ABSTRAK

Distribusi vaksin yang efektif sangat bergantung pada keberlangsungan sistem rantai dingin *(cold chain)* yang mampu mempertahankan suhu vaksin dalam rentang 2-8℃. Studi ini bertujuan merancang dan mengimplementasikan *Smart Vaccine Carrier* berbasis teknologi *Internet of Things (*IoT*)* yang secraa otomatis memantau dan mengatur suhu penyimpanan vaksin selama distribusi. Sistem bekerja dengan mengukur suhu *internal* menggunakan sensor DS18B20 secara *real-time*, kemudian mengendalikan sistem pendingin agar suhu tetap berada dalam batas yang telah ditentukan. Apabila suhu melebihi batas aman, alarm *buzzer* akan memberikan peringatan dini. Data suhu dikirim secara berkala melalui koneksi Wi-Fi ke aplikasi *smartphone* untuk pemantauan jarak jauh, sedangkan LCD OLED menyediakan tampilan suhu secara lokal. Secara mekanis, perangkat dilengkapi dengan slot botol dan lapisan busa pelindung untuk menjaga kestabilan dan meredam guncangan selama distribusi. Komponen utama yang digunakan dalam sistem meliputi sensor suhu DS18B20, modul Peltier, *buzzer*, mikrokontroler ESP8266, serta LCD OLED.

Kata Kunci: *Smart Vaccine Carrier*, IoT, DS18B20, modul Peltier, ESP8266, rantai dingin

ABSTRACT

*The effectiveness of vaccine distribution relies heavily on the integrity of the cold ch*AI*n system, which ensures that vaccines are maintained within a temperature range of 2–8℃. This study aims to design and implement a Smart Vaccine Carrier based on Internet of Things (*IoT*) technology that automatically monitors and regulates vaccine storage temperature during distribution. The system measures internal temperature in real-time using a DS18B20 sensor and controls a Peltier module-based cooling system to maintain the temperature within set limits. An alarm buzzer activates when temperatures exceed safe thresholds. Temperature data is transmitted periodically via Wi-Fi through an ESP8266 microcontroller to a smartphone application for remote monitoring, while an LCD OLED display shows local temperature readings. The carrier is also mechanically designed with bottle slots and protective foam to ensure stability and reduce shock during transport. This innovation aims to improve vaccine safety and reliability, especially in regions with limited infrastructure.*

Keywords: Smart Vaccine Carrier, IoT*, DS18B20, Peltier module, ESP8266, cold chain*