ABSTRACT

This research aims to design a groundwater filtration system based on the Internet of Things (IoT) to reduce iron (Fe) content and facilitate practical water quality monitoring. The system is built using a combination of natural filtration media, including a 5-micron sediment filter, zeolite combined with ferrolite, coconut fiber with activated carbon, and a ceramic filter. Water quality monitoring is conducted using pH, TDS, and NTU sensors integrated with an IoT platform for periodic data logging and analysis.

Samples were collected from two groundwater sources with different characteristics in terms of depth and surrounding environmental conditions. The test results showed that the filtration system successfully reduced Fe levels by an average of 17.87% based on laboratory tests, with the highest reduction reaching 25.56% in samples with the highest initial Fe concentration. Additionally, the sensor system was able to estimate Fe levels using a regression-based Fe Index model that incorporates log(TDS), NTU, and pH parameters, achieving an accuracy rate of 82.4% when compared to laboratory results. The estimated values showed a mean absolute error deviation of 0.07 mg/L, indicating that the prediction model is sufficiently accurate to be used as an early indicator of Fe concentration.

Overall, this study demonstrates that a multi-layer filtration system equipped with IoT-based monitoring can significantly reduce iron content in groundwater and provide a reasonably accurate estimation of Fe levels for routine water quality assessments without the need for frequent laboratory testing.

Keywords *: Multi-filtration system, Iron (Fe), pH sensor, TDS sensor, NTU sensor, Iron content estimation, Internet of Things (IoT).*