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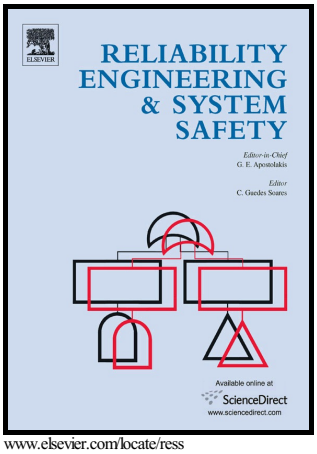

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Automated Matching of Pipeline Corrosion Features from In-line Inspection Data

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Abstract

The integrity assessment of corroded pipelines is often based on in-line inspection (ILI) results. Before determining the corrosion growth for the integrity assessment, the detected corrosion features from two or more ILIs need to be matched with respect to their location in the pipeline. The objective of this paper is to introduce a framework for automated feature matching. The input for the framework is the locations of all detected corrosion features and girth welds from each ILI. Using a multi-step approach, the size of several ILIs with a possibly large number of features is reduced to a set of independent smaller problems to match efficiently the corrosion features. The results include the matched features for the subsequent corrosion growth analysis and the identification of outliers that cannot be matched. The applied probabilistic matching assigns to each feature pair a probability of being a match to reflect the inherent uncertainty in the matching process. The proposed framework replaces manual matching, which can be time intensive and prone to errors, particularly for internal corrosion with high feature densities. It reliably matches features in pipelines and supports the integrity and risk assessment of pipeline systems.

Keywords: Pipeline, Corrosion, In-line Inspection, Feature matching, Integrity assessment

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1. Introduction

Pipelines are large infrastructure systems that efficiently transport hydrocarbon products over short and long distances from production to end users. Most pipelines consist of carbon steel, which makes corrosion one of the most common integrity threats of these systems. Corrosion is a time dependent process that gradually reduces the wall thickness of pipelines. It can lead to leak and rupture failures with significant consequences for society, the environment, and the economy.

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