Quarterly Report

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Introduction

Metal loss due to localized corrosion and pitting of pipelines can significantly increase the risk of rupture. Therefore, it is vitally important to accurately determine the residual strength of corroded pipelines so that proper remedial actions may be taken to avoid catastrophic events. Although historical methods and practices for inspection and integrity assessment have led to an overall safe and reliable pipeline infrastructure with a low frequency of failures, public expectations concerning pipeline safety are growing, and industry is committed to pursuing further improvements. Consequently, new US regulations and sophisticated inspection technologies have burdened many operators with large quantities of data that are often difficult to interpret and apply within the framework of existing assessment guidelines. Clearly, the industry needs a technically sound, comprehensive and integrated approach to assess and mitigate the effects of localized corrosion in gas and oil pipelines, and to assure appropriate pressure-containment safety margins.

Several methods have been developed for assessment of corrosion defects, such as ASME B31G, RSTRENG and LPC. These methods were developed using an early fracture mechanics relationship for toughness-independent failure of pressurized pipes and were empirically calibrated against a database of full-scale burst tests for thin wall pipes. Some work has already been done to address the limitations of existing assessment methods available to the industry. The objective of this project is to extend these methods by providing guidance for assessing corrosion damage in high strength steels up to X100 (project 153H); develop simplified guidance to assess corrosion metal loss defects in pipelines that are subjected to external loadings in service (project 153J); establish the potential for fatigue failure from corrosion (project 153K); and develop guidance on the use of existing failure criteria for corroded linepipe operating in the ductile/brittle transition regime (project 153L). Following completion of these tasks new rules and guidance for comprehensive assessment of corrosion damage in transmission pipelines will be incorporated into a Guidance Document for use by the pipeline industry (project 153M).

Summary of Progress – Project 153H

Stress versus strain data for grade X80 and X100 pipeline material has been sourced from public domain sources, e.g. from recent ASME International Pipeline Conference papers and from related PRCI Materials Technical Committee funded projects. Round bar tensile test results have been obtained for 32" and 48" diameter grade X80 parent material. Similarly, round bar tensile test data for 36" diameter grade X100 material has been obtained. In each case the yield and ultimate tensile strength was confirmed to meet specified minimum values. All materials data has been converted into true stress versus true strain form as required for non-linear finite element analysis.

Point of Contact:
Advantica, Inc.,
Ashby Rd.,
Loughborough,
England, LE11 3GR
vinod.chauhan@advantica.biz
Tel: +44 (0)1509 282363
FAX: +44 (0)1509 283119