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Corrosion Assessment Criteria: Rationalizing Their Use Applied to Early Versus Modern Pipelines Agreement DTRS56-03-T-0014 3rd Quarterly Status Report Period March 1, 2004 to May 31, 2004 Contractor: Battelle

Technical Status

Work in this quarter developed guidelines by which current code criteria for the pipe body could be applied to selected cases involving corrosion on welds. These guidelines reflect work in the last quarter that defined the technical aspects of corrosion failures on welds in contrast to those in the body of the pipe.

A key difference between 70s corrosion acceptance criteria developed for “earlier vintage steels” and 90s criteria for “modern steels” involved use of a “flow-stress” as the defect-free “reference stress”, whereas the 90s criteria utilized the “ultimate tensile stress” (UTS) for the same purpose. Full-scale test data were gathered to determine if there is a physical basis for different reference stresses. These results indicated the UTS was relevant for all grades and vintages when plastic collapse controlled failure. The role of constraint in a case where 70s criteria over-predict failure pressure was evaluated as a possible cause for this over-prediction, and shown to be the causative factor for both the failure and the over-prediction. Numerical work in reference to laboratory test geometries evaluated the extent to which constraint induced by defect geometry and loading could contribute to over-predicting failure pressure, and as an explanation for the use of a defect-free reference stress whose value is less than the UTS.

Work completed in this reporting period in reference to specimens continues in the next reporting period, where the focus is constraint associated with corrosion in pipe rather than laboratory specimens. Selected full-scale testing was initiated in this reporting period to explore the mechanics of failures in seams with reduced strength and toughness as compared to the pipe body. This will be completed and discussed in the next reporting period.

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