



Pipeline and Hazardous Materials Safety Administration Office of Pipeline Safety

Pipeline Safety Research & Development Program

Workgroup#6: Breakout Tanks – Methods to Prevent Corrosion of Tank Bottoms

Zaid Obeidi

December 1, 2021



Good Morning & Welcome!

PHMSA Leader: Zaid Obeidi, General Engineer

Industry Co-Leader: Chris Aldrich, Integrity Management Program Coordinator, Marathon Pipe Line, LLC.

Industry Co-Leader: Justin Samuel, Engineer, Integrity Tech Services, Phillips 66

Industry Co-Leader: John G Field, Corrosion Engineer, Energy Transfer Partners

- Thank you for choosing this Workgroup
- We have an important charge for you:
 - Listening/Learning
 - Assist in developing PHMSA's future research agenda



Workgroup Objectives

1. Updating the audience on the challenges and funded research to date associated with this workgroup subject
2. Identifying technical gaps that address key challenges
3. Developing a list of important topics for future PHMSA funded research from identified gaps



Agenda at a Glance



Today's Agenda – December 1

Time	Presentation	Speaker
10:00 AM	Introduction to Workgroup	Workgroup Leader PHMSA Workgroup Leader Industry
10:30 AM	Research Funding Organization Presentations	Presenters 1-4
11:30 AM	Q&A	
12:00 PM	Contractor Support Introduction & Description	S&K Facilitate
12:10 PM	Research Gap Brainstorming Session	Workgroup Participants
12:45 PM	Lunch Break & CAAP Poster Presentations During Lunch similar gaps will be combined.	
2:45 PM	Review gaps identified following the combination.	Workgroup Leaders
3:15 PM	Sticky Note Exercise – Round 1 & 2 Workgroup prioritizes R&D Gaps	S&K Facilitate
4:15 PM	Break	
4:30 PM	Workgroup Research Topic Roadmapping	Workgroup Leaders & Participants
6:00 PM	Workgroup Closeout Day 2 closeout	Workgroup Leader



Tomorrow's Agenda – December 2

- 10:00 a.m. **PHMSA's Year-Round R&D Solicitation**
- 10:10 a.m. **Workgroup Readouts**

The results of this Workgroup will be presented at 10:10 a.m. tomorrow ETZ.

Return to the event meeting page to find the entry link to Day 3.



PHMSA Funded Research

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Safety Administration

PHMSA: Your Safety is Our Mission



PHMSA Related Research

- No prior related research addressing tank integrity challenges
- However, significant focus within areas of corrosion in pipelines
- PHMSA will now build a research portfolio with the output from this group



PHMSA Policy & Active work



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PHMSA: Your Safety is Our Mission



Tank bottom corrosion challenges

- PHMSA's goal is to prevent any Spill, through Corrosion Mitigation.
- Repeated Incidents of tank bottom release of hazardous liquid, some with less than 20 years in service.
- Constant corrosion inspection findings on tank bottom.
- PHMSA / Industry understanding of Cathodic Protection (CP) application.
- Lack of specific CP designs for all types of Breakout tanks.

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Related Current Regulations

- 49 CFR §195.2 Definitions
- 49 CFR §195.3 What documents are incorporated by reference partly or wholly in this part?
 - Many Industry standards are incorporated by Reference in 49 CFR §195.3
- 49 CFR § 195.553 What special definitions apply to this subpart?
- 49 CFR § 195.563 Which pipelines must have cathodic protection?
- 49 CFR § 195.565 How do I install cathodic protection on breakout tanks?
- 49 CFR § 195.571 What criteria must I use to determine the adequacy of cathodic protection?
- 49 CFR § 195.573 What must I do to monitor external corrosion control?

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PHMSA Incorporated By Reference (IBR) Tank Documents

	Current IBR'd	Current Published
▪ API Pub 2026	2 nd Edition	3 rd
▪ API RP 651	3 rd Edition	4 th
▪ API RP 652	3 rd Edition	5 th
▪ API RP 2003	7 th Edition	8 th
▪ API RP 2350	3 rd Edition	5 th
▪ API Spec 12F	12 th Edition	13 th
▪ API Std 510	9 th Edition	10 th
▪ API Std 620	11 th Edition	12 th
▪ API Std 650	11 Edition	13 th
▪ API Std 653	3 rd Edition	5 th
▪ API Std 2000	6 th Edition	7 th
▪ API Std 2510	8 th Edition	9 th

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PHMSA active work on Corrosion Techniques

- Report to Congress (Aboveground Storage Tanks Review of Current and New Corrosion Control Techniques).
- PHMSA/API SCAST collaboration review on all Standards updated Ballots including API RP 651- Cathodic Protection of Aboveground Petroleum Storage Tanks and API Technical Report 655 - Vapor Corrosion Inhibitors for Storage Tanks.
- Possible future IBR documents
 - NACE SP0193 – External Cathodic Protection of On-Grade Carbon Steel Storage Tank Bottoms.

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Tank Bottoms Designs & Technologies Gaps

- Volatile Corrosion Inhibitors (VCI) performance and effectiveness:
 - Determine the effectiveness of VCIs in the field under varying conditions across the range of geographical locations around the country or the world.
 - Improve in-situ monitoring of VCI performance by developing new monitoring protocols or new monitoring systems.
 - Determine how to best apply VCIs to make sure the entire tank bottom is protected.
 - Determine VCI degradation rate for different tank environments.
 - Determine if bacteria activity has an impact on the effectiveness of VCIs and if biocides effect the protection provided by VCIs through laboratory and field studies.
 - Determine criteria where CP and VCIs are used to together, particularly in highly corrosive environments.



Tank Bottoms Designs & Technologies Gaps

- Tank designs on concrete pads (steel in contact with concrete)
 - Concrete pad thickness
 - Sloping of the inward pad or outward
 - Groves within pads for drainage
 - Sealing of chime to concrete to prevent intrusion of water and maintenance interval of that seal
 - Elevation of concrete pads above the secondary containment floor for moisture control
- Determine Tank designed with high density polyethylene (HDPE) liner
- Determine Tank designed with concrete pads placed on top on HDPE liner
- Determine Tank design for double bottom tank (e.g., El Segundo Tank)



Tank Bottoms designs Gaps/ discussion

- Concrete = **Electrolytic** Contact with the Soil.
- HDPE Liner = Isolated from contact with Soil.



Thank You!

Research Program Contacts

Sentho White

Director – Engineering & Research
Department of Transportation
Pipeline & Hazardous Materials
Safety Administration
Office of Pipeline Safety
(202) 366-2415
sentho.white@dot.gov

Robert Smith

R&D Program Manager
Department of Transportation
Pipeline & Hazardous Materials
Safety Administration
Office of Pipeline Safety
(919) 238-4759
robert.w.smith@dot.gov

Kandilarya Barakat

Operations Supervisor
Department of Transportation
Pipeline & Hazardous Materials Safety
Administration
Office of Pipeline Safety
(202) 941-8623
kandilarya.barakat@dot.gov

Nathan Schoenkin

Senior Engineer
Department of Transportation
Pipeline & Hazardous Materials Safety
Administration
Office of Pipeline Safety
(202) 740-1978
nathan.schoenkin@dot.gov

