

Third Party Cased Pipe Risk Assessment Model

Description: A risk-based model in spreadsheet and commercial software form to aid users in defensible decision-making for prioritizing assessment, monitoring or other actions on cased pipe segments.

Status: Project complete. Spreadsheet model available to funders. Others can purchase commercial product from New Century Software that includes robust platform and Graphical User Interface.

BENEFITS

A spreadsheet model to estimate and prioritize risk associated with cased pipelines would allow operators the ability to better prioritize pipeline integrity management actions. This would create cost savings through prevention of unnecessary excavations and inspection, it would improve safety because actual risk would be better characterized (i.e., susceptible casings would be identified for action), and it would help operators comply with federal regulations, especially for those pipelines where external corrosion integrity assessments are performed by ECDA.

BACKGROUND

NYSEARCH retained DNV (formerly CC Technologies) and WKM Consultancy to develop a simple tool for making data-validated decisions on assessing or monitoring cased pipes (Figure 1) in High Consequence Areas (HCAs) and to allow a streamlined and formal approach for prioritizing casing inspection activities that can be integrated with other benchmarking and technology developments.

Gas operators with pipes in High Consequence Areas (HCAs) have been challenged to determine the best means to inspect pipelines in cased segments. As written in the Pipeline Integrity rules, all transmission line segments in HCAs are required to be assessed by in-line inspection, pressure testing, direct assessment or 'other technology' and cased pipes are no exception.

Many of the LDCs' cased pipeline segments are

unpiggable and are considered difficult or impossible to qualify as candidates for hydrostatic pressure testing due to ramifications of gas supply interruptions. In addition, Direct



Figure 1: Cased Pipe Exposed for Test

Assessment (DA) on cased pipe is challenging because of two obstacles: 1) providing a justification that a section of pipe within a casing is sufficiently similar to other sections so that it may be defined as being in the same 'region', and, 2) the requirement of applying DA only to continuous segments of pipe.

The third party cased pipe risk assessment model project was intended to be part of a multi-faceted approach to address cased pipe integrity. With use of a risk model, users can assemble the information into an acceptable and structured process that can be used as an alternative or aid to the overall solution.

TECHNICAL APPROACH

The third party cased pipe risk assessment model

is designed to provide a quantitative evaluation/prediction of risk for cased pipe segments (Figure 2).

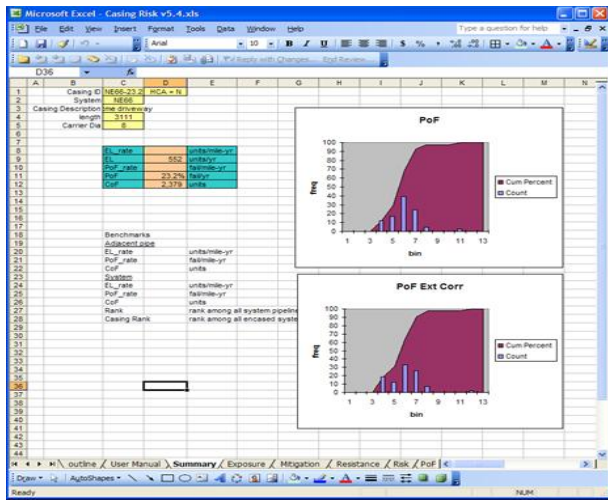


Figure 2: Example Output from Spreadsheet Model

The methodology behind the model is that the primary threat to cased pipe is corrosion, which can occur atmospherically in humid environments and in liquid water that might exist in the annular space. Thus, the model uses equations to calculate risk from three general concepts: 1) Exposure (corrosivity), 2) Effectiveness of Cathodic Protection (CP) and coatings (mitigation), and, 3) Pipe wall thickness and/or Specified Mean Yield Strength (SMYS) (resistance). Based on the calculated exposure and mitigation, the Probability of Damage (PoD) is calculated. From PoD, using the resistance, one can calculate the Probability of Failure (PoF). Finally, the model considers various measures and elements for Consequence of Failure. The total risk calculation is then the product of the PoF and the Consequence of that predicted or assumed failure.

In the project, three phases resulted in the following accomplishments: 1) defining the initial model and developing algorithms and simple means for calculating Probability of Failure, 2) Refining the model and adding algorithms for Consequence of Failure and calculation of Total Risk, 3) Collecting users' data and validating the model, 4) Working with individual users to address challenges and individual data gaps, and, 5) Assessing use of the model as a DA tool.

PROGRAM STATUS

The model has been developed, delivered to users, evaluated and commercialized. Two Final Reports and a User Manual are available to funders to explain how to use the model and to provide details on project activities and findings. Advice is also available in the final reports about how best to manage data collection for model, lack of data, default/conservative assumptions and how to translate data findings from one segment to uses for others in the model.

In the latest Phase III effort, completed in early 2011, the validation was able to demonstrate that the model could be used for practical applications. Also, case studies illustrated that significant changes can occur in risk estimates when new information becomes available.

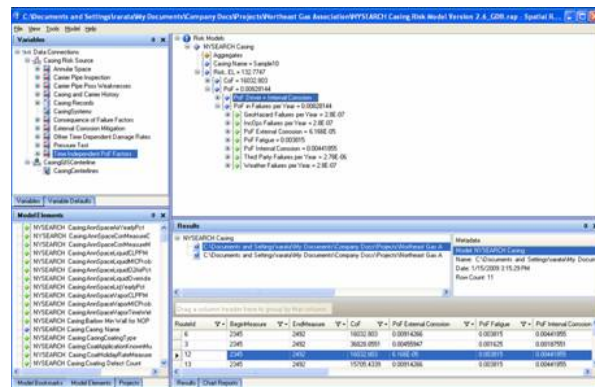


Figure 3: Sample Output from Commercial NCS version of “NYSEARCH Cased Pipe Integrity Assurance Model”

The contractor of the Phase III validation effort, WKM Consultancy, has offered additional workshops and sessions to help with additional training on the model. For the general public, New Century Software (www.newcenturysoftware.com) is providing commercial support and training for the commercial version known as “NYSEARCH Cased Pipe Integrity Assurance” model (Figure 3).

Highlights

- Model is available to funders in spreadsheet format with user manual
- Commercial software for model is available from New Century Software.

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