

CAAP Quarterly Report

Date of Report: December 23, 2018

Prepared for: *U.S. DOT Pipeline and Hazardous Materials Safety Administration*

Contract Number: 693JK31850006CAAP

Project Title: Predicting Remaining Fatigue Life of a Dent with Corrosion Using Advanced Measurements and Modeling

Prepared by: *Georgia Institute of Technology*

Contact Information: Laurence Jacobs
Georgia Tech College of Engineering
225 North Avenue
Atlanta, GA 30332-0360
laurence.jacobs@coe.gatech.edu

For quarterly period ending: December 30, 2018

Business and Activity Section

(a) Contract Activity

Kickoff meeting held on Georgia Tech campus on December 10, 2018 with James Kelly (PHMSA), and team members in person or via Skype from Georgia Tech (in person), Colonial Pipeline (last minute cancelation) and Fleet Technologies (Skype). Kickoff to discuss contract and technical details. Laboratory and facilities tour for James Kelly. Discussion of contract details and reporting requirements.

No materials purchased in the first quarter.

(b) Status Update of Past Quarter Activities

The primary activities in the first quarter was to set up the contract at Georgia Tech and to establish an overview plan with the industrial partners: Colonial Pipeline and Fleet Technologies. We had two technical Skype meetings and numerous email conversations to work up a plan of six overarching tasks. Key objective is to agree on a set of legacy materials and procure them from Fleet. The proposed tasks are:

- Task 1: Baseline nonlinear ultrasound (NLU) measurements on virgin specimens of three different pipe grades to quantify the effect of material variability on the measured NLU parameter, β [1].
- Task 2: NLU measurements on statically loaded (or prestrained) specimens to quantify the effect of material plasticity on the measured NLU parameter, β .
- Task 3: NLU measurements on fatigue damaged specimens to track changes in the NLU parameter, β
- Task 4: Determine the influence of corrosion on NLU parameter, β
- Task 5: Development of a predictive model for the measured NLU parameter, β
- Task 6: Model validation for real pipeline specimens.

(c) Cost share activity

None

(d) Task 1: *Baseline NLU measurements on virgin specimens from three different pipe grades*

Worked with Fleet and Colonial on candidate list of legacy materials. Modifying experimental setup for NLU measurements on these specimens.

Detailed discussion and descriptions for the following:

1. Background and Objectives in the 2nd Quarter

1.1 Background

Start to determine material variability in a series of three different legacy pipeline materials provided to Georgia Tech by Fleet Technologies.

1.2 Objectives in the 2nd Quarter

Identify and procure materials. Make first set of NLU measurements on these materials to determine variability of measured β . Objective is to determine If the inherent material variability will dominate the expected changes in β due to fatigue damage.

2. Experimental Program in the 2nd Quarter

2.1 Experimental design

Establish the measurement parameters for the curvature and thickness of the pipe materials.

3. Results and Discussions

None yet.

4. Future work

Continue with NLU measurements

References

1. Matlack, K.H., Kim, Jin-Yeon, Jacobs, L.J., and Qu, Jianmin, "Review of second harmonic generation measurement techniques for material state determination in metals," *Journal of Nondestructive Evaluation*, DOI 10.1007/s 10921-014-0273-5, 2015.