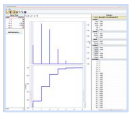
OTD Operations Technology Development

Guidelines for Data-Collection Requirements

Guidelines for natural gas distribution and transmission data-collection requirements were developed to assist the industry in determining the data that needs to be collected for regulatory compliance, integrity-management programs, and risk management.



Project Description

For regulatory compliance, natural gas distribution and transmission operators have prescriptive data-collection requirements such as leak surveys and cathodic-protection readings. They must also assess risk for integrity management programs, which can involve the use of sophisticated models that may require data and inputs that are not readily available.

As operators review their records in response to National Transportation Safety Board recommendations, many are identifying noteworthy gaps in the data needed to substantiate system design, maximum allowable operating pressure, and risk modeling and trending. One of the top priorities noted by industry experts is the need for industry standards and guidelines to assist operators in understanding the importance of various pieces of data in terms of risk-modeling accuracy and reliability. These guidelines could be used to develop data-collection strategies and prioritize records operations based on how important the data is to understand the risk.

The objective of this project was to develop industry guidelines for data-collection requirements that are important for risk assessment in natural gas transmission and distribution systems. The data-collection guidelines are based on an analysis of the factors that fundamentally influence risk and are important for integrity management and risk modeling. The analysis includes the data required during manufacturing, engineering and design, installation and construction, integrity management, and operations and maintenance.

The results of this project will be used to assist the industry in determining what data needs to be collected for regulatory compliance as well as internal integrity management and risk management.

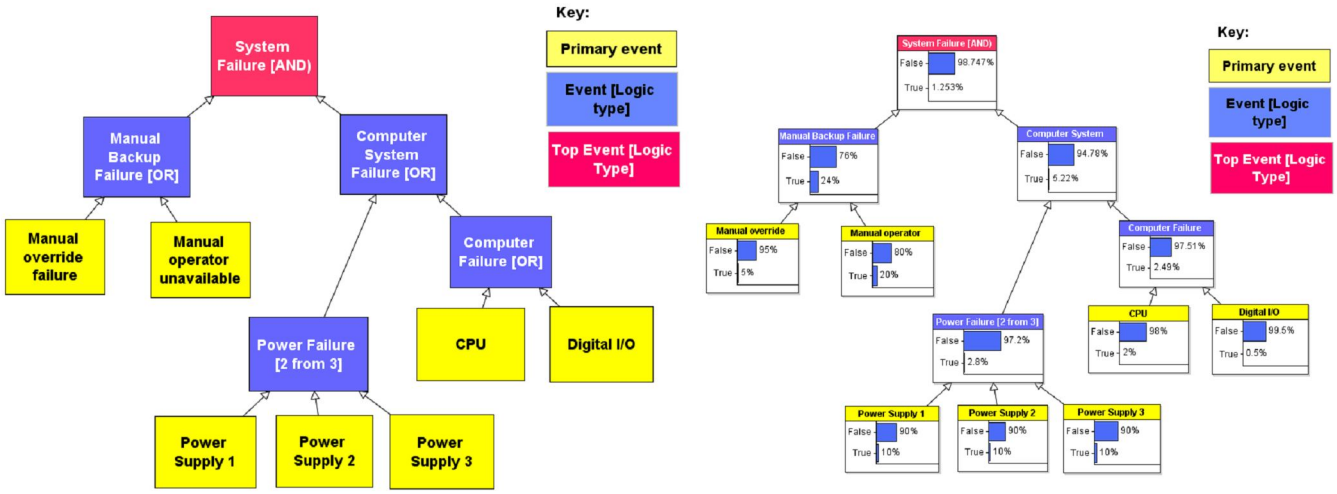
This project takes a holistic perspective of natural-gas assets and operations to determine the data-collection requirements. This project complements two other OTD projects, which are limited to specific operations: (5.11.m) *Intelligent Utility Installations* and (5.11.t) *Essential Data Capture for PE Fusion Operations.*

Deliverables

The deliverables from this project include data-collection guidelines and a data dictionary.

Benefits

Collecting data that allows operators to know and understand the performance and condition of their assets will reduce risk and improve system integrity.



Example of a fault tree analysis realized in a causal network.

This industry guidelines capture the best collective information of all participating utilities and avoids costly data-collection re-design.

Technical Concept & Approach

This project expands upon the two existing OTD projects related to defining data-collection requirements.

This specific effort identifies data requirements and updates the Gas Distribution Model (GDM) based on these new requirements. (GDM is a vendor-neutral data model that standardizes database design to reduce customization and facilitate interoperability.)

Researchers initiated this project with an analysis of the factors that fundamentally influence risk and are important for integrity management and risk modeling. The analysis begins at manufacturing and ends at asset decommissioning.

The analysis includes the data required to support the following risk categories:

- Third-party damage (contractor and excavator type, map and record accuracy)
- Corrosion (atmospheric vs. external [buried] vs. internal, coating, cathodic protection)
- Design (material response to stress, impact resistance)
- Incorrect operations (over-pressurization, contaminant introduction).

A data dictionary was developed to structure data-collection forms, defining the format, fields, drop-down menus, and relationships of the data.

Results

In 2012, the research team completed a gap analysis between the deliverables of this project and the *Intelligent Utility Installation Process Outline* developed under another project.

Researchers analyzed the threats presented in the natural gas distribution system to identify the contributing factors to system risk. Fault tree diagrams for steel pipe external corrosion and third-party damage were developed. The diagrams include the contributing factors that drive the system risk, together with the logic between the factors and the conditions at which the combination of the contributing factors could result in a system failure.

The guidelines for transmission systems were developed according to the requirements in ASME B31.8S. Additional data were considered necessary based on the risk-calculating algorithm that is used by the operators.

A sensitivity analysis using an existing risk algorithm for natural gas transmission system was conducted to show the importance of the data elements to the risk assessment and integrity-management process.

The guidance for collecting the necessary data to conduct risk assessment in natural gas distribution systems was also developed. The guidance addresses the probabilities of failure from the various threats and their consequences.

A methodical approach to collect and store data was presented that will assist in developing the appropriate probability distributions for datasets. Examples of how to apply these distributions in data analysis, determining the likelihood of unobserved events, and causal probabilistic risk models are discussed. Sensitivity analyses on these alternative risk models are presented.

It should be noted that the calculations in the analysis present a methodology for assessing the effect of the data, but not meant to represent the actual risk associated with any real pipeline system. The operators should use this guideline to collect the necessary data for assessing the risk in their system. Additional data may be required based on the risk algorithm they prefer to use.

Status

This project was completed in 2013. A Final Report that included the guidelines was issued in November 2013.

For more information:

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