

RANCANG BANGUN SISTEM *LOCKOUT – TAGOUT – TRYOUT* (LOTOTO) BERBASIS *INTERNET OF THINGS* (IoT) DI PT. INDAH KIAT *PULP AND PAPER* PERAWANG

Nama Mahasiswa : M.Zaidi
Nim : 3204221505
Dosen pembimbing : Agustiawan, S.ST., M.T.

ABSTRAK

Sistem *Lockout–Tagout–Tryout* LOTOTO berbasis *internet of things* (IoT) dirancang dan dikembangkan untuk meningkatkan keselamatan kerja pada proses *maintenance* panel *Motor Control Center* (MCC) di PT. Indah Kiat *Pulp and Paper* Perawang. Tujuan penelitian ini adalah merancang sistem yang mengintegrasikan *Station Box*, *Smart Padlock*, *Face Recognition*, *Sistem Monitoring* IoT berbasis *Web Server*, dan *WhatsApp Bot* untuk mendukung proses identifikasi operator, penguncian panel, *monitoring*, serta dokumentasi aktivitas LOTOTO secara *digital*. *Face Recognition* digunakan sebagai metode autentikasi operator sebelum mengambil maupun mengembalikan *Smart Padlock* pada *Station Box*. Selanjutnya, *Smart Padlock* dipasang pada perangkat *lockout* untuk mengamankan *breaker* selama proses *maintenance* berlangsung. Sistem juga dilengkapi dengan fitur *monitoring* status *Smart Padlock*, status *breaker*, indikator *Zero Energy*, notifikasi *WhatsApp Bot*, serta penyimpanan data pada *Equipment Isolation Form*. Hasil pengujian menunjukkan bahwa sistem mampu membuka *Smart Padlock* dengan waktu *respons* sekitar 2 s, memperoleh tingkat akurasi *Face Recognition* sebesar 60 %, mendeteksi kondisi *Zero Energy* dengan tingkat keberhasilan 100%, serta mengirimkan informasi melalui *WhatsApp Bot* dengan tingkat keberhasilan 80 %. Selain itu, pengujian pada panel *Crusher* menunjukkan bahwa daya panel sebesar 29,184 kW pada kondisi *breaker ON* berubah menjadi 0 W setelah *breaker OFF*, sehingga kondisi *Zero Energy* berhasil diverifikasi. Hasil tersebut menunjukkan bahwa sistem yang dirancang mampu mendukung pelaksanaan prosedur LOTOTO secara lebih aman, efektif, dan terdokumentasi.

Kata kunci: *Lockout Tagout Tryout, Internet Of Things, Monitoring, Keselamatan Kerja, Proses Gambar.*

DESIGN OF AN INTERNET OF THINGS (IOT)-BASED LOCKOUT–TAGOUT–TRYOUT (LOTOTO) SYSTEM AT PT. INDAH KIAT PULP AND PAPER PERAWANG

Student Name : M.Zaidi
Student Number : 3204221505
Supervisor : Agustiawan, S.ST., M.T.

ABSTRACT

The Internet of Things (IoT)-based Lockout–Tagout–Tryout LOTOTO system was designed and developed to improve occupational safety during the maintenance process of Motor Control Center (MCC) panels at PT. Indah Kiat Pulp and Paper Perawang. This research aims to develop a system that integrates a Station Box, Smart Padlock, Face Recognition, an IoT Monitoring System based on a Web Server, and a WhatsApp Bot to support operator identification, panel locking, monitoring, and digital documentation of LOTOTO activities. Face Recognition is used as an operator authentication method before retrieving and returning the Smart Padlock from the Station Box. The Smart Padlock is then installed on the lockout device to secure the breaker during the maintenance process. The system is also equipped with features for monitoring the Smart Padlock status, breaker status, Zero Energy indication, WhatsApp Bot notifications, and data storage in the Equipment Isolation Form. The test results showed that the system was able to unlock the Smart Padlock with a response time of approximately 2 seconds, achieved a Face Recognition accuracy of 60%, detected the Zero Energy condition with a success rate of 100%, and successfully transmitted monitoring information through the WhatsApp Bot with a success rate of 80%. Furthermore, testing on the Crusher panel indicated that the panel power decreased from 29.184 kW when the breaker was ON to 0 W after the breaker was switched OFF, confirming that the Zero Energy condition had been successfully verified. These results indicate that the proposed system is capable of supporting the LOTOTO procedure in a safer, more effective, and well-documented manner.

Keywords: *Lockout Tagout Tryout, Internet of Things, monitoring, work safety, image processing.*