

TECHNOLOGY TRANSFER: MOVING KNOWLEDGE FROM RESEARCH INTO INDUSTRY STANDARDS

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ABSTRACT

Recently the Pipeline & Hazardous Materials Safety Administration (PHMSA) of the US Department of Transportation signed a Memorandum of Agreement (MOA) with the Pipeline Standards Developing Organizations Coordinating Council (PSDOCC). This MOA is intended to enhance the cooperation and coordination between the Parties to facilitate a more effective and efficient integration of pipeline safety research and development (R&D) results into the development and revision of voluntary consensus technical standards. This presentation will provide background about the PSDOCC and its role in the development of standards and its role of technology transfer for the pipeline industry.

INTRODUCTION

In the late 1990's and early 2000's, there were a number of pipeline failures that drew a large amount of public attention. These failures heightened awareness about the issues surrounding pipeline integrity and safety. In response to these failures the US Congress passed a series of bills that directed the US Department of Transportation Office of Pipeline Safety (OPS) to develop regulations to address pipeline integrity. As OPS began developing these new regulations, they first looked for industry standards to guide this effort. In order to assist OPS, a number of pipeline standards developing organizations (SDOs) developed the Pipeline Standards Developing Organization Coordinating Council (PSDOCC) as a means creating a response to OPS about which standards could be used in the making these new regulations.

Many regulators including PHMSA are incorporating consensus standards into the Code of Federal Regulations (CFR). The goal is to strengthen and streamline the code, be less prescriptive and allow for performance to drive how

regulations are met. National consensus standards can carry the equivalent weight of law when incorporated by reference into the CFR. These standards are intended to ensure the safe design, construction, operation, maintenance and repair of pipelines. They constantly require new knowledge to be effective and are reviewed and upgraded by selected committees of engineers and other technical experts.

PHMSA incorporates several dozen consensus standards by reference either in part or in whole. These standards come from over a dozen SDOs and strengthen PHMSA's regulatory program.

It is imperative that new knowledge revise consensus standards so they remain relevant to their purpose. The pipeline industry and PHMSA are partnering on research addressing standards to strengthen their scope and to expand their applicability. Significant time and resources are spent reaching consensus on research strategy at R&D forums and other stakeholder events. PHMSA believes successful R&D projects affecting standards must provide knowledge transfer to the standards-making process and for the identification and measurement of research benefits.

To ensure success with this research program objective, PHMSA and the Pipeline Standards-Developing Organizations Coordinating Council (PSDOCC) entered into a Memorandum of Agreement (MOA). The MOA is enhancing cooperation and coordination between "the Parties" to facilitate a more effective and efficient integration of pipeline safety research and development results into the development and revision of voluntary consensus technical standards. The systematic process described in the MOA is vital to ensure knowledge from pipeline safety research is transferred to end users.

PIPELINE STANDARDS DEVELOPING ORGANIZATION COORDINATING COUNCIL

The purpose of the PSDOCC is to provide a forum for coordination of the development and implementation of *operating* standards used in the pipeline industry. The Council accomplishes this by maintaining membership from the organizations responsible for developing such standards, the organizations that use them within the industry, the organizations responsible for pipeline regulation, research organizations, and other stakeholders, including public interest groups.

The Council will also work with SDOs and regulators to provide for more performance based language in the regulations, more technical guidance in the body of standards and more choices for the pipeline industry. This will be done by ensuring more government participation on SDOs at either the federal or state level and from more than just pipeline safety agencies. Regulators and SDOs will work to produce more performance based regulations with the incorporation of consensus standards to provide the necessary technical requirements.

The Council will assist the OPS in incorporating appropriate standards into the CFR by reference by preparing a package of new or modified standards in the fourth quarter of each year. The package will be in the appropriate format for OPS and public review and comment.

The Council will publish an annual report summarizing the status of new standards and significant modifications to existing standards that are in development. The report should also list identified needs for standards that are not in development, including standards that address new technologies as they are being commercialized.

The Council will identify needs in the standards development area (e.g. for greater public participation in standards development). If appropriate, costs to meet the identified needs will be submitted to OPS for possible inclusion in their budget. Members of the PSDOCC are:

American Gas Association
American Petroleum Institute
American Society of Mechanical Engineers
American Society of Testing and Materials
American Welding Society
Association of Oil Pipelines
Gas Technology Institute
Interstate Natural Gas Association of America
NACE International
National Fire Protection Association
Plastics Pipe Institute Inc.
Pipeline Research Council International

RESEARCH TARGETING PIPELINE CONSENSUS STANDARDS

The PHMSA Pipeline Safety R&D Program is strengthening industry's ability to effectively meet promulgated integrity management regulations by providing near-term solutions and communicating them to pipeline stakeholders. The program contributes directly to the PHMSA mission by pursuing three program objectives:

1. Fostering development of new technologies that can be used by operators to improve safety performance and to more effectively address regulatory requirements,
2. Strengthening regulatory requirements and related national consensus standards,
3. Improving the state of knowledge of pipeline safety officials so industry and regulatory managers and pipeline safety field inspectors can use this knowledge to better understand safety issues and to make better resource allocation decisions leading to improved safety performance.

All three objectives have significant collaboration and co-funding by the pipeline industry. Strengthening consensus standards via this program and by others is paramount for SDOs to continue updating standards and keeping them relevant to changing threats over time. Most SDOs do not have the financial resources or the human capital to conduct the research that generates the knowledge for targeted standards.

PHMSA's modern program was influenced by the Pipeline Safety Improvement Act of 2002 both in direction, structure and by subsequent appropriations. Since 2002 the program has awarded 133 research projects. Roughly 34 of these projects are targeting national consensus standards with \$13M of PHMSA and \$18M of industry co-funding. All in all, a \$31M effort is underway to strengthen standards and keep them relevant to emerging issues. These numbers come from this webpage <http://primis.phmsa.dot.gov/rd/splan.htm> at the time this paper was finalized. New project awards were in progress so these numbers will be different at the time of IPC 2008.

In 2007 PHMSA issued a data call to affected SDOs about how the collaborative research with industry is impacting their standards. This was the first time PHMSA contacted SDOs in this capacity and in line with actions described in the MOA. It will take multiple iterations working with SDOs to standardize their responses to this data call so the public can understand the true impact.

PHMSA will contact relevant SDOs annually and capture the current status or final impact of that research affecting standards. Many SDOs revise standards on a 3 or 5 year

frequency so it could take multiple years to register the final and desired impact “Standard Revised.” In addition, PHMSA and the PSDOCC must work harder to share the research with the SDO committees to ensure the results are factored when revising consensus standards.

The Annex to this paper documents the current program success in strengthening consensus standards. The success seen here is testament to the fact that government and the pipeline industry can coordinate, collaborate and co-fund research affecting standards and now jointly measure its impact. It should be noted that one project may affect more than one standard. Knowing that, the totals shown in the Annex will be more than the totals reported in this section.

The record of “Standard Revised” should improve now that SDOs have a process to be aware of and to track research affecting their standards. SDOs are working diligently to identify if this research was used to revise their standards.

These impact measures will be posted on the PHMSA website at <http://primis.phmsa.dot.gov/rd/performance.htm>. Look for them by the end of 2008.

ACKNOWLEDGMENTS

The authors would like to thank the council members of the PSDOCC for their continued participation and guidance.

In addition, thank you to the organizations funding the research that drives new knowledge into these standards. Without both of these actions, standards would become irrelevant and ineffective in addressing present and future challenges.

REFERENCES

Title 49 of the Code of Federal Regulations (CFR), Parts 190-199, 2006

PHMSA Pipeline Safety R&D Program Performance website, <http://primis.phmsa.dot.gov/rd/performance.htm>

ANNEX A

The following section documents the program success in strengthening consensus standards. The success seen here is testament to the fact that government and the pipeline industry can coordinate, collaborate and co-fund research affecting standards and now jointly measure its impact. The record should improve now that SDOs have a process to be aware of and to track research affecting their standards. SDOs are working diligently to identify if this research was used to revise their standards.

Figure A1. Research Relevance with Standards Developing Organizations

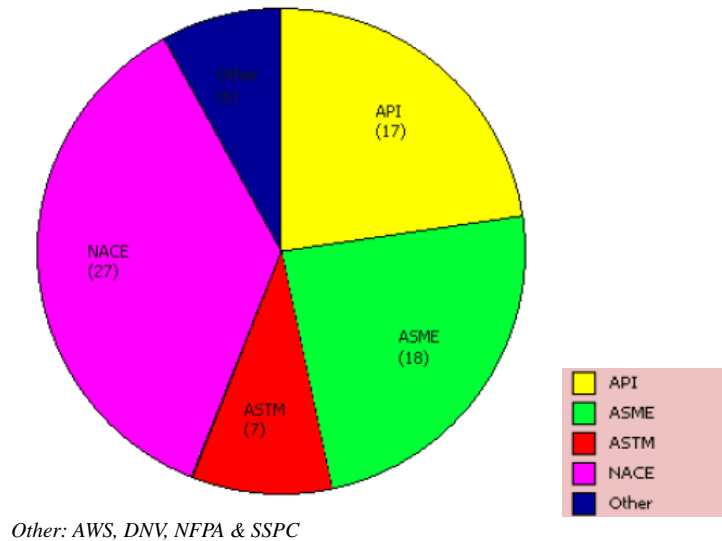


Table A1. Impact Status on Standards Developing Organizations

No.	Organization Name	% Affected ^{A, B}	% Revised ^C	% Out to Committee ^D	PHMSA	Industry	Total	Standard Relevance Count ^E	Impact Meter
1.	American Petroleum Institute (API)	21%	11%	23%	\$ 6.37M	\$ 9.25M	\$15.63M	17	■■■■
2.	American Society of Mechanical Engineers (ASME)	22%	0%	5%	\$ 7.90M	\$12.01M	\$19.91M	18	■■■■
3.	American Society for Testing and Materials (ASTM)	8%	0%	0%	\$ 2.80M	\$ 2.67M	\$ 5.48M	7	■■■■
4.	American Welding Society (AWS)	3%	0%	0%	\$ 1.36M	\$ 3.83M	\$ 5.20M	3	■■■■
5.	Det Norske Veritas (DNV)	1%	0%	0%	\$ 0.17M	\$ 0.16M	\$ 0.33M	1	■■■■
6.	NACE International (NACE)	34%	7%	22%	\$ 6.42M	\$ 8.50M	\$14.93M	27	■■■■
7.	National Fire Protection Association (NFPA)	1%	0%	100%	\$ 0.21M	\$ 0.22M	\$ 0.43M	1	■■■■
8.	Society for Protective Coatings (SSPC)	1%	0%	0%	\$ 0.14M	\$ 0.39M	\$ 0.53M	1	■■■■

Footnotes:

- A. The number of projects affecting an SDO divided by the number of projects the PHMSA program has addressing all consensus standards.
- B. These percentages may not total 100% since some projects are targeting the development of new standards yet directed by an SDO.
- C. The number of projects revising standards issued by an SDO divided by the number of projects affecting that same SDO.
- D. The number of project results sent to committee officers targeting a standard issued by an SDO divided by the number of projects affecting that same SDO.
- E. The total number of PHMSA projects targeting consensus standards issued by an SDO.

NOTE: Funding amounts are more than actual amounts because a project can affect more than one standard. PHMSA is working to best reflect the relevance of investments.

Table A2. Research Program Category and SDO Impact

SDO	Affected Standards	Revised Standards	Standards Out for Revision	PHMSA	Industry	Total
Damage Prevention						
American Petroleum Institute (API)	1		1	\$ 0.07M	\$ 0.08M	\$ 0.15M
American Society of Mechanical Engineers (ASME)	1		1	\$ 0.07M	\$ 0.08M	\$ 0.15M
Category Sub-Totals:	2	0	2	\$ 0.14M	\$ 0.16M	\$ 0.30M
Pipeline Assessment and Leak Detection						
American Petroleum Institute (API)	5	1	2	\$ 1.50M	\$ 1.84M	\$ 3.35M
American Society of Mechanical Engineers (ASME)	6			\$ 1.48M	\$ 1.75M	\$ 3.24M
American Society for Testing and Materials (ASTM)	1			\$ 0.35M	\$ 0.46M	\$ 0.81M
Det Norske Veritas (DNV)	1			\$ 0.17M	\$ 0.16M	\$ 0.33M
NACE International (NACE)	20	2	5	\$ 5.05M	\$ 5.99M	\$11.04M
Category Sub-Totals:	33	3	7	\$ 8.57M	\$10.21M	\$18.79M
Defect Characterization and Mitigation						
American Petroleum Institute (API)	3	1		\$ 1.98M	\$ 2.44M	\$ 4.43M
American Society of Mechanical Engineers (ASME)	3			\$ 1.68M	\$ 1.96M	\$ 3.65M
American Society for Testing and Materials (ASTM)	1			\$ 0.55M		\$ 0.55M
NACE International (NACE)	1		1	\$ 0.08M	\$ 0.08M	\$ 0.16M
Category Sub-Totals:	8	1	1	\$ 4.30M	\$ 4.49M	\$ 8.79M
Improved Design, Construction and Materials						
American Petroleum Institute (API)	8		1	\$ 2.81M	\$ 4.88M	\$ 7.69M
American Society of Mechanical Engineers (ASME)	8			\$ 4.65M	\$ 8.21M	\$12.87M
American Society for Testing and Materials (ASTM)	5			\$ 1.89M	\$ 2.21M	\$ 4.11M
American Welding Society (AWS)	3			\$ 1.36M	\$ 3.83M	\$ 5.20M
NACE International (NACE)	6			\$ 1.29M	\$ 2.43M	\$ 3.72M
Society for Protective Coatings (SSPC)	1			\$ 0.14M	\$ 0.39M	\$ 0.53M
Category Sub-Totals:	31	0	1	\$12.17M	\$21.97M	\$34.14M
Safety Issues for Emerging Technologies						
National Fire Protection Association (NFPA)	1		1	\$ 0.21M	\$ 0.22M	\$ 0.43M
Category Sub-Totals:	1	0	1	\$ 0.21M	\$ 0.22M	\$ 0.43M
Grand Totals:	75	4	12	\$25.40M	\$37.06M	\$62.47M

NOTE: Funding amounts are more than actual amounts because a project can affect more than one standard. PHMSA is working to best reflect the relevance of investments.