

Three-Tube Heat Transfer Educational Pilot Plant For Unit Operations Training

Item Number: LPK-BHTT



Introduction

Three-tube heat transfer pilot plant for studying convective heat transfer enhancement and condensation. Allows comparison of smooth, corrugated, turbulent tubes, verifying empirical correlations. Ideal for chemical engineering education with safety and closed-loop steam recovery.

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Parameter	Specifications
Tube Configurations	Smooth Tube, Corrugated Tube, Turbulent Flow Tube
Measured Variables	Flow rate, wall temperatures, inlet/outlet temperatures, system pressure
Frame Material	High-strength aluminum alloy support frame with locking industrial casters
Maximum Dimensions	$2200\text{ mm} \times 580\text{ mm} \times 1880\text{ mm}$ (Length $\times$ Width $\times$ Height)
Water Management	Closed-loop steam condensate recovery system
Safety Instrumentation	Physical safety water seal, pressure transmitter, digital overpressure alarm

Experimental Module	Key Engineering Concepts Covered	Associated Terminology in Classic Textbooks
Convective Heat Transfer Correlation	Dimensional analysis, Nusselt, Reynolds, and Prandtl numbers, turbulent flow in pipes	Forced convection in pipes, empirical heat transfer equations (<i>Unit Operations of Chemical Engineering</i> / <i>Transport Processes and Unit Operations</i>)
Vapor Condensation Analysis	Filmwise vs. dropwise condensation, condensation on horizontal tubes, thermal resistance	Condensation of single vapors, film condensation (<i>Unit Operations of Chemical Engineering</i>)
Overall Heat Exchanger Performance	Overall heat transfer coefficient (K_o), fouling factors, log mean temperature difference (LMTD)	Heat exchange equipment design, heat transfer coefficients (<i>Chemical Engineering Design</i>)