

CAAP Quarterly Report

Date of Report: *January 5, 2015*

Contract Number: *DTPH5614HCAP05*

Prepared for: *DOT and PHMSA*

Project Title: *Improved Coatings for Pipelines*

Prepared by: *Texas Engineering Experimental Station*

Contact Information: *Dr. H. –J. Sue, 1-979-845-5024, hjsue@tamu.edu*

For quarterly period ending: *December 31, 2014*

Business and Activity Section

1. Generated Commitments - *<Please list any additional teaming agreements or describe any changes to existing agreements with partners or cofounders that relate to work under the CAAP award. Please itemize the purchase of any equipment or supplies over this reporting period.>*

There have been no additional teaming agreements, although we have met with the Pipeline Research Council International in Houston, Texas, to briefly discuss this project with PRCI leadership. We have tentative plans to present this project to PRCI membership at a technical meeting. Note that our existing partners (Dow Chemical and Shawcor Ltd.) have the capabilities we need to complete our milestones. Our primary goal for these discussions is to gather additional input in order to maximize our chances of developing a new technology that is commercially successful.

The formulation we have agreed to test has multiple components in addition to the resin and hardener. The manufacturers of most of the additives have agreed to provide free samples. Dow Chemical Co. has shipped resin and one of the two hardeners. We have ordered one of the hardeners. The charges will be incurred in the next quarter.

We have received steel panels from Shawcor that we will coat for testing. These panels are treated on one side, and are specially manufactured for corrosion tests.

2. Status Update of Past Quarter Activities -

Our plans for this quarter were to kick off the project with an on-site meeting, to agree on a coating formulation, and to agree on a testing protocol. All of these were accomplished.

1. The kickoff meeting took place at Texas A&M in College Station, Texas, on October 23rd, 2014. We reviewed the existing nanofilled coating technology that had been developed at Texas A&M, and discussed potential opportunities for use in various types of pipeline coatings. Follow-up meetings were conducted by phone for those that were unable to attend the initial meeting, and to agree on the technical direction.
2. After discussing several types of coatings (powder, waterborne, liquid), we agreed that we would use a 2-layer coating starting with a thin (10-100 μm) layer of nanofilled epoxy with a thick (100-500 μm) a two-part epoxy coating on top. The nanofilled layer will be our existing ZrP-epoxy formulation. The top layer will be a two-part marine formulation provided by Dow Chemical Co. Control panels will be coated with only the two-part marine formulation with a thickness equal to the combined thickness of the test panel coatings. Shawcor has provided the panels and will run the tests.

- The top marine coat formulation is shown in Figure 1 below. The resin side ('Part A') contains D.E.R.TM 354 (Trademark of The Dow Chemical Co.), which is bisphenol F diglycidyl ether. The other components are functional fillers. The hardener side ('Part B') contains a mix of a phenolic hardener, D.E.H.TM 615 (Trademark of The Dow Chemical Co.), and an amide-amine, Versamid® 140 (Trademark of BASF). We will scale down the batch size listed in Figure 1 for our initial tests.

Figure 1: Formulation for 2-Part Coating

Dow 100% Solids DTM Coating Formula:

Material Name	Type	Pounds	Gallons
<i>Part A</i>			
Grind			
DER 354	Binder	502.87	50.63
Mica 325	Extender	134.10	5.69
Wollastocoat 10 ES	Extender	134.10	5.54
Blanc Fixe N	Extender	167.62	4.90
Halox SZP-391	FunctionalPigment	167.62	6.67
<i>Grind Sub-total</i>		1106.32	73.42
<i>Part B</i>			
Premix			
Versamid 140	Binder	83.81	10.37
DEH 615	Binder	136.11	16.20
<i>Premix Sub-total</i>		219.92	26.58
Totals		1326.24	100.00

3. Description of any Problems/Challenges -

This is our first report and we are preparing to coat our first set of panels. The following is a list of potential problems, not actual problems.

- Scaleup of the ZrP nanofiller. We are working to understand all of the processing variables in order to ensure reliability and efficiency. Our work in the past was aimed at producing completely exfoliated nanofiller with no impurities. For example, we used several centrifugation steps to remove traces of agglomerated particles. We are now working to understand whether these steps are necessary.
- Adhesion between the two coating layers. The use of two layers introduces the possibility of failure of the interface between the layers. If this does indeed prove to be a problem, we think it may be solved by partially curing the ZrP-epoxy layer.

4. Planned Activities for the Next Quarter -

- Continue to scaleup our ZrP-epoxy formulation, coat a portion of the panels.
- Gather all of the components for the marine coating, locate a mixer capable of adequate mixing, and demonstrate that we can cure a sample with acceptable properties.
- If the above activities go smoothly, coat our first set of steel panels along with the control panels and ship them to Shawcor.

December 12, 2014

Dr. Hung-Jue Sue
Texas A&M University
College Station, TX 77843-3123
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RE: 1st quarter industrial support for DOT pipeline project DTPH5614HCAP05

Dear Dr. Sue:

Our 1st quarter support for the quarter for staff time, expenses, and materials is \$3500. A breakdown of this total is shown below.

Project Activity	Contributed Cost in \$
Staff time for coating formulation, testing, evaluation, meetings	1000
Materials, sample preparation, consulting	2500
Travel expenses	0
Total	3500

Sincerely,



Dennis Wong, PhD, P Eng
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U.S.A.

DATE: 1/9/2015

Dr. Hung-Jue Sue
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College Station, TX 77843-3123
+1 979 845 5024

RE: 1st quarter industrial support for DOT pipeline project DTPH5614HCAP05

Dear Dr. Sue:

Our 1st quarter support for the quarter for staff time, expenses, and materials is \$90.60.
A breakdown of this total is shown below.

Project Activity	Contributed Cost in \$
Staff time for coating formulation, testing, evaluation, meetings	0.00
Materials, sample preparation, consulting	0.00
Travel expenses	90.60
Total	90.60

Sincerely,

Lingyun He

PERSONAL AND CONFIDENTIAL



WORLDWIDE PARTNER