectrum broken down into bins, plus your loading rates broken down into bins. But the fatigue only is using the delta P's and the number of them.

MR. PIERIZINA: I think Sean -- did Sean talk about that yesterday?

MR. NICHOLSON: He did talk about it. I was just about to ask aren't you going to use the rates?

MR. SUTTON: I believe Sean has created an Excel file that does calculate the loading rates as well and they are used --

they have used it to model SCC growth, I believe.

It looks like this guy's done then.

So that's just our features. So this top portion here, nothing's different from what I had shown before. But now if you look, if you had used 50 psi bins, what kind of impact it has on your fatigue lives.

MR. FOX: So 13, 13 years went to 4.8 years and the 33 years went to 15 years?

MR. NICHOLSON: Do you have to take that and divide it by 2? Isn't that how you get your assessment interval? You divide that by 2?

MR. SUTTON: Yeah, it would be our shortest remaining flaw -- or shortest remaining fatigue life divided by 2 is our reassessment interval.

MR. PIERZINA: And then the top one -- so, the very top row with the 10-year fatigue life, that was using that most aggressive quarter, right?

MR. SUTTON: Yes.

MR. PIERZINA: And but the ones that we've got are --

MR. SUTTON: Or -- sorry. Yeah, these are all -- these ones are -- I guess it shouldn't be this one.

MR. PIERZINA: So it should be the 10-year --

MR. SUTTON: Yes.

MR. PIERZINA: Okay. That makes a little more sense to me.

MR. SUTTON: Yeah. Because both of these two were using the 2008 quarter one.

MR. PIERZINA: Right. Just one quarter aggressive.

MR. FOX: So then that cuts it about in half.

MR. PIERZINA: So --

MR. CHHATRE: But 10 year (indiscernible) --

MR. FOX: I'm sorry?

MR. CHHATRE: Changes seems quite a bit. Thirteen years to 4 years and 33 years, 15.

MR. FOX: Well, actually, 10-1/2 years to 4.8 years or 33 --

MR. CHHATRE: Half, roughly half.

MR. FOX: Yeah, roughly half.

And I think I asked you this and I can't remember exactly what you said. Have you run that with 250 wall? You know, like post-accident, just to see, you know, what the fatigue length would have been, or --

MR. SUTTON: Off the top of my head, I'm not sure if we have. I know, according to, I guess, our current processes we use, I guess, either lower between USCD or nominal wall thickness or WM. So I'm assuming somewhere we have used that quarter-inch wall thickness in a calculation.

MR. FOX: Okay.

MR. PIERZINA: I can't think of the question right now.

MR. NICHOLSON: Oh, well.

MR. JOHNSON: Quick, shut it off.

(Laughter)

MR. NICHOLSON: Well, I mean, the thing we want to see, we can't see. It's the .25 run, so --

MR. JOHNSON: But if you put that in a request, we can send you that printout, can we not?

MR. NICHOLSON: Okay.

MR. SUTTON: Is this --

MR. FOX: Or we could maybe do it tomorrow --

MR. SUTTON: Is this other computer by chance connected to the network, do you know?

MR. JOHNSON: It was.

MR. SUTTON: Yeah?

MR. NICHOLSON: Yeah, I guess we could try and do it --

MR. SUTTON: Because if we can do that, I can pull it up and we can run it.

MR. JOHNSON: Well, I mean -- I mean, it obviously won't be right now, but he could run exactly that scenario for you.

MR. NICHOLSON: Maybe tomorrow we could -- you're going to be around, right?

MR. SUTTON: Yeah.

MR. JOHNSON: You know, if you put that together, I mean -- and then we could send it --

MR. CHHATRE: Or you (indiscernible) we can just maybe get a printout.

MR. JOHNSON: Yeah, we can have him print -- he can print it out and walk it over.

MR. NICHOLSON: We'd like the -- the interaction is good to have.

MR. JOHNSON: Oh, well, I mean --

MR. NICHOLSON: Nice to see it.

MR. JOHNSON: We can take a lunch break and come over and he'll run it for you.

MR. NICHOLSON: That's what I'm thinking.

MR. JOHNSON: Yeah. I'm sure he -- yeah, that can be done. Then he can have it done in advance for you, or unless you want to see him punch all the --

MR. NICHOLSON: Well, it looks like there's other things you can choose off FlawCheck too. There's fatigue analysis and like there's a whole bunch of other little jobs you could run off that drop down menu.

MR. SUTTON: Right.

MR. NICHOLSON: So maybe we'll start playing with those features.

MR. CHHATRE: Would this change if you were not to look at 3 months average, or high and low kind of deal? Will this whole process change if you just actually did the actual readings or average daily, other than quarterly?

MR. SUTTON: It would change. I know we just had some training here with BMT Fleet. They're the ones that actually created this software. And they gave an example of where they were using -- something more like this where they were using precise data, where they were using hourly average, where they were using daily average, and they showed what the spectrum files look like. And there's noticeable difference when you're visually looking at them and then what the fatigue lives were in. There was huge difference in them.

MR. PIERZINA: Well, I think we saw in the output there where the fatigue life of that one feature grew from 10.5 years to 13.3 years. And the only difference was the one quarter of aggressive data versus 4 years of actual data, so --

MR. SUTTON: Right.

MR. NICHOLSON: Yeah.

MR. PIERZINA: So that's a pretty significant --

MR. CHHATRE: So why are you guys using quarterly data and --

MR. SUTTON: I guess it relates back to like our pressure cycle monitoring. So we'll use, I guess, the most aggressive quarter of data since the inspection and kind of assume, well, we've operated the line at that point, maybe we can get back to that point again. So we'll assume constant operation at that level until our next inspection. So what the PCM will allow us to do is, if we all of a sudden dip below that that aggressiveness, we have to re-evaluate our fatigue because maybe it's not valid any more. So we'll go back and redo it now with that aggressive cycling quarter.

MR. NICHOLSON: What's the PCM?

MR. SUTTON: Our pressure cycle monitoring.

MR. NICHOLSON: Well, I don't know what that is. How does that work? Is that -- is it an application, or --

MR. JOHNSON: That was -- that's a PI. He did that yesterday.

MR. SUTTON: Yeah, Sean might have showed this. It's our little plots that show our discharge stations and then our severity indications.

MR. NICHOLSON: Oh, he did show that.

UNIDENTIFIED SPEAKER: Somebody did. That might have been Steve this morning or it could have been Ryan 2 days ago; I don't know.

MR. NICHOLSON: That's right.

MR. JOHNSON: We saw it?

UNIDENTIFIED SPEAKER: Yeah.

MR. NICHOLSON: We saw it.

UNIDENTIFIED SPEAKER: Yup.

MR. NICHOLSON: Thank you.

UNIDENTIFIED SPEAKER: I was going to say, no, it was Sean, and then he went Steven. I went, oh, shit, it could have been Steven. I think it was Sean, though, to tell you the truth.

MR. SUTTON: So that's, I guess, where the quarter of data is coming from, just because we're pulling it on a quarterly basis and doing analysis on that.

MR. CHHATRE: But your quarterly data already has a built-in averaging factor in it, right?

MR. SUTTON: Yes, because we're assuming that we're going to repeat that quarter over and over and over again, even though realistically our operation could be quite a bit later than the quarter that we're using.

MR. NICHOLSON: So what other --

MR. JOHNSON: Ravi, would you not want him to use that aggressive quarter?

MR. CHHATRE: No, I want him to use it.

MR. JOHNSON: Okay. I just -- I want to make sure I understood you.

MR. CHHATRE: No, no, I understand.

MR. PIERZINA: All right. So, for planning your next inspection that's his -- you know, that's conservative. If you're analyzing a failure you'd -- they have the ability to use the actual, you know, to determine, yeah, okay, that this behaved the way we think it would or --

MR. SUTTON: Right.

BY MR. CHHATRE:

Q. The only thought I have on that it's all originally the quarter is usually January to March. If you have a 12-month period, there might be 3 months, consecutive months, it may not be like -- overlapping two quarters.

A. Right.
Q. That can be the worst case.
A. Right.
Q. That's what I was thinking when you asked me that question, so --
A. It might not be, yeah, January, February or March; it might be March, April, May might be your three worst months.
Q. It could be -- yeah, I mean --
A. Right.
Q. So I didn't mean that, you know -- okay. So the errata (ph.) is in the actual data other than doing -- going to through a situation, trying to take the average and --
A. Yes. There's -- I guess what we're using the PCM for is more of a quick screen to kind of be able to say our fatigue that we've done isn't valid, we need to look at it again, reassess whether what we're doing is correct or whether we should maybe start going to using the full pressure spectrum.
Q. Well, the reason I asked you this because the rupture, rupture segment -- to explain that the (indiscernible) did not see it or maybe the crack growth was much rapid --
A. Right.
Q. -- that anybody expected.
A. I think it comes down a situation too depending on when your inspection was. So if your inspection's getting towards your 5 years or something, well, maybe then you want to start pulling

all the data to get a better idea of what your fatigue is actually doing. Whereas, if you're pulling the worst quarter, you're probably being over-conservative to how the lines actually operated.

Q. And is there environmental factor figure in here? Because the other thing I'm thinking of is if there's corrosion fatigue happening, I mean, you are -- you already have more of this stress corrosion cracking.

A. Right.

Q. So, you know corrosion is happening at the crack here. So why we are using fatigue and not corrosion fatigue? And if you are using environmental monitor in there, how would it been (indiscernible)?

A. Right.

Q. I don't understand that.

A. So FlawCheck itself doesn't use environmental into the fatigue analysis. What we do, do for our features though is we grow all of our features using fatigue and then we grow all of our features using SCC growth rates that we calculate. And so what we'll do is we'll compare the fatigue life to the SCC growth rate and what the life we would get out of that and compare back to which one's faster. Is it SCC growth that's driving our re-inspection interval or is it our fatigue?

MR. NICHOLSON: That's now, but back in 2005?

MR. SUTTON: In 2005, I don't think we were, no. But that's before my time here, so --

MR. PIERZINA: I think what Sean said was that they -- by their history they always thought that fatigue was the worst --

MR. NICHOLSON: The dominant.

MR. PIERZINA: Right, the dominant.

BY MR. CHHATRE:

Q. And my -- I guess I still have some problem that we are not using corrosion fatigue. I mean, because a crack, we can really find the stresses of the crack, it may be different other than fatigue. So realistic, your rates may be much, must worse than what it really -- in stress corrosion cracking, you are considering environmental aspect of it by definition --

A. Right.

Q. -- in stress corrosion. Under fatigue you guys know very well that we have disbonded coating and you have corrosion happening, otherwise you wouldn't be getting stress corrosion cracking. So why the environmental aspect is considered in model?

A. I guess what you're -- what you're talking more of then, I guess, is the SCC growth, not the fatigue?

Q. No, no, I'm talking about -- fatigue growth, but it's corrosion fatigue growth. Because in one case the crack that are (indiscernible) --

A. Right.

Q. -- the morphology is completely different.

A. Right.

Q. The (indiscernible) is much sharper than regular run crack corrosion fatigue. And so the stress concentration, the fluctuation, everything is going to be completely different. I don't think we have a simple example that is known of limit that growth -- there is an endurance limit that --

A. Right.

Q. -- (indiscernible). You can (indiscernible) all you like, there will be no fatigue failure period.

A. Right.

Q. On the other hand, corrosion fatigue has no endurance limit. So, I guess what -- what I still feel is that if you are somehow not considering environmental factors in a fatigue model, you really are comparing apples to oranges, because in one case environmental factors --

A. Right.

Q. -- is being considered.

A. I think, actually, the environmental factors are factored into the fatigue growth constants that we're using.

Q. How?

A. I guess just when they were determined, empirically with experiments. Because I know in API 579, you can look up your constants based on the type of steel that you're using as well as the environment that the steel is in.

Q. But the environment of the surface is completely different than the environment of crack depth and how you -- I guess I'll be happy knowing that showing -- if you can show me, okay, this how we are incorporating the environmental aspect.

A. Right.

Q. And then you really cannot call it fatigue, then. You have to call it corrosion fatigue. But that's semantics. But I haven't seen something like that so far. I'm not saying it's not there, but if it is, I would like to see that.

A. Right. Offhand I don't know --

Q. Or either can get back to us. I'm not --

A. Right.

Q. If you do not know, you do not know it.

A. Right. I'm not sure off the top of my head.

Q. Somebody told us that they are including environmental factor in there somehow, right, and I still do not understand --

MR. NICHOLSON: Sean mentioned it.

UNIDENTIFIED SPEAKER: Sean did, but --

MR. NICHOLSON: He wasn't very clear on how.

MR. SUTTON: I think it is incorporated in the constants, but I'm not entirely sure how. Because I know I've looked at API 579 and it does say like for Martensitic steel in this environment or at this temperature range, use this value.

BY MR. CHHATRE:

Q. Are you using the same value here, or -- but if you are not, then you are not incorporating --

A. Right.

Q. -- the environmental aspect of it.
A. I'm not sure.
Q. Okay. That's fine. But if you guys can just get back to me on that, that would really -- and that has been bugging me since Sean's presentation. It's not clear to me. I'm not saying it's not there, but --
A. Right.
MR. PIERZINA: I think what Sean said was that the 8.61 times 10^{-19} was a screening -- a conservative screening value without knowing anything else about the behavior of your material, right? Something like that.
MR. SUTTON: Right.
MR. CHHATRE: But that does mean the environmental factors are there, right?
MR. PIERZINA: That's way beyond my knowledge, so --
MR. CHHATRE: Again, I'm not saying it's not there --
MR. SUTTON: Right.
MR. CHHATRE: -- but if it is there, I have to convince myself that, okay, this is how you guys (indiscernible) it.
MR. SUTTON: Right.
BY MR. FOX:
Q. I'm curious about the length of the crack, the axial length, and, you know, we've got the 2 square root DT limit placed on that. Is that a limit that the FlawCheck software is valid for? If you go beyond that, it would be invalid --

A. Yeah.
Q. -- the data?
A. More or less. I can -- we can run through a couple examples if you want, playing around with the length, or --
Q. Sure. I mean, if I can do, say, the accident flaw with, you know, the total length of -- what was it -- 51 inches?
A. Fifty-one inches, or something, yeah.
Q. Yeah. I mean, what the heck?
MR. NICHOLSON: Do 1.6.
MR. FOX: You want 51.6?
MR. NICHOLSON: Um-hum.
MR. PIERZINA: The 2 square root DT value doesn't change, right?
MR. FOX: Yeah, I mean -- well, that would stay the --
MR. NICHOLSON: Yeah, not the size of a flaw, though.
MR. FOX: No, that's not -- yeah, it's only --
MR. CHHATRE: Because they can change --
MR. FOX: So if I --
MR. NICHOLSON: Okay. We're overriding the 2 DT with the 51.
BY MR. FOX:
Q. Yeah, we're putting a different value in instead of the 2 DT, square of the 2 -- 2 square DT.
A. So I'll just use the 2008 quarter one pressure data.
Q. Well, let's run it with the -- have we run it with the

full -- with the spectrum that it saw?

A. Run that one, or --

Q. Did we run any of the other ones to compare it with?

A. Yes, I believe we did do that one. I think that's this guy here.

Q. Okay. Yeah, let's run that. So before we had 13.6 years.

MR. PIERZINA: So those initial lengths, are those input values or are they --

MR. SUTTON: They're the input values.

MR. PIERZINA: They were input?

MR. SUTTON: Yeah.

MR. PIERZINA: Oh, okay.

And why did we use those instead of the actual flaw length?

MR. SUTTON: Just because if it's kind of a flaw beyond that 2 square root DT, the length isn't going to change, or not a significant amount.

MR. CHHATRE: What he's saying -- he's saying the fatigue length --

MR. PIERZINA: Oh. All right. So if we input a longer length feature, we should not see the fatigue length change?

MR. SUTTON: Right.

MR. PIERZINA: Okay.

MR. SUTTON: So, I just got to pull up the critical depths.

So, here what it's saying -- I think Sean has probably spoken to this about randomizing the spectrum or how the spectrum is applied and scaling it. So here it's saying, okay, you've got your 6 years of pressure data or whatever you've got. I can't run that 20 times, so what I'm going to do is I'm going to scale that back so that you can run that at least 20 times.

UNIDENTIFIED SPEAKER: That's new to me, Aaron, but --

MR. NICHOLSON: Yeah. He did talk about scaling. I didn't know -- it said it's going to reduce it by one quarter.

Oh, maybe he did talk about that.

MR. FOX: But we didn't -- oh, we didn't run that. Okay.

MR. SUTTON: Then your length -- isn't showing. Not showing, but it's not changing.

MR. PIERZINA: So that's a pretty fast curve.

MR. FOX: So, it comes out at 4-1/2? A little bit less than 5 years.

UNIDENTIFIED SPEAKER: Uh-huh.

MR. FOX: Well, that seems like a pretty good -- reasonable --

MR. JOHNSON: What's that?

MR. FOX: It seems like a reasonable result.

MR. NICHOLSON: 2005 to 2010, yeah.

UNIDENTIFIED SPEAKER: For what happened, huh?

MR. FOX: Seems to match.

MR. NICHOLSON: Except that's the wrong -- no, that's the right flaw too. It's the wrong wall thickness.

MR. SUTTON: Did I put something -- wrong key in here?

MR. NICHOLSON: Well, it's got bias in it too, right?

MR. FOX: Yeah. It's got the tool bias in there.

MR. NICHOLSON: Yeah. It's got the bias.

MR. FOX: Yeah. So you got the tool bias in there. You've got the extra wall thickness.

MR. NICHOLSON: Can you take the bias out, or do you want to leave the bias in?

MR. FOX: It gives you an idea.

MR. SUTTON: I'm just trying to find where it's --

MR. FOX: You could run a whole matrix of, you know, what values you want to plug in for length and depth and, you know, width of the wall thickness.

MR. NICHOLSON: So it went from 13.6 to 5? Is that what would happen? Yeah, 13.6 to 5.

MR. PIERZINA: Now, was that a curve with the 50-pound bins?

MR. NICHOLSON: Oh, I don't know. Is that 50-pound bins?

MR. SUTTON: I'm not sure. I'm trying to find where I have that. Input file.

MR. PIERZINA: No, because we did the 50-pound bins on the -- just the severe quarter.

MR. FOX: That's right.

MR. PIERZINA: And that was the --

MR. FOX: That's right.

MR. NICHOLSON: Why don't we go off the record for --

(Whereupon, the interview was concluded.)

CERTIFICATE

This is to certify that the attached proceeding before the

NATIONAL TRANSPORTATION SAFETY BOARD

IN THE MATTER OF:	ENBRIDGE - LINE 6B RUPTURE IN MARSHALL, MICHIGAN Interview of Aaron Sutton
DOCKET NUMBER:	DCA10FE007
PLACE:	Edmonton, Alberta, Canada
DATE:	December 8, 2011

was held according to the record, and that this is the original, complete, true and accurate transcript which has been compared to the recording.

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Vanita Tildon
Transcriber