

Multi Pump Fluid Transport Process Piping Unit Operations Training Pilot Plant

Item Number: LPK-SMTLT



Introduction

Industrial-scale multi-pump pilot plant for unit operations training in fluid transport and process piping, featuring real-material and semi-physical simulation modes, comprehensive pump and flowmeter calibration, and safety-enhanced two-tier platform, bridging academic theory and industrial practice for chemical engineering education.

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Parameter	Specification Details
Overall Dimensions	3930 × 2560 × 3900 mm (Length × Width × Height) <i>[Subject to customization based on site space]</i>
Structural Frame	Two-tier industrial steel platform, powder-coated finish, square tube structural columns, 3mm anti-slip checkered steel floor plates
Safety Features	1.2m yellow carbon steel safety guardrails, safety inclined ladder with secure interlocking joints
Pump Technologies	Centrifugal pump, Vortex pump, Gear pump, Vacuum pump, Metering pump, Air compressor
Flow Instrumentation	Glass rotameter, Metal tube rotameter, Orifice plate flowmeter, Turbine flowmeter
Process Control Systems	Manual and automated PID regulation of storage tank liquid levels; digital flow and pressure loop control
Operation Modes	Physical fluid circulation (Real-Material) & Mathematical-model-driven dry run (Semi-Physical Simulation)

Laboratory Experimental Module	Theoretical Concepts Covered	Relevant Textbook Topics
Pump Characteristics & Operations	Pump head, power consumption, mechanical efficiency, NPSH, cavitation, air binding, series and parallel pump configurations	<i>Unit Operations of Chemical Engineering</i> - Fluid Mechanics: Transportation of Fluids <i>Transport Processes and Separation Process Principles</i> - Momentum Transfer: Pumps and Gas-Compressor Devices
Piping System Hydraulic Performance	Frictional pressure drop in straight pipes, local resistance losses in valves (gate, globe, ball) and fittings (elbows, reducers), friction factor estimation	<i>Unit Operations of Chemical Engineering</i> - Fluid Mechanics: Flow of Incompressible Fluids in Conduits and Thin Layers <i>Transport Processes and Separation Process Principles</i> - Momentum Transfer: Friction Losses in Conduits and Fittings
Flow Metering and Calibration	Differential pressure flow measurement, discharge coefficients, rotameter principles, turbine sensor calibration	<i>Unit Operations of Chemical Engineering</i> - Fluid Mechanics: Measurement of Fluids <i>Transport Processes and Separation Process Principles</i> - Momentum Transfer: Flow Measurement

Laboratory Experimental Module	Theoretical Concepts Covered	Relevant Textbook Topics
Storage Tank Level & Process Control	Closed-loop feedback control, PID controller tuning, manual vs. automatic control, valve characteristics, instrument calibration	<i>Chemical Engineering Design</i> - Instrumentation and Control / Process Safety <i>Unit Operations of Chemical Engineering</i> - Process Control Systems
System Operations & Safety Simulation	Process flow diagram (PFD) reading, standard operating procedures (SOPs), plant startup/shutdown, risk mitigation, digital twin simulation	<i>Chemical Engineering Design</i> - Plant Layout and General Process Design Safety