Guest Comment

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Corrosion is a major consideration in the economics of pipelines. It affects both Capex and Opex and plays a role in defining the balance between these costs. For example, depending on the type and nature of corrosion expected for a pipeline, there may be benefits to using expensive corrosion resistant alloys, with the impact on Capex being recovered through reduced Opex through the asset life. Clearly corrosion needs to be considered at all stages, from project initiation through to end of life. This means it's not only a materials issue and a wide range of disciplines play their role in maximising the long term return on investment in pipelines. The approach at the design stage directly affects Capex, but – once in service – the approach to corrosion and integrity management will strongly influence through life costs, associated with both interventions and failures.

Management in any field relies on information and implementing actions based on that information. In the case of pipeline integrity management, the primary aim is to ensure integrity of the pressure boundary in a cost effective manner throughout the intended life, and sometimes beyond. Decisions and actions are based on information related to the condition of the pipeline and its operation. An understanding of the operating conditions and how those might affect corrosion is fundamental to effective management when corrosion is a threat to integrity. This on its own is not sufficient, however, and direct information on the condition of the asset is also essential. Provision of this information is the role of inspection. The reliability and nature of information delivered by inspection is therefore fundamental to the effectiveness of integrity management decisions. Poor information leads to poor decisions, with increased costs, e.g. associated with unnecessary interventions or increased failure rates. Conversely, inspections that deliver reliable information on asset condition will drive more cost effective decisions and actions.

There is a growing emphasis on understanding how inspection data and its interpretation influence integrity management outcomes, and hence also on adopting inspection approaches that provide more useful information.

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Improvement in existing inspection technologies and development of new technologies and methods of data analysis are driving changes in integrity management. There is a growing reliance on inspections that provide quantitative data, often in massive volumes. Inline inspection using intelligent tools is often delivers the primary information on which to base decisions and this field is seeing rapid development. While many pipelines are designed to be piggable, there are probably more pipelines in service that are not piggable (or where the costs of modification for pigging render it uneconomic). Externally applied inspection is essential to determine the internal condition of such lines.

The capabilities of externally applied inspections are advancing rapidly, in response to both the needs of integrity management and the availability, at relatively low cost, of sophisticated electronics technologies developed in other fields. The speeds at which data acquisition and processing is possible continue to grow rapidly, making possible inspection which provides very detailed data on the internal condition of pipelines. For example, examination of a corrosion defect which may imminently threaten integrity of a subsea pipeline is possible with measurements on a grid of 0.5 mm x 0.5 mm with the thickness values obtained having an 80% tolerance of less than 0.15 mm. This kind of inspection performance allows fitness for purpose assessments on directly representative geometries, and also provides the basis for accurate corrosion growth rates and remaining life assessments. It can, and has, made the difference between pipelines being shut down and replaced or repaired in the short term, versus being kept in service over many years until end of their field life. The savings to the pipeline operator are substantial, typically many times more than the investment in the inspection. Advances in analysis methods play an equally important role. As inspections provide more quantitative data so the opportunities for maximising knowledge of asset condition based on analysis of this data increase. Data science, a growing disciple in many other fields, is taking on increasing importance in integrity management. Its role will continue to grow in response to the benefits it offers to through life cost.

Corrosion will remain a challenge to pipelines operators, but the good news is the toolbox with which to tackle it is getting ever more capable.