

## Prediction of chlor-alkali's caustic current efficiency by artificial neural network; case study: A zero-gap advanced chlor-alkali cell

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### ABSTRACT

The progress of the membrane chlor-alkali technology resulted in a meaningful reduction of energy consumption in chlor-alkali process. In this research at first step, a zero-gap oxygen-depolarized chlor-alkali cell with a state-of-the-art silver plated nickel screen electrode (ESNS<sup>®</sup>) was employed to consider the effects of various process parameters on caustic current efficiency. The anode side anolyte pH, temperature, flow rate brine concentration and the cathode side oxygen temperature, flow rate, and the applied current density are taken as the process parameters. At the second step the pre-scaled experimental data were used to train the artificial neural networks (ANNs). The ANNs approach is used to estimate the caustic current efficiency (CCE). In the training process the back-propagation learning algorithm and several training methods were used. The minimum error was found to be that of the Levenberg–Marquardt (LM) algorithm. Excellent prediction with minimum mean square error of  $1.1 \times 10^{-4}$  was made. The results showed the ANN's capability and performance for prediction of the caustic current efficiency.

*Keywords:* Chlor-alkali; Zero-gap advanced cell; Caustic current efficiency; Artificial neural networks

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