PUBLIC SUBMISSION

As of: 11/14/18 9:48 AM
Received: November 13, 2018
Status: Pending_Post
Tracking No. 1k2-96j4-1aum
Comments Due: November 13, 2018
Submission Type: Web

Docket: NRC-2018-0168
Weld Residual Stress Finite Element Analysis Validation

Comment On: NRC-2018-0168-0001
Weld Residual Stress Finite Element Analysis Validation

Document: NRC-2018-0168-DRAFT-0002
Comment on FR Doc # 2018-19941

Submitter Information

Name: Ben Pellereau
Address:
Rolls-Royce
United Kingdom,

General Comment

General Comments

This seems to be quite an onerous and detailed statistical procedure for analysts to follow but is still based on some fairly crude assumptions. Is it possible to derive a simpler rule of thumb to enable analysis results to be reliably conservative without being too onerous? for example using a WRS profile from measurements/FE that is shifted up by a set amount (eg 50 or 100 MPa) or a %age of the peak (or define a similar rule to apply to the SIFs)? Have you considered a comparison with any published profiles/modelling procedures in documents like API-579/ASME FFS-1 or R6?

The average of isotropic and kinematic hardening stresses is a slightly arbitrary means of approximating mixed hardening. Does the fact that it seems to work well in this case guarantee that it will for other welds?

All of the validation is at the WCL, could this not drive the analyst to adjust their model to match the results here at the expense of accuracy elsewhere?

The errors in the FE results that have been excluded are typical of errors that analysts might make in actual assessments. It would be useful to see what the effect of these could be on SIFs how much would safety cases be undermined?

For the heat input tuning guidance [page 5-11] surely matching the size of the fusion zone is more important

than just melting one element this advice potentially makes the heat input mesh dependent.

Measurement Data

There is also quite a large difference between the contour and DHD measurements to what extent has this been investigated/understood all that can really be concluded is that the FE, DHD and contour data are in broad agreement.

The generation of multiple profiles from the contour surface accounts for some amount of variability in WRS around the circumference but doesnt account for any errors inherent in the method or any systematic error in this measurement which would affect all of the generated profiles. For example: plasticity effects, cutting features (wire entry/exit, cutting start/end), variability in elastic modulus. If these were considered then the scatter from the contour results would be increased significantly. Similarly, the comparison of different DHD measurements doesnt include modulus variability or plasticity effects. For large residual stresses (close to yield), plasticity can be quite significant in both measurement techniques (generally chopping off the peaks, but it can increase them in DHD measurements).

Minor comments

3.2.4 isnt there some variability in wavelength as well as amplitude and phase? Also, the profiles arent purely sinusoidal so what about membrane and bending stress have these been sampled too, captured in the warping functions or assumed to be constant?

Figure 3.8 why change scales? it exaggerates the effect slightly. It would also be helpful to colour the curve of the outlier differently to make it easier to see on the plot. Is there any reason in the analysis (difference in assumptions/model setup) why this might be an outlier or has it purely been identified because of its effect on the statistics.