The Proof

Information gathered from hundreds of thousands of miles of in-line inspection (ILI) tools has given the industry a wealth of knowledge about various coatings. Electromagnetic transducer technology (EMAT) can detect the type of coating and whether it is disbonded. The proof is in every properly performed and recorded field evaluation. Some still ignore these facts instead of using them to improve.

Above-ground survey techniques cannot locate or confirm disbonded CP shielding coatings, non-shielding coatings, or if there is corrosion. These surveys can provide locations where current is being consumed and, along with ILI/EMAT, can effectively find where external corrosion and SCC are present. "Therefore, it is important to provide information on factors that can lead to SCC. One such factor is coating disbondment," S. Tappert, et al., wrote in *Pipeline and Gas Journal*.[13]

Integrity Management

An integrity management plan must state how the operator will avoid future damage to the pipeline. Valid integrity management plans must describe how the operator will monitor the pipeline to assure that threats to the pipeline have been successfully mitigated or neutralized. Valid integrity is understanding pipeline coating performance related to CP if there is a disbondment or coating failure. "The formation of disbondment behind a coating that passes CP presents a third ranking. In this case the coating has failed, but CP can act as a backup," S.S. Papavinasam, M. Attard, and R.W. Revie wrote in a 2006 issue of *Materials Performance*[14] (Figure 4). The integrity question is, does the coating shield CP if the adhesion fails and electrolyte penetrates?

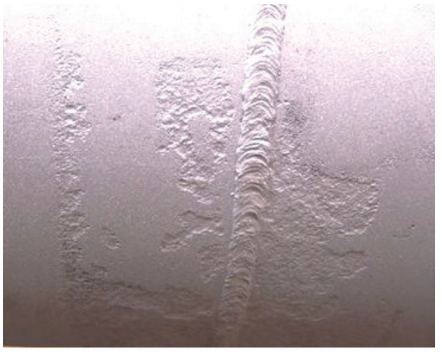

FIGURE 4 External corrosion under solid film-backed, CP-shielding girth weld coating, but no corrosion under the mainline FBE coating.

Regulatory Coating Requirements

The minimum coating requirements as stated by the Pipeline and Hazardous Materials Safety Administration (PHMSA), Title 49 Code of Federal Regulations (CFR) for the transportation of natural and other gas at 80 % SMYS, Part 192.112 says, "The pipe must be protected against external corrosion by a non-shielding coating." For the transportation of hazardous liquids by pipeline, Part 195.559 says coating materials must "support any supplemental cathodic protection." How can a coating that shields CP when adhesion fails meet this requirement?

Single layer, non-shielding FBE barrier coating systems offer anti-corrosion protection for underground pipelines, as well as verification of their performance from above ground," J. Rogozinski wrote in *World Pipelines*.[15] Mesh-backed wraps and two-part epoxies have also shown compatibility with CP if there is coating disbondment.

Conclusions

Many types of pipeline coatings have been used for more than 100 years. All coating can disbond or be damaged. Poor application or inspection, incomplete specifications, improper selection, handling of the coated pipes, soil stress, wrong application procedures, external impacts (rocks, digging equipment, floods, etc.), and many more environmental issues cause all coating types to fail and potentially shield CP leading to external corrosion, bacterial corrosion, and SCC. To improve integrity for cathodically protected structures, why not develop and use pipeline coatings that tend to be non-shielding when disbondments occur? Proof of coating integrity is critical for all pipelines.

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