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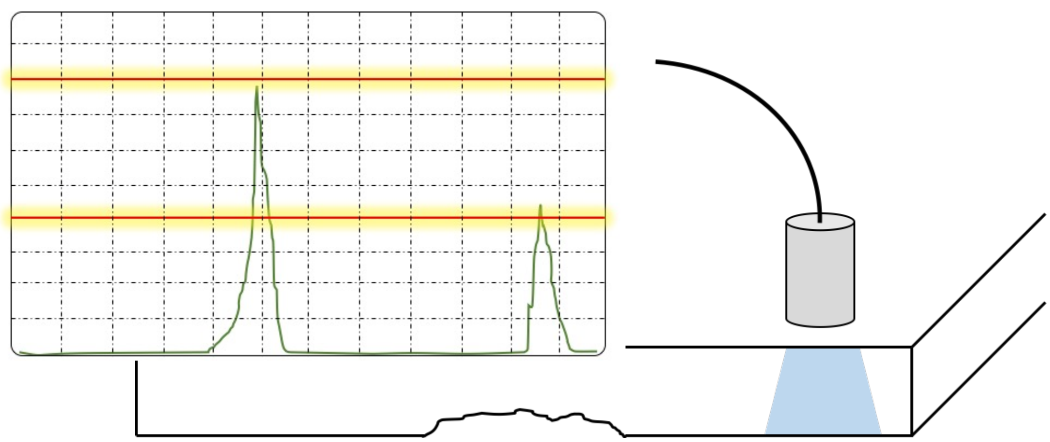
This installment of the Technical Bits describes the most basic of methods for sizing pits (or other indications) using a longitudinal beam transducer. We're purposely not going on to how to determine the minimum thickness, we'll save that for later.

I suppose that there are a few ways to accomplish the same thing, but what I find, and teach, is a 6 dB drop method to sizing. If you remember from your first UT class, 6 dB drop describes the way a change in 6 dB, in this case down, affects signal amplitude by reducing it by 50%. I guess that this is technically a 6 dB drop *premise* method but really it's a 50% ratio method.

If we assume that the transducer is longitudinal and that we've calibrated correctly, we can set the range to be a total of 1 -2 back wall signals. The screen should look like this (using a digital unit with A-Scan, no initial pulse shown):



Set the first back-wall at 80% full screen height. This is assuming that the unit is in the standard mode, not echo-to-echo mode. Echo-to-echo is another article for another day.

At this point 100% of the sound that is put into the test piece is hitting the back-wall and being reflected back to the transducer. It's not really 100% but is something less due to attenuation and what not, but let's agree that it's 100%. So, 100% of the sound returning to the transducer relates to 80% screen height or amplitude. We want to see the top of the signal to see what happens to it as we run the transducer over the surface of the plate because thickness testing is not amplitude dependent. What I mean by that is that, unlike other

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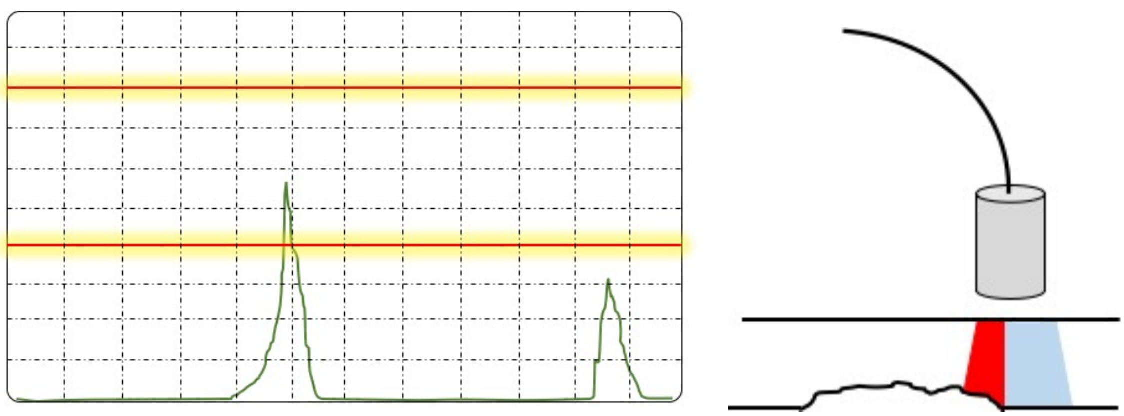
ultrasonic techniques, the returned signal may not have amplitude sufficient to trigger the measure gate and we don't use signal amplitude as a basis to reject parts.

Now let's look at the effect of the moving the transducer over a corrosion cell. In the picture below you see that as we move the transducer over the corrosion, the amount of sound on the back-wall changes; it lowers. This changes the signal on the screen. Let's say that 30% of the sound is on the corrosion cell and 70% is on the back-wall. The back-wall signal on the screen will change by the same 30% difference and lose 30% of the 80% of amplitude resulting in a signal height of about 56% screen height.



What's happening is that the sound that doesn't make it to the back-wall, that 30%, is hitting the corrosion cell and because of the non-uniform surface, reflects all over the place and some won't get back to the transducer and some does. The sound that does is probably of insufficient intensity to show a good signal and results in maybe some very low amplitude "noise" along the baseline. That's not good for determining the minimum thickness but it's very good in determining the size, or extents, of the corrosion for mapping purposes. If we continue into the corrosion cell until half of the sound is on the back-wall and half is on the corrosion cell, our screen will look like the picture below where our initial back-wall signal of 80% loses amplitude to 40%.

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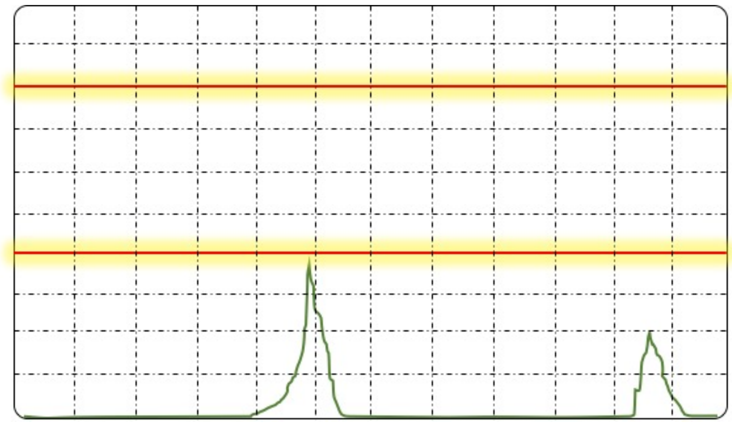

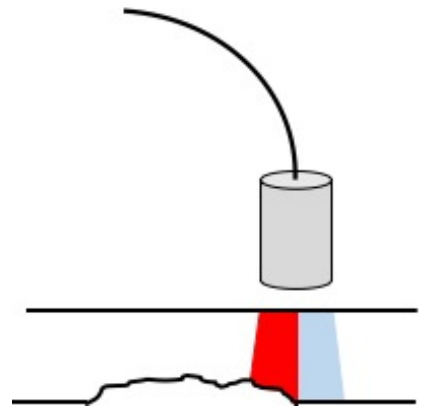

If we make small movements of the transducer up and down, in and out, we will be able to keep the signal at the 40% screen height level and essentially trace or draw the corrosion cell on the surface of the part. When the perimeter of the corrosion cell is determined, take the transducer off of the inspection surface and draw a line through the couplant with a marker in the center of the 'trail'. That's the outline of the corrosion cell. Now you can dimension the indication very accurately and record your findings appropriately. It takes a bit of practice to become good at it, but with a little patience you'll be an ace.

That's it for this article on sizing using a longitudinal beam transducer. If I haven't explained everything to your liking or you need clarification, please let me know by e-mailing me or calling my cell. I hope that you learned something here and will come back to see what's next. Try out this technique, and others as they're posted, and impress your friends, colleagues, and most importantly, your Clients.