AI-Based Determination of Target pH for Carbon Dioxide Injection in Water Treatment Plant

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Abstract

Efficient control of carbon dioxide dosing is crucial for optimizing coagulation performance and maintaining the target pH in water treatment processes. This study presents the development of an artificial intelligence (AI) model to determine the optimal target pH for CO_2 injection at the 'G' Water Treatment Plant. The model aims to automate the current manual decision-making process, reducing chemical costs and improving operational stability.

Key operational criteria for CO_2 injection were analyzed, including raw water pH thresholds, seasonal variations, and the relationship between pH and coagulation efficiency. Historical plant data—such as turbidity, alkalinity, conductivity, temperature, and pH measurements from multiple process units—were collected and preprocessed. Input variables included parameters from intake, coagulation, and sedimentation stages, with the target pH as the dependent variable.

The AI model will identify the most influential factors affecting target pH and establish optimal dosing strategies under varying operational conditions. This research is expected to enhance automated pH control, reduce chemical usage, and support sustainable and cost-efficient water treatment operations.

This work demonstrates the potential of AI in optimizing chemical dosing strategies in water treatment, supporting both operational efficiency and regulatory compliance, while contributing to carbon neutrality goals by minimizing unnecessary CO_2 usage and promoting more sustainable treatment practices.

Key words: Water treatment, Carbon dioxide dosing, pH control, Coagulation optimization, Artificial intelligence

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