

ABSTRAK

Tugas Akhir ini bertujuan merancang dan membangun mesin capping otomatis berbasis *Programmable Logic Controller (PLC) FX1N-20MT* dan sistem pneumatik untuk meningkatkan efisiensi proses perakitan kemasan di PT Surya Graha Sinar Cemerlang. Penelitian dilatarbelakangi oleh proses penutupan kemasan yang masih manual, sehingga kapasitas produksi rendah dan kualitas kurang konsisten. Metode yang digunakan adalah pendekatan prototype melalui studi literatur, observasi lapangan, perancangan mekanik dan elektrik, pembuatan program *PLC* dengan aplikasi *MELSOFT GX Works2*, serta pengujian performa alat. Sistem mengintegrasikan *conveyor*, roda putar, silinder pneumatik, dan sensor *photoelectric* untuk memposisikan produk secara presisi dan menutup kemasan otomatis. Hasil pengujian menunjukkan mesin mampu memproses hingga 100 unit per siklus tanpa cacat, dengan deteksi dan counter display yang akurat. Penerapan teknologi ini meningkatkan produktivitas, mengurangi ketergantungan pada tenaga kerja manual, menjaga konsistensi kualitas, serta memberikan fleksibilitas tinggi karena parameter kerja dapat diatur dan program *PLC* dapat diubah tanpa pengkabelan ulang.

Kata kunci: *capping machine*, *PLC FX1N-20MT*, sistem pneumatik, otomasi industri, *prototype*.

ABSTRACT

This final project aims to design and develop an automatic capping machine based on the FX1N-20MT Programmable Logic Controller (PLC) and a pneumatic system to improve the efficiency of packaging assembly at PT Surya Graha Sinar Cemerlang. The research is motivated by the fact that the capping process is still performed manually, resulting in low production capacity and inconsistent quality. The method applied is a prototype approach, which includes literature study, field observation, mechanical and electrical design, PLC programming using MELSOFT GX Works2, and performance testing. The system integrates a conveyor, rotary wheel, pneumatic cylinder, and photoelectric sensor to position products precisely and automatically seal the packaging. Test results show that the machine is capable of processing up to 100 units per cycle without defects, with accurate detection and counter display. The implementation of this technology improves productivity, reduces reliance on manual labor, maintains consistent quality, and provides high flexibility since operating parameters can be adjusted and the PLC program can be modified without rewiring.

Keywords: *capping machine, PLC FX1N-20MT, pneumatic system, industrial automation, prototype.*