Perancangan *Liquid Process Trainer* dengan Konfigurasi

***Multi-Tank* Berbasis PLC CPM2A**

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ABSTRAK

Penelitian ini bertujuan merancang model mekanik 3D *Liquid Process Trainer* konfigurasi *multi-tank* menggunakan Autodesk Inventor 2024, merealisasikan prototipe fisik, serta menguji kesesuaian dimensinya melalui metode *Research and Development* (R&D) model ADDIE. Sistem simulator laboratorium ini menggunakan dua *feeding tank* 1,5 liter, satu *process tank stainless steel* 3 liter dengan *heater* 350 Watt, dan satu *product tank* 3 liter yang dialiri melalui pipa PVC $\frac{1}{2}$ dim dengan kendali *solenoid valve* NC. Seluruh komponen ditopang oleh kerangka modular bertingkat ($500 \times 500 \times 650$ mm) berbahan aluminium *hollow* 3×3 cm tebal 3 mm berlapis panel ACP, serta dikendalikan oleh PLC Omron CPM2A berbasis sensor *mini float switch.*

Pengujian kebocoran dilakukan secara bertahap untuk memastikan keandalan sirkulasi fluida. Rembesan awal yang ditemukan pada sambungan *double nipple* dan *solenoid valve* akibat kelonggaran ulir berhasil diatasi secara optimal menggunakan lapisan *seal tape* pipa yang tebal. Hasil evaluasi akhir menunjukkan capaian nol kebocoran (kedap air total), kesesuaian tata letak fisik terhadap desain CAD, serta struktur mekanik yang valid dan siap diintegrasikan penuh dengan sistem kontrol otomatisasi.

Design of a Multi-Tank Liquid Process Teaching

Aid Based on the CPM2A PLC

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ABSTRACT

This study aims to design a 3D mechanical model of a Multi-Tank Liquid Process Trainer using Autodesk Inventor 2024, realize the physical prototype, and evaluate its dimensional conformance using the Research and Development (R&D) method with the ADDIE model. This laboratory-scale simulator utilizes two 1.5-liter feeding tanks, a 3-liter stainless steel process tank with a 350-Watt heater, and a 3-liter product tank connected via $\frac{1}{2}$-inch PVC pipes and controlled by NC solenoid valves. All components are supported by a multi-tier modular frame ($500 \times 500 \times 650$ mm) made of 3×3 cm aluminium hollow profiles with a 3 mm thickness covered with ACP panels, and integrated with an Omron CPM2A PLC based on mini float switch sensors.

Leakage testing was conducted progressively to ensure fluid circulation reliability. An initial fluid seepage detected at the connection between the double nipple and the solenoid valve due to loose threads was successfully resolved by applying thicker thread seal tape. The final evaluation yielded zero leakage (completely watertight), a precise alignment between the physical layout and the CAD model, and a structurally valid framework ready for full integration with the automated control system.