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Choosing the Right Geometry / Deformation Tool Under Current Guidelines

By Scott Coats, President, Precision Pigging, LLC

Regulation of pipeline construction is becoming increasingly complex. In late 2009, the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) unveiled new Interim Guidelines regarding the inspection of pipelines under specific conditions. These Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength directly address the concerns of pipe expansion in spiral-seamed pipe that have been seen in the past few years. These concerns only appear to be growing, rather than dissipating. Therefore, as long as spiral-seamed pipe is utilized, these Guidelines will likely remain in effect.

The PHMSA Interim Guidelines place more stringent regulation on large diameter pipe (36-inch and 42-inch). The main issue of concern for PHMSA appears to be the potential expansion of large diameter pipe as a result of low yield strength. PHMSA expressed these concerns in an Advisory Bulletin issued in May 2009:

PHMSA has identified an integrity issue with respect to microalloyed high grade line pipe. Tests that have been conducted on line pipe that has been installed in pipeline systems have shown that some of the pipe material has yield strengths, tensile strengths, and/or chemical compositions that do not meet the requirements of the American Petroleum Institute, Specification for Line Pipe—5L, (API 5L), for PSL 2 and the specified pipe grade. Pipe joints produced from plate or coil from the same heat may exhibit variable chemical and mechanical properties. Yield strengths below the minimum specified yield strength have been

reported and yield strengths up to 15% lower than the strength values on the pipe manufacturer produced mill test report have also been reported. In some cases, the affected pipe may successfully pass strength testing methods contained in current specifications but may lead to a future pipeline integrity issue. The presence of low yield strength line pipe installed in a pipeline system may result in increased susceptibility to excessive pipe expansion or rupture during the pre in-service field hydrostatic strength test. PHMSA wants to ensure that owners and operators of recently constructed pipeline systems are aware of the need to investigate whether their pipelines contain joints of pipe that do not meet minimum specification requirements.¹

Subsequently, PHMSA apparently became concerned about the possibilities of inspection tools not being able to recognize any potential expansion. Therefore, in September 2009 (gas) and October 2009 (hazardous liquid), PHMSA made three mandatory minimum requirements for geometry/deformation tools to conform to the new Interim Guidelines.² Pipeline Operators must comply with the requirements for operations of Class 1 pipe above 72% specified minimum yield strength (SMYS) and for all other pipe in the alternative maximum allowable operating pressure (MAOP) special permit pipeline.

The requirements that a geometry inspection tool MUST have to comply with this ruling are as follows:

1. the inspection tool must have “multi-finger sensors;”
2. the multi-finger sensors must contact the internal diameter of the pipe; and
3. the sensors must have an accuracy of +/- 1% or less to identify expanded pipe and dents.

¹ United States Department of Transportation Pipeline and Hazardous Materials Safety Administration Advisory Bulletin PHMSA-2009-0148; Pipeline Safety: Potential Low and Variable Yield and Tensile Strength and Chemical Composition Properties in High Strength Line Pipe, Bulletin ADB-09-01, 74 FR 23930.

² See, Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength for Gas Pipelines and Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength for Hazardous Liquid Pipelines, October 6, 2009.

How these directives may affect the new construction market and the bidding process is that this ruling may have reduced vendor choices and may increase the cost of performing a geometry inspection. How this directly affects the tool to be utilized is mainly driven by the second requirement that the sensors must come in direct contact with the pipe wall. With the issuance of the Interim Guidelines, Precision Pigging began the development of a geometry/deformation tool that would meet and exceed all of these requirements.

An initial review of the current inspection tools on the market revealed that there appeared to be no inspection tool available that both conformed to these regulations and also covered all 360 degrees of the pipe. Precision Pigging's goal was to create a PHMSA-compliant geometry/deformation tool that had sensors that also touched all 360 degrees of the pipe wall. In designing a compliant geometry tool, one of the first concerns was the potential mechanical damage all metal sensors could create in internally coated pipe. Additional concerns were to avoid potential exaggerations of reductions in the pipe and minimize chatter.

With extensive research, engineering, and testing, Precision Pigging was able to resolve all three of these concerns and meet the goal of complete pipe wall coverage. Sensor accuracy has been increased to the point that Precision Pigging geometry / deformation tools are capable of detecting the spiral seam of the pipe. Precision Pigging tools also greatly exceed the +/-1% accuracy requirement. With Precision Pigging's new design, the probability of detection (POD) rises to 99.9% and probability of accuracy (POA) approaches 96%.

This brief review of the PHMSA Interim Guidelines for Confirming Pipe Strength in Pipe Susceptible to Low Yield Strength hopefully illuminates some of the key requirements to be aware of when choosing a geometry / deformation tool. When requesting a quote from a geometry tool vendor for pipelines which are governed by the Interim Guidelines, the following should be confirmed by the vendor:

1. The tool meets the requirement of the sensors directly contacting the pipeline's internal diameter (and that the sensors are not inside the rear cup);
2. The tool has a +/- 1% accuracy (most vendors are compliant);
3. Required head pressure for the inspection;
4. CFM required to push the tool during inspection; and
5. Minimum and maximum speed of the tool during the inspection process.

Awareness of these capabilities and qualities of the geometry / deformation tool to be employed in operations utilizing low yield strength-susceptible pipe will allow for attention to compliance with this narrow aspect of pipeline regulation.

BIO

Scott Coats, President and Owner

A Native American, Scott Coats began his career in the United States Marines. He has more than 15 years experience in the research, design, and utilization of geometry caliper / deformation tools. A visionary driven to succeed, Scott Coats founded Precision Pigging in Tulsa, Oklahoma in 1999 and has grown the business exponentially to be more than competitive with any of the geometry tool services available on the market. As President of Precision Pigging, Scott has focused his efforts on the research and development of new technology to provide ever-increasingly better equipment for his clientele.

Precision Pigging, LLC

Precision Pigging provides exceptional digital multi-channel high resolution geometry / deformation inspection services and is experiencing an exciting amount of growth. Now a serious alternative to the *status-quo* competition, Precision Pigging has and will be participating in some of the largest pipeline projects, including the Keystone Project, REX-West Project, Overland Pass Project, SESH Project, Tiger Project, Florida Gas Phase VIII Expansion Project, and Ruby Pipeline. Precision Pigging is proud of its commitment to technology advancements and will continue to provide its clients with the highest level of service in the geometry/deformation inspection field.