ANALISIS *PREDICTIVE MAINTENANCE* DENGAN *UNSUPERVISED LEARNING* DAN ANOVA PADA VIBRASI *SOLAR CENTAUR* 50 *GAS TURBINE* DI PT. XYZ

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ABSTRAK

Rotating machinery, seperti turbin gas, memainkan peran penting dalam berbagai industri, sehingga pemeliharaan prediktif menjadi krusial untuk mencegah *downtime* tak terduga. Penelitian ini bertujuan untuk menganalisis *predictive maintenance* dengan pendekatan *unsupervised learning* dan ANOVA pada *data* vibrasi mesin. *Data* vibrasi dianalisis menggunakan K-*Means Clustering* untuk mengelompokkan pola operasional mesin, sementara ANOVA digunakan untuk seleksi fitur guna memfilter variabel yang signifikan. Hasil analisis menunjukkan bahwa algoritma *Isolation Forest* berhasil membedakan kondisi operasional *normal* dan *anomaly* dengan tingkat akurasi 93,07%. Studi ini membuktikan bahwa pendekatan *unsupervised learning* dapat memberikan wawasan tentang kondisi mesin berdasarkan *cluster* vibrasi serta *anomaly detection*, membantu *model* algoritma *isolation forest* mengidentifikasi kondisi operasional turbin gas berdasarkan vibrasi, ANOVA memberikan pemahaman fitur apa saja berkontribusi pada temuan *anomaly* tersebut, menjadi metode reduksi *data* yang bagus untuk *model* prediksi XGBoost dan membantu untuk kebutuhan perawatan preventif maupun kondisional.

Kata Kunci: *Predictive Maintenance Unsupervised Learning*, Vibrasi

PREDICTIVE MAINTENANCE ANALYSIS WITH UNSUPERVISED LEARNING AND ANOVA ON THE VIBRATION OF THE SOLAR CENTAUR 50 GAS TURBINE AT PT. XYZ

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ABSTRACT

Rotating machinery, such as gas turbines, play an important role in various industries, so predictive maintenance is crucial to prevent unexpected downtime. This study aims to analyze predictive maintenance with unsupervised learning and ANOVA *approaches on engine vibration data. Vibration data is analyzed using K-Means Clustering to cluster machine operational patterns, while* ANOVA *is used for feature selection to filter out significant variables. The analysis results show that the Isolation Forest algorithm successfully distinguishes normal and anomaly operational conditions with an accuracy rate of 93.07%. This study proves that the unsupervised learning approach can provide insight into engine conditions based on vibration clusters as well as anomaly detection, help the isolation forest algorithm model identify gas turbine operational conditions based on vibrations,* ANOVA *provides an understanding of what features contribute to the anomaly findings, be a good data reduction method for the* XGBoost *prediction model and help for preventive and conditional-based maintenance needs.*

Keywords: *Predictive Maintenance*, *Unsupervised Learning*, *Vibration Rotating Machinery*