



Structural Integrity: Materials Testing *Interpreting Results*

The next step in interpretation is after the test, when obviously we've got the load displacement trace, but we've now got to look at the fracture and then use the information we get from the fracture face to analyse that information. So here we've got the machine notch, we've got the fatigue crack underneath it and then there's a fracture face as a result of the test underneath that. We obviously need to know the depth of that, uh, fatigue crack because that's the thing that goes into the analysis, along with the load and displacement, and gives us the toughness result. The vast majority of materials are much more ductile than that, and this is an example of a, of a more ductile fracture, and K_{IC} would not be appropriate for this interpretation, but you've got the same thing, you've still got the notch, the depth of fatigue crack but you can see that the fracture face is much more ductile than the previous one, and this would be a COD type analysis, and this is the one that's the more conventional for modern structural materials. In this case, this happens to be a pipeline steel.

Pipeline steel is perhaps a very good example of the way that we use toughness information. Pipelines are, undergo a very arduous life, so both from their manufacture to their actual end use.

Ours may be installed hundreds of metres in, in water depth so they've got a large compressive stress on them from this actual sea water, let alone the oil or the gas that's flowing through them, but on top of that, because of that depth, they're laid from a, a lay barge on the, on the surface of the water, and they've then got to drop off the end of that barge, several hundred metres down and then flatten again on the seabed, so the pipe itself undergoes a large amount of strain during that process. And the, the welded pipe has got to be capable of sustaining that strain without any fracture, without any damage. On top of that, it's possible that some pipelines, certainly m... primarily land pipelines, will be damaged during service by people running into them, farmers with tractors, diggers, things of this nature, and that can damage the pipeline, and this is then got to be assessed to see whether it's possible to keep that pipe in operation or it has to be taken out of operation to be repaired.