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March 17, 2015

Mr. James Merritt
Contracting Officer's Representative (COR)
R&D Program Manager Office of Pipeline Safety
DOT - PHMSA
793 Country Briar Lane
Denver, CO 80129

Sent via Email: James.Merritt@dot.gov

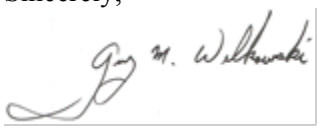
Dear Mr. Merritt:

Subject: Technical Brief on DOT SBIR Phase 1 Project under Contract No. DTRT5715C10023

As required by the terms of the above contract deliverables, attached is a one page "*Technical Brief*" on the our DOT SBIR Phase 1 Project titled "*A Novel Approach to Establishing Remaining Strength of Line Pipe and Fittings with Corrosion Type Defects*."

Please do not hesitate to contact me or Dr. Prabhat Krishnaswamy the Project Manager, if you need any additional information or have questions.

Sincerely,



Dr. Gery M. Wilkowski, P.E.
Principal Investigator

cc:
Ms. Linda Byrne, DOT Contracting Officer; linda.byrne@dot.gov
Ms. Melissa Wong, DOT SBIR Program Manager, melissa.wong@dot.gov

DOT SBIR Phase 1 Project

A Novel Approach to Establishing Remaining Strength of Line Pipe and Fittings with Corrosion Type Defects

TECHNICAL BRIEF

Name and Address: Engineering Mechanics Corporation of Columbus (Emc^2), 3518 Riverside Drive, Suite 202, Columbus, OH 43221.

Point of contact: Dr. Gery Wilkowski; gwilkows@emc-sq.com ; 614-459-3200 x228

Contract Number: DTRT5715C10023

Introduction: The US DOT's PHMSA is exploring technologies and methods which could increase the integrity, reliability and safety of the U.S. pipeline network. Corrosion metal loss is one of the major damage mechanisms to gas transmission pipelines worldwide. Current methods to assess the remaining strength of corroded pipelines, such as the ASME B31G (including the Modified B31G) and RSTRENG models that have been incorporated into the US Code of Federal Regulations may be inadequate and perhaps non-conservative for higher grade line pipe, i.e., X65 and above.

Background: Recent work supported by PHMSA has identified a critical need for developing and demonstrating new non-destructive evaluation methods to quantify remaining strength of line-pipe steel and/or pipeline fittings for these higher grade pipeline materials. This work also indicates that a detailed computational analysis along with full-scale experimental validation is needed to develop a new approach to determine the remaining strength of higher grade (X65 and greater) pipelines and fittings as a result of corrosion – which would lead to either a further correction of the Modified B31 G approach or a completely new set of criteria for these materials that can be used as an B31G Option 3 analysis.

Summary of the work to be accomplished: Emc^2 proposes to establish the feasibility of a novel mathematical and computational model to assess the remaining strength of pipelines and fittings with natural corrosion type defects and a failure criterion that accounts for the transitional changes from a sharp crack to generally thinned corroded regions. The successful demonstration of the proposed approach "Simulation of Natural Corrosion via Computation" (SNC^2) along with carefully selected laboratory experiments will allow appropriate correction factors to the existing methodologies and also provide a high-performance computational tool for reliable prediction of the remaining strength of both line pipe and fittings made with higher grade steels.

The success of this feasibility study will enable the development of appropriate correction factors for existing methods to assess the remaining strength of line pipe and fittings with metal loss and corrosion type defects for regulatory applications. Over and above, the computational software developed during Phase 1 and validated with full-scale experiments during Phase 2 will provide an easy-to-use tool for the oil and gas industry, chemical and process industry as well as the nuclear industry to analyze various types of blunt flaws corrosion, erosion, natural flaws that are detected from in-line inspections.