From: Benson, Michael
To: Kirk, Mark
Subject: RE: Throwing a Dart at FAVOR
Date: Monday, August 27, 2012 11:22:00 AM

At one point, I heard Terry say something about "ductile tearing". By that, was he referring to potentially incorporating EPFM to FAVOR?

From: Kirk, Mark
Sent: Monday, August 27, 2012 10:37 AM
To: Benson, Michael
Subject: RE: Throwing a Dart at FAVOR

This is better for a lunch time conversation ... but I'll throw a few things out.

- Don't confuse metallurgy and mechanics.
- All cleavage is not brittle, and (so) cannot all be analyzed by LEFM. In particular in the upper transition region (as you point out) EPFM is probably more appropriate ... even though a structural engineer would probably regard the ultimate failure as brittle.
- In NUREG-1806, Section 3.3.3.1 you will see our cut at justifying the use of FAVOR. You will further see that it is admittedly imperfect. There are certainly situations where EPFM would be the better choice
    - http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1806/v1/sr1806.pdf

  I did not go to pains to point out where we are not doing the best job in the report and, frankly, have not much been called on it. Sean's recent analysis of itty bitty flaws speaks to the accuracy of FAVOR in those cases. The worst case for EPFM appropriateness would be an embedded flaw with some small distance between the inner crack tip and the clad/base interface. In that case the plastic zone would, I expect, be large with respect to that dimension ... causing LEFM problems.

From: Benson, Michael
Sent: Thursday, August 23, 2012 8:35 AM
To: Kirk, Mark
Subject: Throwing a Dart at FAVOR

Mark,

I have a question. BCC materials can exhibit brittle cleavage fracture, so we analyze vessels with LEFM in FAVOR. However, at high temperatures EPFM may be more appropriate (a la RG 1.161). So, why does FAVOR not use EPFM?

Thanks,

Michael Benson, PhD
U.S. Nuclear Regulatory Commission
Materials Engineer - RES/DE/CIB
Phone: (301) 251-7492

B/185