

ABSTRACT

Oil pollution in water bodies has become a serious issue, adversely affecting marine ecosystems and environmental balance. Mitigation efforts such as direct burning or the use of surfactants often cause harmful secondary effects. This research aims to design an Internet of Things (IoT)-based oil-water separation system that utilizes the principle of density difference and gravitational force as an environmentally friendly and efficient alternative solution.

The proposed system consists of two main subsystems. The first subsystem employs a TCS3200 color sensor to detect the presence of oil and an HC-SR04 ultrasonic sensor to measure water volume. An ESP32 microcontroller serves as the main control unit and also connects to an IoT platform for monitoring system performance via a Kodular-based application. The separation process is carried out using a separator, where oil and water are automatically separated based on their density differences. Oil, having a lower density than water, floats and is pumped out separately.

The oil-water separation was tested 30 times with a fixed initial water volume of 3.300 mL. Every 10 trials used different volumes of oil: 1.000 mL in the first test, 800 mL in the second, and 600 mL in the third. The average separation efficiency varied depending on the amount of oil used. In the first test, the separated water volume reached 97% efficiency with 1.000 mL of oil. In the second test, a 95% efficiency was recorded with 800 mL of oil, and in the third test, the system achieved 96% efficiency with 600 mL of oil.

Keywords: *Oil-water separation, TCS3200 color sensor, gravity, Internet of Things.*