

Hydraulic and Pneumatic Conveying of Bulk Solids Training Course

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Overview

Hydraulic and Pneumatic Conveying of Bulk Solids Training Course is a one-week intermediate course for process, mechanical, plant operations, maintenance, and project professionals who leave with a Bulk Solids Conveying Design and Reliability Basis. Participants examine bulk solids characterization, slurry pipeline design, pneumatic conveying system selection, pressure-loss analysis, conveying system troubleshooting, and combustible-dust controls. The course connects material behavior, transport regime, equipment interfaces, safety, energy, and reliability. Agile Leaders Training Center presents hydraulic and pneumatic conveying of bulk solids.

Who Should Attend

- Functions responsible for process-system selection, sizing, and design review
- Teams responsible for bulk-material handling, plant operations, and production continuity
- Functions responsible for pipelines, pumps, blowers, feeders, separators, and dust collectors
- Teams responsible for mechanical reliability, inspection, maintenance, and troubleshooting
- Functions responsible for projects, commissioning, safety review, and performance acceptance

The course assumes participants interpret basic process-flow and equipment data at work, and it leaves out detailed equipment manufacturing and computational model development.

Departments and Industries

The course supports departments and industries that transport powders, granules, minerals, ash, catalysts, food ingredients, or process slurries.

- Process engineering, mechanical engineering, and project delivery
- Mining, mineral processing, cement, and metals operations
- Chemical, petrochemical, plastics, and fertilizer production
- Power generation, ash handling, and environmental systems
- Food, grain, pharmaceutical, and bulk-storage operations

Learning Objectives

By the end of this course, participants will be able to:

- Analyze particle, bulk, liquid, and gas properties for conveying decisions
- Compare hydraulic and pneumatic transport regimes and system configurations
- Build slurry-pipeline and pneumatic-conveying sizing calculations
- Evaluate feeders, pipelines, bends, separators, filters, pumps, and blowers
- Diagnose settling, plugging, erosion, attrition, leakage, and unstable flow
- Prioritize safety, energy, maintenance, and reliability improvements

Course Agenda

Day 1: Characterize Materials and Select Transport Modes

- Bulk Solids Particle Size, Shape, Density, and Hardness Data Sheet
- Flowability, Cohesion, Moisture, and Abrasiveness Test Matrix
- Slurry Concentration, Rheology, and Settling Behavior Profile
- Hydraulic versus Pneumatic Conveying Selection Framework
- Conveying Duty, Route, Throughput, and Constraint Design Basis

Day 2: Size Hydraulic Solids Transport Systems

- Homogeneous, Heterogeneous, Sliding-Bed, and Stationary-Bed Flow Map
- Critical and Deposition Velocity Calculation Method
- Slurry Pipeline Diameter and Pressure-Loss Calculation Sheet
- Pump Duty, System Curve, and Solids Throughput Balance
- ASME B31.4 Slurry Pipeline Design and Integrity Review

Day 3: Design Pneumatic Conveying Systems

- Dilute, Dense, and Transitional Phase Selection Matrix
- Pressure versus Vacuum Conveying Configuration Review
- Pickup, Saltation, and Minimum Conveying Velocity Method
- Airflow, Solids Loading, Pressure Drop, and Blower Sizing Sheet
- Feeder, Pipeline, Bend, Receiver, and Filter Interface Map

Day 4: Control Safety, Wear, and Reliability

- NFPA 660 Combustible-Dust Hazard Control Review
- NFPA 91 Air-Conveying Exhaust System Safety Check
- Erosion, Attrition, Bend Wear, and Material Degradation Map
- Settling, Plugging, Surging, Leakage, and Instability Diagnostic Tree
- Instrumentation, Alarm, Inspection, and Maintenance Strategy

Day 5: Practice Conveying Design and Troubleshooting

- Suggested Exercise: Characterize a Bulk Solid and Select the Transport Mode
- Suggested Exercise: Size a Slurry Pipeline above Deposition Velocity
- Suggested Exercise: Configure a Dilute- or Dense-Phase Pneumatic Line
- Suggested Exercise: Diagnose Pressure, Wear, and Plugging Evidence
- Capstone Exercise: Complete the Bulk Solids Conveying Design and Reliability Basis

Practical Exercises

The course uses suggested activities to convert material and operating data into conveying decisions.

- Suggested activity: characterize mineral slurry and dry-powder cases using particle, carrier-fluid, route, and throughput evidence.
- Suggested activity: calculate hydraulic velocity, pipeline loss, pump duty, pneumatic airflow, solids loading, and blower pressure.
- Suggested activity: evaluate feeder, bend, separator, filter, and instrumentation interfaces for capacity and reliability.
- Suggested activity: turn settling, plugging, erosion, attrition, and dust-hazard evidence into corrective and verification actions.

FAQs

Who suits hydraulic and pneumatic conveying of bulk solids training, and what does it assume?

Hydraulic and pneumatic conveying training suits process, mechanical, operations, maintenance, reliability, safety, and project functions. It assumes participants interpret basic process-flow and equipment data and excludes detailed equipment manufacturing.

How does bulk solids conveying training differ from a general fluid-flow course?

Bulk solids conveying training addresses particle behavior, solids concentration, transport regimes, deposition or saltation, equipment interfaces, wear, plugging, and dust hazards. A general fluid-flow course mainly treats single-phase liquids or gases.

What determines slurry pipeline deposition velocity?

Slurry pipeline deposition velocity depends on particle size and density, size distribution, solids concentration, carrier-liquid properties, pipe diameter, flow regime, and pipeline orientation.

How are dilute- and dense-phase pneumatic conveying selected?

Dilute- and dense-phase conveying are selected by evaluating particle fragility, abrasiveness, cohesion, bulk density, required throughput, route, pressure capability, product quality, energy, and acceptable conveying velocity.

What evidence supports bulk solids conveying troubleshooting?

Bulk solids conveying troubleshooting combines pressure profiles, flow and throughput trends, pump or blower load, feeder behavior, vibration, dust-collector differential pressure, wear inspection, product degradation, and blockage location.

Conclusion

Participants take back a Bulk Solids Conveying Design and Reliability Basis linking material properties, transport regimes, calculations, equipment interfaces, safety controls, and troubleshooting evidence. It changes separate process and mechanical assumptions into a traceable system decision path. The basis supports design review, commissioning, operations, maintenance, and performance verification.

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