Int. J. Electrochem. Sci., 16 **(2021)** Article ID: 210253

International Journal of ELECTROCHEMICAL SCIENCE
www.electrochemsci.org

Stray Current Prediction Model for Buried Gas Pipelines Based on Multiple Regression Models and Extreme Learning Machine

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doi: 10.20964/2021.02.21

Received: 3 October 2020 / *Accepted:* 25 October 2020 / *Published:* 31 December 2020

Serious stray current corrosion poses a threat to the sustainable and safe use of buried gas pipelines. To exactly predict the stray current of buried gas pipelines and take timely action to reduce stray current corrosion on buried pipelines, the multiple linear regression (MLR) model, multiple nonlinear regression (MNLR) model, extreme learning machine (ELM) model and extreme learning machine processed by principal component analysis (PCA-ELM) model are established in this work. The stray current data obtained on site are applied to establish the above four prediction models. The predicted results suggest that the neural network models perform better at prediction than the traditional multiple regression models, and the proposed PCA-ELM model yields the smallest prediction errors, leading to a higher prediction accuracy and better generalization performance than the other three prediction models. However, the activation function and the number of hidden layer nodes in the neural network models should be selected and tested carefully. With the local optimization method, the proposed PCA-ELM model prefers the sine activation function and 18 hidden layer nodes. In summary, the proposed PCA-ELM model can be used for stray current prediction of buried gas pipelines or in other prediction studies.

Keywords: Multiple regression model; Extreme learning machine; Principal component analysis; Stray current; Prediction

FULL TEXT