Application of Artificial Intelligence on Corrosion Failure Analysis of Gathering Pipelines in Oil & Gas Field

Dezhi Tang, Tan Gu,

PetroChina Planning and Engineering Institute

Presenter's e-mail address: dztangcp@126.com

Abstract：Corrosion is the main factor that causes failures of gathering pipelines. Tens of corrosions exist in gathering pipelines. Idenfication of each corrosion failure is crucial important for corrosion control of gathering pipelines in oil & gas field. Corrosion failure analysis in oil & gas field is mainly relied on manual experience judgment, with low identification accuracy. In most cases, it only can be categoried into internal or external corrosion. Even thouth some corrosion failure pipes are sent to laboratories for analysis, the whole process is complex, inefficient and high cost.

In this work, the corrosion failure database of gathering pipelines in oil and gas field is established, with more than 25000 corrosion failure cases. Machine learning is adopted to establish an intelligent recognition model of corrosion failure based 831 typical corrosion failure cases, which is selected from corrosion failure database. The results show that image classification technology based on deep learning can be used for corrosion failure analysis of oil & gas pipelines. Unimodal model, such as vision transformer(ViT), can be used for classification of corrosion into internal or external corrosion, as well as corrosion with obvious characteristics, such as CO_2 corrosion, SRB corrosion, erosion corrosion, and dissolved oxygen corrosion. A multimodal model is required for indentification of external corrosion of internal corrosion with less obvious features.

Keywords: corrosion failure analysis, artificial intelligence, machine learning, corrosion failure database

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