# Evaluasi Penerapan Regresi Logistik pada Penentuan Probabilitas Kegagalan dalam Asesmen Risiko Cacat Korosi di Bawah Insulasi = Evaluation of Implementation Logistic Regression for Prediction Corrosion Under Insulation Failure Probability in the Risk Assessment

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Abstrak

Kegagalan korosi di bawah insulasi atau corrosion under insulation (CUI) masih terjadi di industri dan selain itu biaya untuk mengatasi CUI mencapai 40-60% total biaya perawatan. Di era revolusi industri 4.0, metode Machine Learning (ML) telah banyak diajukan dan diterapkan baik dalam prediksi maupun interpretasi data inspeksi untuk kasus CUI. Penerapan ML dapat bertujuan untuk memperbaiki ataupun meningkatkan akurasi prediksi CUI dari standar yang sudah ada.
Pada penelitian ini, API RP 581 digunakan sebagai baseline asesmen kuantitatif penentuan probabilitas kegagalan dari CUI. Prediksi laju korosi CUI berdasarkan API RP 581 dan data laju korosi aktual di lapangan menunjukkan adanya perbedaan, Perbedaan laju korosi ini dapat mengakibatkan perbedaan nilai prediksi probabilitas kegagalan, oleh karena itu ML diterapkan untuk memperbaiki prediksi probabilitas kegagalan dengan mempelajari data inspeksi lapangan. K-Nearest Neighbor (KNN) dan Logistic Regression (LR) adalah dua model pilihan utama.
Berdasarkan nilai akurasi dan R2, metode LR memiliki nilai tertingi sehingga dipilih untuk proses prediksi selanjutnya. Langkah selanjutnya adalah pemilihan variabel minimum untuk prediksi dimana secara nilai akurasi dan R2 diperlukan minimum 5 variabel untuk prediksi yaitu temperatur, tipe insulasi, tipe siklus temperatur, diameter, ketebalan aktual. Pengujian model terhadap data pengukuran terakhir menunjukkan nilai prediksi yang tepat terhadap nilai probabilitas kegagalan prediksi awal dengan nilai probabilitas diatas minimum 57%. Hasil menunjukkan bahwa LR dapat digunakan untuk melakukan prediksi kegagalan CUI berdasarkan data lapangan.
.....Failure due to Corrosion Under Insulation (CUI) is still recorded in the industry and CUI maintenance cost is expected up to 40-60% of overall maintenance cost. In the era of Industrial Revolution 4.0, Machine Learning (ML) has been proposed and implement for prediction and interpretation of inspection data for CUI cases. The purpose of ML implementation is to improve or refine accuracy CUI prediction based on available standard.
In this research, API RP 581 has been implemented as baseline of quantitative assessment for determination of CUI probability of failure. Based on observation, there were differences between CUI corrosion rate from API RP 581 and aktual CUI corrosion rate. These differences may result in value of predicted probability of failure; therefore implementation of ML is expected to enhance prediction based on aktual field data. KNearest Neighbor (KNN) and Logistic Regression (LR) are primary method selected for ML model development.
Based on accuracy value and R2, model developed by LR has higher values based on those criteria hence further model development is prepared using LR. In the next process, minimum variable selection for prediction shows that a minimum of 5 variable is required for prediction including temperatur, type of insulation, cyclic temperatur, pipe diameter, aktual pipe wall thickness. For the last step, testing of model

indicates similarity of initial and prediction values with minimum prediction probability above 57%. Thus, research shows that LR can be utilized to predict CUI based on aktual field data in lieu of API RP 581.