Solid Spherical Heat Transfer Coefficient Determination Educational Chemical Engineering Pilot Plant

Item Number: LPK-CGXC

Introduction

This educational chemical engineering pilot plant enables students to determine convective heat transfer coefficients and observe transient thermal behavior of solid spheres under natural convection, forced convection, fixed beds, and fluidized bed regimes.

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Module / Component	Technical Specification / Description	Associated Curriculum Concepts
Physical Dimensions	Max 1480 mm × 580 mm × 1500 mm (L × W × H); mounted on a mobile, high-quality aluminum alloy frame with lockable casters.	General Laboratory Layout & Space Management
Fluidization Column	Industrial-grade transparent column for clear observation of fixed bed and fluidized bed behavior of solid particles.	Fluidization, Minimum Fluidization Velocity, Two-Phase Flow
Air Supply System	High-efficiency blower with adjustable flow rate; integrated rotameter/flow meter for precise air velocity measurement.	Fluid Dynamics, Forced Convection, Flow Measurement
Heating & Pre-heating System	High-temperature pre-heating chamber with safety insulation for heating the test spheres before cooling.	Process Safety, Steady-State Pre-heating
Instrumentation	High-precision temperature sensors embedded in test spheres (core temperature) and fluid stream (ambient/air temperature).	Temperature Measurement, Transient Response
Experimental Module 1	Determination of cooling curves for small spheres under natural and forced convection.	External Convective Heat Transfer, Boundary Layer Theory
Experimental Module 2	Heat transfer coefficient determination within fixed and fluidized beds.	Packed Bed Transport, Gas-Solid Fluidized Systems
Experimental Module 3	Calculation of Biot number (Bi) to evaluate internal vs. external thermal resistance.	Unsteady-State Conduction, Lumped Parameter Analysis