Methane Cracking Educational Unit Operations Pilot Plant

Item Number: LPK-CJWL

Introduction

This bench-scale methane cracking educational pilot plant provides hands-on catalytic conversion training with a 1000°C furnace, seven mass flow controllers, and real-time automation for safe, curriculum-aligned experiments. Designed for university teaching of unit operations and reaction engineering.

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Module / System Component	Technical Specifications	Curriculum & Textbook Alignment
Fixed-Bed Reactor System	Material: 316L Stainless Steel; Max Pressure: 2 MPa; Quick-disassembly coupling design.	**Chemical Reaction Engineering** • Heterogeneous Catalysis and Kinetics • Fixed-Bed Reactor Design and Pressure Drop
Thermal Management System	Three-stage programmable heating; Range: 0–1000°C; Accuracy: ±1°C.	**Transport Processes and Unit Operations** / **Unit Operations of Chemical Engineering** • Conductive and Convective Heat Transfer • Non-isothermal Reactor Operation
Gas Delivery & Flow Control	7 Mass Flow Controllers (MFC); Flow range: 0–500 mL/min; Integrated gas mixing manifold.	**Transport Processes and Unit Operations** • Fluid Flow and Gas Dynamics • Mass Transfer in Gas Mixtures
Process Control & Data Acquisition	15-inch industrial touchscreen; real-time data logging, cloud-based monitoring, and export.	**Chemical Engineering Design** / **Process Dynamics and Control** • Instrumentation and Control Loop Design • Automated Data Acquisition
System Safety & Auxiliaries	Integrated over-temp/over-pressure alarms; dual gas-leak detection options; heavy-duty caster frame.	**Chemical Engineering Design** • Process Safety Management (HAZOP concepts) • Pilot Plant Layout and Piping