ABSTRACT

PREDICTION OF TOTAL SUSPENDED SOLID (TSS) CONTENT IN PALM PALM LIQUID WASTE USING MULTISENSOR METHODS AND ARTIFICIAL NERVE NETWORKS

BY

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This study aims to develop an Artificial Neural Network (ANN) model to predict the Total Suspended Solid (TSS) levels in palm oil mill effluent quickly and accurately. The data used in this study includes parameters such as temperature, turbidity, pH, electrical conductivity (EC), and dissolved oxygen (DO). The model was built using the backpropagation method with two hidden layers and 27 variations of activation functions. The results showed that the input combination of "temperature, pH, EC, DO, and TBT" with the "logsig-tansig-logsig" activation function provided the best performance, with a determination coefficient (R^2) value of 0.9092 and the lowest root mean square error (RMSE) of 2119.41. Model validation also showed that this combination performed the best in predictions, with an R^2 of 0.8503, RMSE of 2422.72, and relative root mean square error (RRMSE) of 45.63%. These results indicate that the ANN model can be used to predict TSS levels quickly and accurately, which is expected to optimize palm oil mill effluent management and prevent environmental pollution.

Keywords: Artificial Neural Network (ANN), Total Suspended Solid (TSS), palm oil mill effluent, backpropagation, TSS prediction.

ABSTRAK

PREDIKSI KADAR *TOTAL SUSPENDED SOLID* (TSS) PADA LIMBAH CAIR KELAPA SAWIT MENGGUNAKAN METODE MULTISENSOR DAN JARINGAN SARAF TIRUAN

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Penelitian ini bertujuan untuk mengembangkan model Jaringan Saraf Tiruan (JST) guna memprediksi kadar *Total Suspended Solid* (TSS) dalam limbah cair kelapa sawit secara cepat dan akurat. Data yang digunakan dalam penelitian ini meliputi parameter suhu, turbidity, pH, *electrical conductivity* (EC), dan *dissolved oxygen* (DO). Model ini dibangun menggunakan metode *backpropagation* dengan dua *hidden layer* dan 27 variasi fungsi aktivasi. Hasil penelitian menunjukkan bahwa kombinasi *input* "suhu, pH, EC, DO, dan TBT" dengan fungsi aktivasi "*logsig-tansig-logsig*" memberikan performa terbaik, dengan nilai koefisien determinasi (R^2) sebesar 0,9092 dan *root mean square error* (RMSE) terendah sebesar 2119,41. Validasi model juga menunjukkan bahwa kombinasi ini memiliki performa terbaik dalam prediksi, dengan R^2 sebesar 0,8503, RMSE sebesar 2422,72, dan *relative root mean square error* (RRMSE) sebesar 45,63%. Hasil ini menunjukkan bahwa model JST dapat digunakan untuk memprediksi TSS secara cepat dan akurat, yang diharapkan dapat mengoptimalkan pengelolaan limbah cair kelapa sawit dan mencegah pencemaran lingkungan.

Kata Kunci: Jaringan Saraf Tiruan (JST), *Total Suspended Solid* (TSS), limbah cair kelapa sawit, *backpropagation*, prediksi TSS.