



LABPARK

Educational Applied Chemistry Pilot Plants Catalog

Contact us for more catalogs of Practical Training Unit Operations Pilot Plants, Educational Unit Operations Pilot Plants, etc.

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COMPANY PROFILE

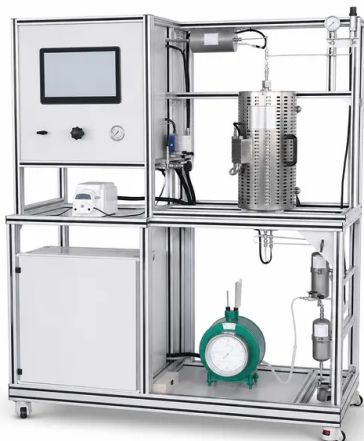
>>> About Us

Labpark is a high-tech enterprise serving universities, research institutes, and enterprises in fields such as chemical engineering, biotechnology, and environmental science. Our main product lines are Educational Unit Operations Pilot Plants and Practical Training Unit Operations Pilot Plants, designed to support practical engineering education. Supported by our own R&D platforms and 209 technical patents, we operate a production facility with a planned area of 49,000 square meters, dedicated to helping institutions enhance laboratory infrastructure and practical training capabilities.



Educational Unit Operations Pilot Plant For Intraparticle Diffusion Effective Factor Measurement

Item Number: LPK-SRID



Introduction

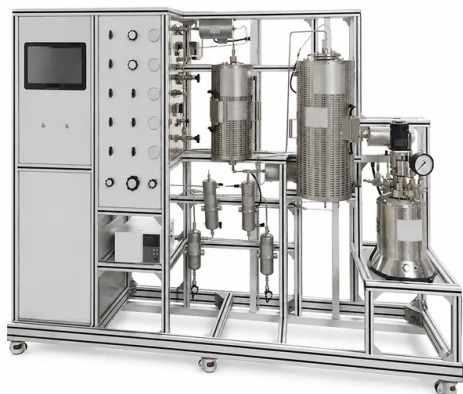
Designed for chemical engineering university labs, this pilot plant allows hands-on determination of catalyst particle intraparticle diffusion effective factors and gas-solid reaction kinetics using a fixed-bed tubular reactor with industrial touchscreen control, bridging theory and practical reactor design.

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Parameter / Module	Details
Reactor Configuration	Fixed-bed tubular reactor optimized for gas-solid catalytic reactions
Heating & Thermal Control	Open-type furnace with programmable temperature controller for rapid reactor access
Control System	Industrial-grade all-in-one computer with touchscreen interface and data logging
Safety Interlocks	Built-in high-limit temperature shutdown and over-pressure relief system
Frame Material & Mobility	High-strength anodized aluminum alloy frame equipped with lockable casters
Physical Dimensions	≤ 1480 mm × 580 mm × 1780 mm (L × W × H)
Experimental Capabilities	Determination of the internal diffusion effective factor (η); Measurement of gas-solid intrinsic reaction kinetics; Performance of catalyst activation, evaluation, and regeneration cycles

Multi-Reactor Educational Pilot Plant For Reaction Engineering Unit Operations

Item Number: LPK-DGNFY



Introduction

Integrated bench-scale educational pilot plant for chemical engineering teaching featuring fixed bed fluidized bed and stirred tank reactors with web-based digital twin controls and safety interlocks for hands-on unit operations and reaction engineering comparative studies in one compact system.

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System Component / Module	Technical Specifications & Capabilities	Educational & Experimental Objectives
Fixed Bed Reactor (FBR)	- Tubular design with customizable dimensions - Programmable electric heating jacket - Internal axial thermowell	- Determination of catalyst activity and selectivity - Evaluation of temperature profiles in packed beds - Calculation of space-time and space velocity
Fluidized Bed Reactor (FLBR)	- Vertical column with gas distributor plate - Visible fluidization zone - Independent preheating	- Observation of fluidization regimes and bed expansion - Determination of minimum fluidization velocity (u_{mf}) - Heat and mass transfer in gas-solid fluidization
Stirred Tank Reactor (STR)	- Autoclave design with variable speed agitator - Pressure gauge and liquid/gas sampling ports - Electric heating and cooling coil	- Study of residence time distribution (RTD) - Kinetics of liquid-phase and multiphase reactions - Heat transfer coefficients in agitated vessels
Feed & Preheating System	- Multi-channel gas mass flow controllers - Dual-stage vapor/gas preheaters - Corrosion-resistant 3-way routing valves	- Gas mixing thermodynamics - Vaporization and preheating calculations - Piping and instrumentation diagram (P&ID) familiarity
Control & Software Suite	- Centralized touchscreen PLC/HMI panel - WebGL-enabled remote-access interface - Automated instructor assessment tool	- Real-time data logging and trend analysis - Process automation and PID tuning concepts - Digital-twin pre-lab preparation and testing

Water Electrolysis Hydrogen Production And Storage Educational Pilot Plant

Item Number: LPK-DJSZQ



Introduction

Integrated pilot-scale training system for higher education engineering labs. Features AWE/PEM electrolysis, adjustable DC power, PLC controls, gas-liquid separation, and pressurized hydrogen storage. Hands-on learning in green hydrogen, process control, and safety, ideal for chemical and energy departments.

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System Component / Parameter	Specification / Feature	Associated Educational Experiment / Activity
Electrode Configurations	Compatible with Alkaline Water Electrolysis (AWE) and Proton Exchange Membrane (PEM) modules	Comparison of electrochemical efficiency, current density, and membrane transport properties.
Dosing & Circulation System	Quantitative metering pumps, corrosion-resistant circulation loops, and raw material replenishment tanks	Studies in mass transfer, solution preparation, electrolyte concentration effects, and fluid dynamics.
Power Control Unit	Adjustable DC power supply with integrated voltage and current logging	Faraday's Law verification, voltage efficiency calculation, and polarization curve plotting.
Separation & Storage	High-efficiency gas-liquid separators and pressurized stainless steel hydrogen storage vessels	Gas-liquid equilibrium studies, pressurization dynamics, and compressed gas storage operations.
Instrumentation & Control	Digital flowmeters, pressure transmitters, temperature sensors, and touchscreen PLC interface	Process control loop tuning, system safety interlock testing, and real-time data acquisition.

Internal Circulation Gradient Free Catalytic Reaction Educational Pilot Plant

Item Number: LPK-SRIG



Introduction

Internal circulation gradient free catalytic reaction educational pilot plant for chemical engineering unit operations. Provides isothermal gradient free operation and hands on study of heterogeneous catalysis kinetics and mass transfer with precise control. Ideal for academic labs.

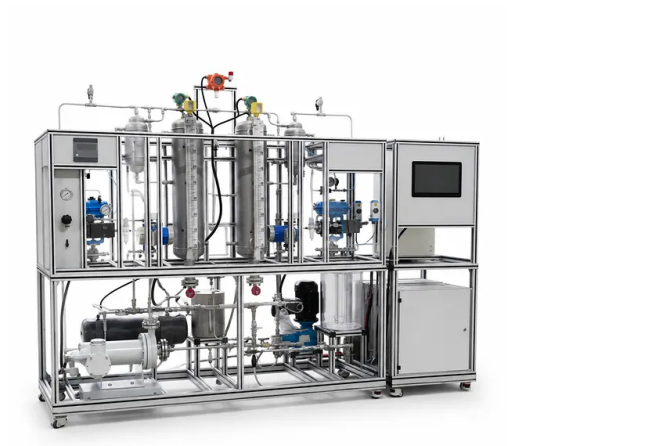
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System Parameter / Module	Technical Detail / Feature	Target Learning Outcome & Educational Concept
Reactor Configuration	Internal circulation gradient-free catalytic reactor with integrated adjustable-speed magnetic drive stirrer.	Intrinsic reaction kinetics; elimination of external and internal mass/heat transfer limitations.
Control & Instrumentation	Industrial-grade all-in-one touchscreen PC with programmable control and automated data acquisition.	Process dynamics, automated control loops, and digital data collection.
Safety Systems	Programmable temperature control, automatic over-temperature and over-pressure alarms, pressure relief paths.	Process safety management (PSM), safe operating limits, and emergency shutdown procedures.
Feed and Flow System	Precision feed pumps, flow meters, and optional wet gas flow meter for exit gas measurement.	Mass balancing, stoichiometry, and fluid transport through packed beds.
Frame & Dimensions	Heavy-duty anodized aluminum alloy frame on lockable casters; dimensions 1480 mm × 580 mm × 1780 mm.	Modular pilot-scale laboratory integration and industrial space efficiency.

Alkaline Membrane Water Electrolysis Educational Pilot Plant

Unit Operations Training System

Item Number: LPK-CHPE



Introduction

Hands-on educational pilot plant for alkaline membrane water electrolysis hydrogen production, integrating unit operations training with industrial PLC control, real-time data logging, customizable design, durable 316L stainless steel construction, explosion-proof safety, and modern 5G connectivity for university laboratories.

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Experimental Module	Technical Specifications & Components	Textbook Concepts & Knowledge Points Covered
Electrochemical Reaction & Gas Generation	- Alkaline membrane electrolytic cell - Stainless steel 316L alkali solution tank - Pure water feed tank	- Faraday's Laws of Electrolysis - Electrochemical kinetics and thermodynamics - Energy balance in reacting systems
Fluid Transport & Hydrodynamics	- Industrial shielded circulation pump - Make-up water dosing pump - Integrated flow control valves	- Fluid flow behavior and pressure drop - Pump performance curves and power consumption - Flow measurement principles
Gas-Liquid Separation	- High-efficiency oxygen separator - High-efficiency hydrogen separator	- Multi-phase fluid dynamics - Gravity settling and phase separation principles - Mass transfer across phase boundaries
Process Heat Transfer	- Stainless steel 316L tubular heat exchanger - Cooling water loop integration	- Heat transfer coefficient determination - Energy balance in heat exchangers - Thermal management of exothermic operations
Process Control & Instrumentation	15.6-inch touchscreen interface - Integrated pressure and liquid level sensors - PLC-based automated interlocks	- Process dynamics and feedback loops - Sensor calibration and signal transmission - Industrial safety interlock system design

Electrolytic Hydrogen Production Educational Unit Operations Pilot Plant

Item Number: LPK-CEHP



Introduction

Bench-scale electrolytic hydrogen production pilot plant designed for university engineering labs. Provides hands-on training in water electrolysis, gas-liquid separation, and process safety. Fully customizable system with digital PID control, corrosion-resistant components, and hydrogen gas detector. Ideal for chemical engineering curricula.

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Sub-system / Component	Technical Specification	Educational Focus & Unit Operation
Electrolytic Cell Stack	Multi-plate industrial-style electrolyzer configuration	Faraday's laws of electrolysis, electrochemical kinetics, energy efficiency calculation.
Electrolyte Circulation System	Dual corrosion-resistant magnetic drive pumps; integrated rotameters; PTFE flow control valves	Fluid mechanics, pump characterization curves, pressure drop across process equipment.
Separation & Storage Tanks	High-level gas-liquid separation columns with integrated buffer reservoirs	Gravity-driven gas-liquid separation, mass transfer, and multi-phase fluid dynamics.
Thermal Control Unit	Digital PID temperature controller with immersion heater and sensor feedback loop	Heat transfer, thermal equilibrium, and feedback loop process control.
Safety and Instrumentation	Continuous hydrogen gas ambient monitor with integrated interlocking relay	Industrial process safety, hazard analysis (HAZOP) training, sensor calibration.

Binary System Vapor Liquid Equilibrium Data Determination Educational Unit Operations Pilot Plant

Item Number: LPK-SVLB



Introduction

This educational pilot plant determines vapor-liquid equilibrium data for binary systems under atmospheric pressure. Students observe phase behavior, measure T-P-X-Y, and construct phase diagrams for unit operations labs. Features transparent cell, dual circulation. Ideal for chemical engineering curricula.

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Technical Parameter / Feature	Description & Utility	Relevant Unit Operations & Textbook Alignment
Equilibrium Cell Assembly	High-borosilicate glass cell with a vacuum insulation jacket; designed for atmospheric pressure operation.	Vapor-liquid phase behavior; thermodynamics of mixtures as detailed in <i>Unit Operations of Chemical Engineering</i> .
Circulation Method	Dual independent vapor and liquid circulation paths to ensure uniform composition and rapid steady-state.	Stage-wise separation processes; fundamental equilibrium stage concepts discussed in <i>Transport Processes and Unit Operations</i> .
Measurement Variables	Real-time determination of Temperature (T), Pressure (P), Liquid phase mole fraction (X), and Vapor phase mole fraction (Y).	Activity coefficient calculations; non-ideal liquid mixture behavior covered in <i>Chemical Engineering Design</i> .
Structure & Mobility	Premium aluminum alloy framing with locking casters. Dimensions: 1480mm × 580mm × 1780mm.	General laboratory integration and pilot plant safety design considerations.
Experimental Module 1	Binary system boiling point diagram construction (T-x-y diagrams).	Distillation fundamentals; determination of relative volatility as described in <i>Unit Operations of Chemical Engineering</i> .
Experimental Module 2	Azeotropic point identification and non-ideal system modeling.	Azeotropic distillation; separation of non-ideal mixtures covered in <i>Transport Processes and Unit Operations</i> .
Experimental Module 3	Thermodynamic consistency testing of experimental data.	Validation of phase equilibrium data; parameter estimation for process design as outlined in <i>Chemical Engineering Design</i> .

Gallium And Indium Selective Extraction Educational Pilot Plant

Item Number: LPK-CGIE



Introduction

Integrated pilot-scale laboratory system for engineering education bridging theoretical concepts with industrial practice enabling hands-on study of liquid liquid extraction reaction kinetics and mass transfer for selective gallium and indium separation featuring real-time IoT connectivity with integrated safety

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Educational Unit Operation / Module	Practical Learning Objectives	Textbook Correlation & Concepts
Liquid-Liquid Extraction & Separation	Determine extraction efficiency, study phase equilibria, and evaluate solvent selection for selective metal separation.	<i>Unit Operations of Chemical Engineering</i> - Liquid-Liquid Extraction - Stage Efficiency and McCabe-Thiele Method
Multiphase Reaction Engineering	Analyze reaction kinetics in stirred tank reactors, evaluate mixing performance, and determine temperature-dependent reaction rates.	<i>Transport Processes and Unit Operations</i> - Mass Transfer in Multiphase Systems - Agitation and Mixing of Fluids
Process Control & Instrumentation	Program temperature loops, configure precise reactant feed rates, and analyze transient system responses via the touchscreen interface.	<i>Chemical Engineering Design</i> - Instrumentation and Process Control - Safety and Loss Prevention
Material & Energy Balances	Perform overall and component material balances on gallium/indium streams, and calculate thermal efficiency of the heating jacket.	<i>Unit Operations of Chemical Engineering / Chemical Engineering Design</i> - Material Balances around Process Equipment - Heat Transfer in Agitated Vessels

System Component / Parameter	Specification Details	Educational & Experimental Objective
Reactor Construction	High-borosilicate glass and 316L Stainless Steel	Visual observation of liquid-liquid dispersion and phase separation.
Control Interface	15.6-inch touchscreen with integrated 5G/Bluetooth	Hands-on experience with modern industrial SCADA and PLC data acquisition systems.
Feeding & Circulation	High-precision chemical dosing and circulation pumps	Study of flow hydraulics, residence time distribution, and process dynamics.
Thermal Management	Integrated heating system with high-temperature cut-off	Demonstration of heat transfer coefficients and thermal safety control.
Environmental Safety Unit	Atmospheric protective furnace with exhaust adsorption bottle	Practical instruction on industrial green chemistry and gas scrubbing unit operations.

Polymerization Granulation And Pellet Processing Educational Unit Operations Pilot Plant

Item Number: LPK-CJH30



Introduction

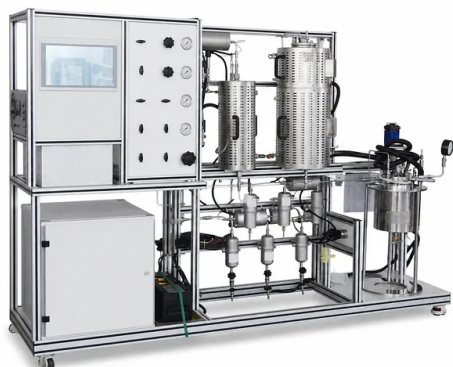
Integrated pilot plant for teaching polymer processing from polymerization to pelletizing. Includes 30L reactor, hydrolyzer, extruder-granulator, vibration dryer, crusher, and sieve. Atmospheric pressure operation for safety, corrosion-resistant SS, customizable for chemical and polymer engineering education. Ideal for university labs.

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Equipment Module	Technical Features & Configuration	Core Curriculum Topics & Unit Operations	Textbook Context & Reference Concepts
Batching Tank & Polymerization Reactor	30L Stainless steel vessel, electric heater, constant temperature bath, ribbon agitator.	Mixing and Agitation; Liquid-Phase Chemical Reactions; Heat Transfer in Agitated Vessels.	Liquid-state mixing dynamics, power consumption in agitation, and heat transfer coefficients in jacketed vessels (<i>Unit Operations of Chemical Engineering</i>).
Hydrolyzer	Dedicated stirring and electric heating system.	Reaction Kinetics; Thermal Conditioning of Viscous Media; Mass Transfer.	Mass transfer with chemical reaction, temperature dependence of reaction rates (<i>Transport Processes and Unit Operations</i>).
Pelletizer (Granulator)	Extrusion and pelletizing assembly.	Particulate Solids Processing; Polymer Rheology; Extrusion Mechanics.	Rheology of non-Newtonian fluids, mechanical separation, and size reduction operations (<i>Chemical Engineering Design</i>).
Vibration Dryer	Vibration-assisted transport and thermal drying.	Direct Contact Drying; Heat and Mass Transfer in Solids; Conveying of Particulates.	Drying rate curves, equilibrium moisture content, and gas-solid heat transfer (<i>Transport Processes and Unit Operations</i>).
Crusher & Sieve	Mechanical mill and vibratory sieving system.	Size Reduction; Particle Characterization; Mechanical Screening.	Screen efficiency, cumulative analysis of particle size distributions, and energy consumption in grinding (<i>Unit Operations of Chemical Engineering</i>).

Multi Functional Catalytic Reaction And Reactor Evaluation Educational Unit Operations Pilot Plant

Item Number: LPK-SRM



Introduction

Bench-scale educational pilot plant for catalytic reaction and reactor evaluation, integrating fixed bed, fluidized bed, and stirred tank reactors. Students compare reactor designs, evaluate catalysts, and study reaction kinetics and hydrodynamics. Perfect for unit operations labs in chemical engineering curricula.

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Specification	Details
Reactor Configurations	Fixed Bed (Tubular), Fluidized Bed, Stirred-Tank Reactor (STR)
Preheating System	Independent preheaters for each reactor pathway
Gas Mixing & Distribution	Dual-gas feed with three-way control valves
Temperature Control	Programmable multi-segment PID controllers with digital display
Construction Material	Corrosion-resistant stainless steel reactors, heavy-duty aluminum alloy frame
Mobility	Equipped with heavy-duty lockable casters for easy laboratory repositioning
Physical Dimensions	Max 2200 mm × 580 mm × 1780 mm (L × W × H)
Safety Features	Over-pressure cut-offs, over-temperature alarms, and protective electrical enclosures

Target Professional Field	Core Subject / Textbook Concept	Corresponding Experimental Module on the Pilot Plant
Chemical Engineering	<i>Chemical Reaction Engineering</i> / Heterogeneous Catalytic Reactions & Kinetics	Catalyst activity evaluation, determination of conversion rates, and space-time yield in fixed-bed versus fluidized-bed reactors.
Chemical & Process Engineering	<i>Unit Operations of Chemical Engineering</i> / Fluidization & Agitation	Determination of minimum fluidization velocity in fluidized beds; evaluation of mixing efficiency and heat transfer in stirred-tank reactors.
Environmental Engineering	<i>Transport Processes and Unit Operations</i> / Fixed-Bed Adsorption & Gas Treatment	Investigation of catalytic oxidation processes and adsorption breakthrough curves using a packed bed reactor.
Food & Biological Engineering	<i>Chemical Engineering Design</i> / Reactor Sizing & Multi-Phase Mixing	Scaling-up principles, heat transfer optimization, and temperature control during exothermic/endothermic processes in jacketed reactors.

Carbon Material Thermal Pretreatment Multiphase Separation Educational Pilot Plant

Item Number: LPK-CJZFL15



Introduction

Educational pilot plant for carbon material thermal pretreatment and multiphase separation. Features jacketed agitated reactor, separation column, and modern controls for hands-on unit operations training in heat transfer, fluid flow, and process safety with industrial-grade materials and wireless data acquisition.

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Component / Subsystem	Technical Specifications	Experimental Modules	Academic Textbook Alignment
Jacketed Agitated Reactor	316L stainless steel, high-torque stirrer, variable speed control, integrated electric heating jacket.	- Agitation and mixing dynamics - Heat transfer through jacketed walls - Thermal decomposition and pretreatment kinetics	<i>Unit Operations of Chemical Engineering</i> (Heat Transfer to Fluids in Agitated Vessels, Mixing of Liquids) <i>Transport Processes and Unit Operations</i> (Agitation and Mixing of Fluids)
Separation Column & Condenser	Insulated fractionating/separation column with 316L stainless steel packing, reflux control.	- Multi-phase thermal separation - Condensation and vapor-liquid equilibrium (VLE) - Mass transfer efficiency	<i>Unit Operations of Chemical Engineering</i> (Distillation, Vapor-Liquid Mechanics) <i>Transport Processes and Unit Operations</i> (Gas-Liquid Separation Processes)
Receiver & Separator Vessels	Dual 316L stainless steel receivers with integrated pressure transmitters and safety relief valves.	- Gravity and phase separation mechanics - Accumulation dynamics under pressure - Process safety relief protocols	<i>Chemical Engineering Design</i> (Vessel Design, Safety Relief Systems) <i>Unit Operations of Chemical Engineering</i> (Gas-Liquid and Liquid-Liquid Separation)
Control Console & Instrumentation	15.6-inch touchscreen, PLC control, multi-point RTD sensors, pressure transducers, wireless/cloud connectivity.	- Process dynamics and control loop tuning - Real-time digital data acquisition - Remote monitoring and IoT integration	<i>Chemical Engineering Design</i> (Process Control and Instrumentation) <i>Transport Processes and Unit Operations</i> (Measurement and Control Principles)

Methanol Synthesis And Catalyst Performance Evaluation Educational Unit Operations Pilot Plant

Item Number: LPK-JCPJ



Introduction

Bench-scale methanol synthesis and catalyst evaluation educational pilot plant for chemical engineering labs to study catalytic kinetics, high-pressure operations, process control, and unit operations under realistic conditions with industrial safety features, precision gas delivery, data acquisition, and intelligent monitoring.

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Technical System / Experimental Module	Functional Specification & Parameters	Core Academic Concept & Associated Textbook
High-Pressure Reactor Vessel	316L stainless steel construction; design pressure up to 10 MPa; max temperature of 1000°C; quick-disassembly mechanism.	Chemical Engineering Design - High-pressure vessel safety and wall thickness calculations - Materials selection for corrosive or high-temperature environments
Precision Feed Delivery Unit	Four-channel thermal mass flow controllers (CO, CO ₂ , H ₂ , N ₂); accuracy of ±1%; working pressure range matching reactor specifications.	Transport Processes and Unit Operations / Transport Processes and Separation Process Principles - Multi-component fluid dynamics - Packed bed pressure drop and gas flow modeling
Catalytic Synthesis & Evaluation Module	Real-time calculation of catalyst conversion rates, space-time yield, selectivity, and space velocity.	Elements of Chemical Reaction Engineering - Solid-catalyzed gas-phase reaction kinetics - Fixed-bed catalytic reactor design and modeling - Temperature profiles in exothermic reactions
Condensation and Separation Loop	High-efficiency gas-liquid separator; downstream chilled condenser; liquid collection vessel.	Unit Operations of Chemical Engineering - High-pressure vapor-liquid phase equilibrium (VLE) - Condensation heat transfer and heat exchanger performance
Data Acquisition and Control Center	15-inch PLC touchscreen system; automated temperature loops; data storage and export capabilities.	Process Dynamics and Control - Closed-loop temperature and pressure control systems - Sensor calibration and industrial instrumentation protocols

Electrolyte Distillation Purification And Formulation Educational Pilot Plant

Item Number: LPK-CSOCL2



Introduction

Integrated bench-to-pilot scale educational pilot plant for electrolyte distillation, purification, and formulation with borosilicate glass construction, PLC automation, touchscreen HMI, and advanced industrial safety features for hands-on chemical process training, ideal for chemical engineering and materials science curricula.

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Unit Operation / Module	Technical Features & Key Components	Target Experimental Learning Outcomes	Corresponding Curriculum Concepts
Distillation Unit	High-borosilicate glass column, corrosion-resistant packing, heating mantle, and condenser.	Study of fractional distillation, reflux ratio control, vapor-liquid equilibrium (VLE) evaluation, and column efficiency calculations.	Distillation, Mass Transfer Operations, Phase Equilibrium
Dehydration & Crystallization Unit	Temperature-controlled crystallization vessel, wall-scraping stirrer, and vacuum dehydration assembly.	Removal of crystalline water, investigation of crystallization kinetics, and heat transfer analysis in agitated vessels.	Crystallization, Heat Transfer, Drying Processes
Formulation & Blending Unit	Agitated formulation vessel, chemical dosing systems, and product storage receivers.	Precision blending, liquid-liquid mixing dynamics, viscosity verification, and process mass balance.	Agitation and Mixing, Fluid Mechanics, Mass Balances
System Control & Safety Interface	Touchscreen HMI, PLC data acquisition, three-color warning light, and corrosion-resistant valve manifolds.	Real-time process monitoring, sensor calibration, automation loop analysis, and emergency shutdown procedures.	Process Dynamics and Control, Industrial Chemical Safety

Micro-Scale Gas-Solid Catalytic Reaction Educational Pilot Plant

Item Number: LPK-TLCR



Introduction

Explore heterogeneous catalysis with this micro-scale gas-solid catalytic reaction educational pilot plant. Designed for university labs, it enables hands-on study of reaction kinetics and transport phenomena in a benchtop packed bed reactor with high-precision flow control and touchscreen automation.

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System Component / Parameter	Specification / Technical Capability	Associated Educational Unit Operations & Concepts
Reactor Type	Quartz or stainless steel micro-reactor	Fixed-bed reactor design, gas-solid heterogeneous catalysis, space velocity calculations
Flow Control Range	Dual/triple gas paths with mass flow controllers (precision: 0.1 ml/min)	Ideal gas law applications, reactant ratio control, fluid flow through packed beds
Thermal Control System	High-temperature furnace with multi-stage PID controller	Heat transfer in porous media, Arrhenius equation, catalyst activation energy determination
System Automation	High-definition PLC touchscreen interface with automated valve switching	Process dynamics, automated control loops, system startup and shutdown procedures
Safety & Monitoring	Over-temperature alarms, pressure relief valves, and real-time sensor logging	Process safety management (PSM), pressure drop analysis in packed beds

Ternary Liquid-Liquid Equilibrium Educational Pilot Plant

Item Number: LPK-SLLT



Introduction

An integrated laboratory training system for engineering students to determine ternary liquid-liquid equilibrium data, construct phase diagrams, and gain hands-on experience with industrial instrumentation, including Abbe refractometer and magnetic stirrers, for precise data acquisition and curriculum-aligned experiments.

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Parameter / Component	Specification / Description	Associated Curricular Knowledge Point
Frame Material	High-strength industrial aluminum alloy with mobile casters	Laboratory safety, pilot plant layout, and unit mobility
Maximum Dimensions	1480 mm × 580 mm × 1780 mm (L × W × H)	Space planning and laboratory footprint optimization
Equilibrium Chamber	Double-jacketed glass liquid-liquid equilibrium cells	Constant temperature maintenance, phase contact, and separation
Temperature Control	Constant temperature bath and circulation system	Isothermal phase behavior and thermodynamic consistency
Analytical Instrumentation	Integrated Abbe refractometer and magnetic stirrers	Refractive index calibration, concentration determination, and phase mixing
Primary Experiments	Determination of ternary LLE data; plotting triangular phase diagrams; calculating distribution coefficients and selectivity	Phase rule application, tie-line construction, and extraction stage calculations

100L Continuous Loop Hydrogenation Educational Unit Operations Pilot Plant

Item Number: LPK-HLJQ100



Introduction

This 100L continuous loop hydrogenation pilot plant is designed for chemical engineering education, featuring 316 stainless steel construction, advanced gas-liquid mass transfer components, explosion-proof safety systems, and a 15.6-inch touchscreen with 5G connectivity, cloud data logging, bridging theory and industry.

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Major Equipment / Module	Technical Specifications & Components	Core Chemical Engineering Concepts	Associated Textbook Knowledge Points
Reaction & Mixing Vessel	100L capacity reactor - Jacketed temperature control - Magnetic flap liquid level gauge	- Jacketed heat transfer - Liquid level monitoring - Multiphase fluid dynamics	Agitation and Mixing of Liquids (<i>Unit Operations of Chemical Engineering</i>) Heat Transfer in Jacketed Vessels (<i>Transport Processes and Unit Operations</i>)
Advanced Reactor Elements	- Coiled-tube reactor - High-efficiency jet disperser - Inline static mixer	- Gas-liquid mass transfer - Convective mass transfer - High-shear dispersion	Gas-Liquid Mass Transfer & Absorption (<i>Unit Operations of Chemical Engineering</i>) Mass Transfer in Reacting Systems (<i>Transport Processes and Unit Operations</i>)
Fluid Transport & Control	- Industrial centrifugal pump - Diaphragm dosing pump - Multiple high-accuracy flowmeters	- Fluid transport dynamics - Flow measurement & calibration - Pump performance curves	Transportation and Metering of Fluids (<i>Unit Operations of Chemical Engineering</i>) Momentum Transfer & Friction Losses (<i>Transport Processes and Unit Operations</i>)
Instrumentation & Safety Systems	- Explosion-proof motors - Real-time temperature transmitters - Digital pressure gauges	- Process safety and interlocks - Thermal runaway prevention - Hazardous area classification	Process Safety and Hazard Assessment (<i>Chemical Engineering Design</i>) Piping and Instrumentation Diagrams (P&IDs) (<i>Chemical Engineering Design</i>)
Data Acquisition (DAQ) System	15.6-inch touchscreen interface 5G and Bluetooth telemetry - Cloud-based storage and logging	- Process dynamics - Digital data acquisition - Remote monitoring	Process Control and Instrumentation (<i>Chemical Engineering Design</i>)

Carbon Dioxide Pvt Curve Determination Educational Unit

Operations Pilot Plant

Item Number: LPK-SPVT



Introduction

Enable hands-on learning of thermodynamic principles with this carbon dioxide PVT curve determination pilot plant. Students visualize critical opalescence, phase transitions, and generate P-V isotherms across liquid, gas, and supercritical regions. Robust safety features, adaptable for university engineering labs.

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Parameter	Description
Working Fluid	Carbon Dioxide (CO ₂)
Frame Material	High-strength industrial aluminum alloy with integrated caster wheels
Overall Dimensions	1480 mm × 580 mm × 1780 mm (L × W × H)
Key Instrumentation	Piston manometer, constant-temperature circulating water bath, digital temperature display
Safety Features	Protective high-pressure acrylic shield, over-temperature protection, dual pressure gauges

Experimental Module	Lab Activity	Key Physical Concepts Covered
PVT Data Determination	Measuring pressure, volume, and temperature coordinates under constant temperature conditions.	P-V-T state relations, phase envelopes, compressibility factor
Critical State Observation	Heating the system to the critical temperature of CO ₂ (31.1°C) to observe the vanishing meniscus.	Critical point, critical pressure, critical temperature, critical opalescence
Isothermal Curve Plotting	Recording pressure-volume steps at multiple temperatures to construct P-V isotherms.	Subcooled liquid region, superheated vapor region, saturation curve, vapor pressure



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