Pipeline and Hazardous Materials Safety Administration

Office of Pipeline Safety

Competitive Academic Agreement Program (CAAP)

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Engineering & Research Division

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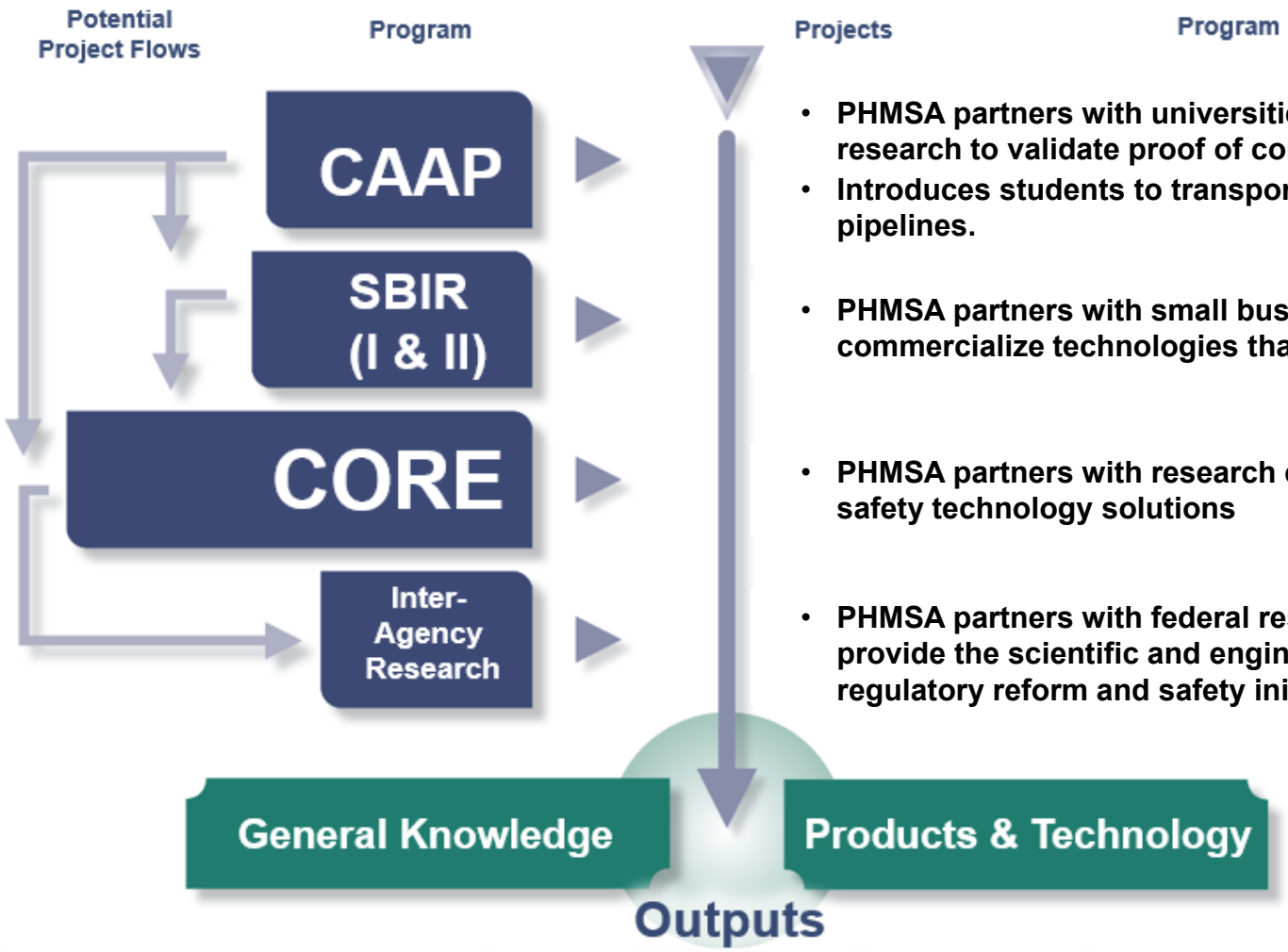
Research & Development Program



- PHMSA partners with universities on pipeline safety research to validate proof of concept of a thesis or theory.
- Introduces students to transportation of energy by pipelines.

- PHMSA partners with small businesses to commercialize technologies that can advance safety.

- PHMSA partners with research entities to develop safety technology solutions

- PHMSA partners with federal research entities to provide the scientific and engineering basis for regulatory reform and safety initiatives.

R&D Program Data

	Program Total
Total R&D projects funded since 2002	427
Active total R&D projects:	87
Total R&D investment through PHMSA:	$199 M
Technology projects funded:	127
Commercialized technologies:	35
	CAAP Total
Total CAAP projects funded since 2013:	73
Total CAAP R&D investment:	$24.3 M
Active CAAP R&D projects:	30
CAAP Student Involvement:	416

Data From:

Research & Development Program: Research & Development | Home (dot.gov)

https://primis.phmsa.dot.gov/matrix/

CAAP

- Academic pipeline safety research and development
- Spur innovation by focusing on high technical risk and high payoff solutions
- Expose undergraduate and graduate students to research in the pipeline safety field; and cultivate new talent
- Solicited (3rd/4th Quarter) and awarded on an annual cycle.
- Statutory requirement* for a 20% cost share for CAAP awards.

*Section 22 of the Protecting Our Infrastructure of Pipelines Enhancing Safety (PIPES) Act of 2016

CAAP Recipients

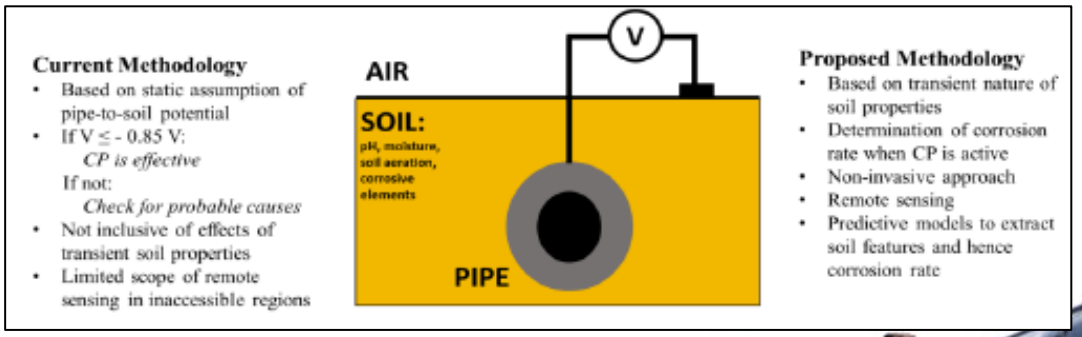
1. Arizona State University
2. Board of Regents of the University of Nebraska for the University of Nebraska-Lincoln
3. Brown University
4. Colorado School of Mines
5. Columbia University
6. Georgia Tech Research Corporation
7. Iowa State University
8. Michigan State University
9. North Dakota State University
10. Ohio University
11. Rutgers, The State University
12. Stevens Institute of Technology
13. Texas A&M Engineering Experiment Station
14. The Ohio State University
15. The Regents of the University of California Berkeley
16. The University of Akron
17. The University of Texas at Arlington
18. The University of Texas at Austin
19. University at Buffalo
20. University of Alaska Anchorage
21. University of Colorado at Boulder
22. University of Colorado Denver
23. University of Missouri (The Curators - Rolla)
24. University of North Dakota Energy & Environmental Research Center
25. University of Oklahoma
25. University of Tulsa
26. West Virginia University
27. University of Miami
28. Marquette University

Project 1 ($999,742)

Effectiveness Assessment of Pipeline CP Systems Using Remote Sensing, Advanced Modeling, and Data Analytics

Rutgers University

- Develop an innovative method for assessing the effectiveness and protection level of CP systems by integrating remote inspection, advanced simulation, and data analytics
- Create new knowledge for assessing CP systems and protection levels with reduced field testing
- Reduce risk of pipeline incidents due to external corrosion
- Improve pipeline management



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Project 2 ($461,350)

Rhamnolipids (RhL): A Bio-based, Ecologically Friendly, Corrosion Inhibitor and SRB for Crude Pipelines

University of Akron

- Provide an environmentally friendly alternative to oilfield corrosion inhibitors (e.g., anionic and cationic) that persist in ecosystems, such as soils and waterways

- Demonstrate that RhLs are a good candidate for an eco-friendly, green corrosion inhibitor and biocide for crude pipelines

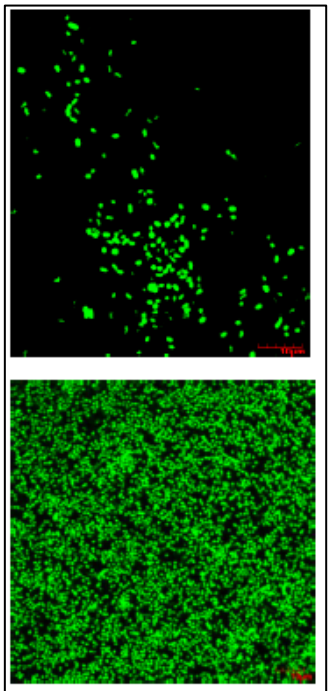

Fig 5. CLSM images of bacteria attachment on the surfaces of coupons after 4 day exposure to the SRB cultures growing in the Postgate C medium containing (top) 750 mg/L RhLs and (bottom) 0 mg/L RhLs, respectively.

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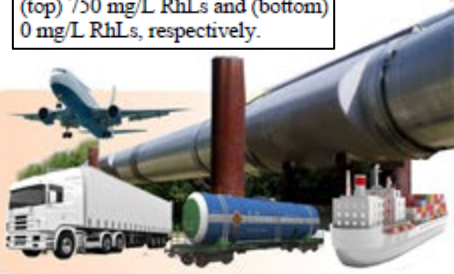

Project 3 ($1 million)

Multicompound Green Corrosion Inhibitor for Gas Pipelines: Synthesis, Optimization, and Evaluation

Arizona State University

- Develop a novel green inhibitor synthesis method
- Evaluate the inhibitor's effectiveness and compatibility using lab testing and nondestructive evaluation (NDE) measurements
- Mitigate internal corrosion risk by optimizing inhibitor performance

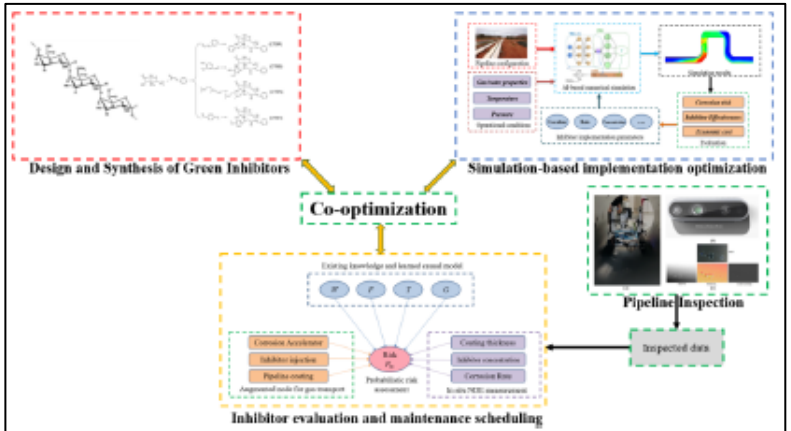

Figure 2: Schematic illustration of the proposed tasks and framework.

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Project 4 ($735,723)

A Novel Reliability-Based Approach for Assessing Pipeline CP Systems in External Corrosion Management

Marquette University

- Evaluate CP effectiveness using a novel, reliability-based approach by integrating different pipeline integrity information types such as CP/survey and ILI data
- Provide DOT and the pipeline industry reliability-based solutions for assessing CP effectiveness
- Provide CP and corrosion management tools that are essential for pipeline integrity

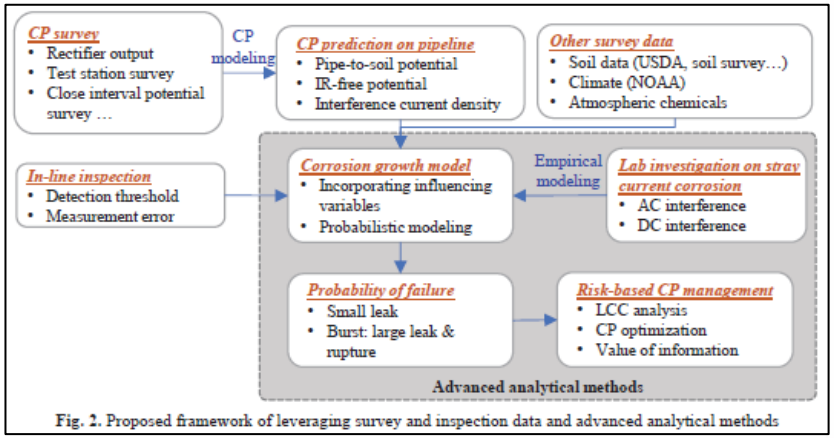

Fig. 2. Proposed framework of leveraging survey and inspection data and advanced analytical methods

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Project 5 ($550,000)

Bio-Inspired Rational Design of Bio-Based Inhibitors for Mitigating Internal Corrosion in Metal Pipelines

University of Miami

- Identify metal-binding peptides using phage display under varied chemical conditions
- Reveal the corrosion performance of the proposed bio-based inhibitor
- Establish the relationship between microstructure and corrosion
- Determine the efficiency of the proposed bio-based corrosion inhibitor in gas gathering pipeline systems
- Investigate the compatibility of the bio-based corrosion inhibitor with different transported products, including liquid crude oil and natural gas.

Photo courtesy of Structural Integrity Associates, Inc.

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Project 6 ($580,271)

Development of a Framework for Assessing CP Effectiveness in Pipelines Based on AI

Texas A&M Engineering Experiment Station (TEES)

- Provide a framework for identifying, characterizing, and assessing CP systems on remote and difficult-to-access buried pipelines
- Develop a procedure and/or methodology that helps prioritize high-risk sites (i.e., low CP effectiveness due to coating defects and corrosion severity)

- Positively impact safety by improving pipeline integrity through reduced incidents caused by corrosion or third-party damage, ultimately leading to minimized risk and maximized integrity

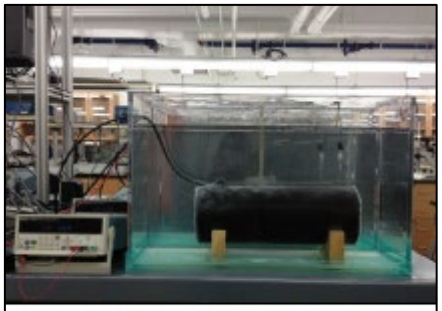

Figure 3. Laboratory set up for buried pipeline simulation

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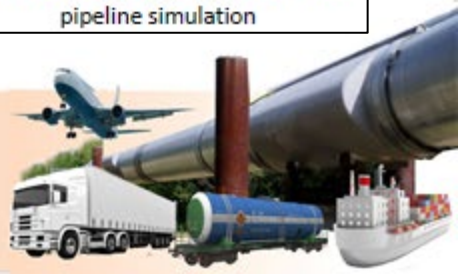

Forum CAAP Posters

Organization	Number of Posters	Contract Number	CAAP Status
University of Oklahoma	2	693JK32250004CAAP	Active
University of Nebraska-Lincoln	1	693JK32050006CAAP	Active
North Dakota State University	2	693JK32250007CAAP 693JK32250009CAAP	Active Active
Arizona State University	3	693JK32150004CAAP 693JK32350004CAAP	Active Active
Rutgers, The State University of New Jersey	2	693JK32050008CAAP 693JK32050004CAAP	Active Active
Michigan State University	3	693JK32050002CAAP 693JK32050003CAAP 693JK32150004CAAP	Active Active Active
West Virginia University	1	693JK31950007CAAP	Completed
University of Missouri	1	693JK31950005CAAP	Closed
Iowa State University	1	693JK31950003CAAP	Completed
The University of Akron	2	693JK31850003CAAP	Completed

Forum Non-CAAP Posters

Organization	Number of Posters
Carnegie Mellon University	2
Arizona State University	3
Northern Illinois University and JPL	1