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 *Unit Operations of Chemical Engineering*.
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 *Transport Processes and Unit Operations*.
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 *Chemical Engineering Design*.
Structure & Mobility	Premium aluminum alloy framing with locking casters. Dimensions: $\le$ 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 *Unit Operations of Chemical Engineering*.
Experimental Module 2	Azeotropic point identification and non-ideal system modeling.	Azeotropic distillation; separation of non-ideal mixtures covered in *Transport Processes and Unit Operations*.
Experimental Module 3	Thermodynamic consistency testing of experimental data.	Validation of phase equilibrium data; parameter estimation for process design as outlined in *Chemical Engineering Design*.