

**Analisis Keandalan Sistem Otomasi Pallet Dispenser Berbasis
PLC Siemens S7 Dengan Metode FMEA Dan Modifikasi Ladder
Diagram Untuk Otomasi Conveyor Di Area Carton Box
PT Indah Kiat Pulp & Paper Tbk.**

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ABSTRAK

Sistem *Automation Pallet Dispenser* pada Area Carton Box PT Indah Kiat Pulp & Paper Tbk. merupakan sistem otomasi yang digunakan untuk mendukung proses distribusi dan pemindahan *Pallet* dalam kegiatan produksi. Keandalan sistem sangat dipengaruhi oleh kondisi komponen kontrol, sensor, aktuator, dan sistem penggerak *Conveyor*. Gangguan pada komponen tersebut dapat menyebabkan proses perpindahan *Pallet* terganggu dan meningkatkan potensi downtime. Penelitian ini bertujuan untuk menganalisis potensi kegagalan pada sistem *Automation Pallet Dispenser* menggunakan metode *Failure Mode and Effects Analysis* (FMEA), serta memberikan usulan perbaikan dan pengembangan sistem kendali melalui penambahan *Ladder* diagram pada PLC Siemens S7. Analisis FMEA dilakukan dengan mengidentifikasi *Failure Mode*, penyebab kegagalan, dampak kegagalan, serta memberikan penilaian *Severity*, *Occurrence*, dan *Detection* untuk memperoleh nilai Risk Priority Number (RPN). Hasil analisis menunjukkan bahwa *Photoelectric sensor* memiliki nilai RPN tertinggi sebesar 27, sehingga menjadi prioritas utama dalam tindakan perbaikan. Gangguan pada sensor disebabkan oleh posisi *Pallet* yang tidak sesuai sehingga berpotensi menabrak sensor dan mengganggu proses deteksi *Pallet*. Rekomendasi perbaikan yang diberikan berupa pemasangan sensor guard, penyesuaian posisi sensor, serta penyetelan jalur *Conveyor*.

Selain itu, dilakukan perancangan usulan *Ladder* diagram untuk mengotomatisasi *Conveyor* 1 yang sebelumnya masih dioperasikan secara manual dengan menerapkan sistem interlock terhadap *Conveyor* 2 dan *Conveyor* 3. Usulan tersebut diharapkan dapat mengurangi ketergantungan terhadap operator, mencegah penumpukan *Pallet*, dan meningkatkan keandalan serta efisiensi sistem *Automation Pallet Dispenser*.

Kata kunci: *Automation Pallet Dispenser, FMEA, RPN, PLC Siemens S7, Photoelectric sensor, Ladder Diagram, Interlock.*

***Reliability Analysis of a Siemens S7 PLC-Based Pallet Dispenser
Automation System Using the FMEA Method and Ladder Diagram
Modification for Conveyor Automation in the Carton Box Area
PT Indah Kiat Pulp & Paper Tbk.***

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ABSTARCT

The Automation Pallet Dispenser system in the Carton Box Area of PT Indah Kiat Pulp & Paper Tbk. is an Automation system used to support the distribution and transfer of Pallets during the production process. System reliability is highly influenced by the condition of control components, sensors, actuators, and Conveyor drive systems. Failures in these components can disrupt the Pallet transfer process and increase the potential for downtime. This study aims to analyze potential failures in the Automation Pallet Dispenser system using the Failure Mode and Effects Analysis (FMEA) method, as well as to provide improvement recommendations and control system development through the addition of a Ladder diagram to the Siemens S7 PLC. FMEA analysis was conducted by identifying Failure Modes, Failure causes, Failure effects, and assessing Severity, Occurrence, and Detection to determine the Risk Priority Number (RPN). The analysis results show that the Photoelectric sensor has the highest RPN value of 27, making it the main priority for improvement. Sensor failures are caused by improper Pallet positioning, which may result in the Pallet colliding with the sensor and disrupting Pallet Detection. The recommended improvements include installing a sensor guard, adjusting the sensor position, and aligning the Conveyor path.

In addition, a proposed Ladder diagram was designed to automate Conveyor 1, which was previously operated manually, by implementing an interlock system with Conveyor 2 and Conveyor 3. This proposed modification is expected to reduce operator dependency, prevent Pallet accumulation, and improve the reliability and efficiency of the Automation Pallet Dispenser system.

Keywords: *Automation Pallet Dispenser, FMEA, RPN, Siemens S7 PLC, Photoelectric sensor, Ladder Diagram, Interlock.*