RINGKASAN

RETROFIT SISTEM KONTROL DAN PENGEMBANGAN SISTEM *MONITORING* SERTA DATA *LOGGING* BERBASIS PLC–HMI UNTUK MENINGKATKAN KEANDALAN PEMANTAUAN OPERASIONAL PADA MESIN EPS *SHAPE MOLDING* (*POLYFOAM)*

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Mesin EPS *Shape Molding Polyfoam* merupakan salah satu mesin utama dalam proses produksi *molding polyfoam*, namun pada beberapa lini produksi masih menggunakan sistem kontrol elektromechanical konvensional yang membatasi keandalan pemantauan operasional. Ketiadaan sistem *monitoring* digital dan fitur pencatatan downtime menyebabkan operator sulit mengetahui kondisi mesin secara real-time maupun menganalisis histori kejadian ketika mesin berhenti atau mengalami gangguan. Kondisi ini berdampak pada meningkatnya risiko troubleshooting yang lambat dan minimnya dokumentasi penyebab kegagalan. Penelitian ini bertujuan melakukan *retrofit* sistem kontrol serta mengembangkan sistem *monitoring* dan data logging berbasis PLC–HMI untuk meningkatkan transparansi dan keandalan pemantauan operasional mesin.

Metode penelitian meliputi perancangan ulang *wiring* sistem kontrol, konfigurasi dan pemrograman PLC Omron NX1P2, serta pengembangan antarmuka HMI Weintek MT8102iP yang memuat fitur *monitoring* status mesin, tampilan operasi manual dan otomatis, serta pencatatan event downtime. Pengembangan data logging mencakup perancangan struktur event, klasifikasi penyebab downtime, pencatatan timestamp, durasi berhenti, serta integrasi mekanisme input operator. Implementasi dilakukan pada beberapa mesin EPS dengan penyesuaian sinyal input–output, pembaruan logika proses, dan validasi visual melalui HMI.

Hasil implementasi menunjukkan bahwa sistem kontrol digital mampu meningkatkan keandalan pemantauan operasional melalui penyajian data kondisi mesin secara real-time, pencatatan downtime yang terstruktur, serta kemudahan analisis histori gangguan. Sistem *monitoring* dan event logging yang dikembangkan menyediakan informasi yang sebelumnya tidak tersedia pada sistem lama, sehingga mempermudah proses troubleshooting, perawatan berkala, dan pengambilan keputusan operasional. Dengan demikian, *retrofit* sistem kontrol dan pengembangan sistem *monitoring*–data logging berhasil meningkatkan transparansi dan keandalan pemantauan pada mesin EPS *Shape molding* Polyfoam.

Kata kunci: data *logging*, *monitoring*, PLC–HMI, *retrofit* sistem kontrol, EPS *Shape molding*

SUMMARY

RETROFIT OF CONTROL SYSTEM AND DEVELOPMENT OF PLC–HMI-BASED MONITORING AND DATA LOGGING SYSTEM TO ENHANCE OPERATIONAL MONITORING RELIABILITY ON EPS SHAPE MOLDING POLYFOAM MACHINE

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The EPS Shape Molding Polyfoam machine is one of the primary units in polyfoam molding production. However, several production lines still rely on conventional electromechanical control systems that limit the reliability of operational monitoring. The absence of digital monitoring and downtime recording features makes it difficult for operators to observe machine conditions in real-time or analyze historical events when downtime or disturbances occur. This condition increases the risk of slow troubleshooting and insufficient documentation of failure causes. This research aims to retrofit the control system and develop a PLC–HMI-based monitoring and data logging system to improve transparency and operational monitoring reliability of the machine.

The research methodology includes redesigning the control wiring, configuring and programming the Omron NX1P2 PLC, and developing the Weintek MT8102iP HMI interface equipped with machine status monitoring, manual and automatic operation modes, and downtime event recording features. The data logging development involves event structure design, downtime cause classification, timestamp and duration recording, and integration of operator input mechanisms. Implementation was carried out on multiple EPS machines through input–output signal adjustment, process logic updates, and visual validation via the HMI.

The implementation results show that the digital control system significantly enhances the reliability of operational monitoring by providing real-time machine condition information, structured downtime recording, and simplified historical disturbance analysis. The developed monitoring and event logging system provides insights that were previously unavailable in the legacy system, supporting faster troubleshooting, more effective preventive maintenance, and better operational decision-making. Therefore, the control system retrofit and the development of the monitoring–data logging system successfully increase transparency and reliability in monitoring the EPS Shape Molding Polyfoam machine.

Keywords: *data logging, monitoring, PLC–HMI, control system retrofit, EPS Shape Molding*