



Solid-Liquid Separation and Industrial Drying

Course: Filters, Centrifuges and Dryers



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Introduction:

Solid-liquid separation and industrial drying, covering filters, centrifuges and dryers, is a 5-day course for process, technology and operations staff in chemical, fertiliser, mining, food and pharmaceutical plants, ending with a Separation and Drying Train Selection and Troubleshooting Plan for a case plant. Plants lose throughput, energy and quality when filter cakes stay wet, concentrates carry solids and dryers are overloaded with water that dewatering should have removed. Nominees already run or support dewatering and drying equipment and work through a modelling build on test and plant data. CoreConcept Training Center delivers this solid-liquid separation and industrial drying course.

Course Objectives:

- Characterise a slurry and map the separation and drying train from feed to dry product using moisture and solids balances
- Interpret filter leaf, settling and centrifuge test data to estimate specific cake resistance, thickener area and centrifuge capacity
- Set operating windows for filter presses, vacuum and candle filters, thickeners, decanters and disc-stack centrifuges
- Select spray, fluid-bed, rotary, flash or contact dryers and set their temperatures and gas flows from psychrometric and drying rate data
- Diagnose cloth blinding, poor cake release, concentrate carry-over, wet product and caking, and reduce dryer energy per kilogram of water evaporated
- Build a sized and costed Separation and Drying Train Selection and Troubleshooting Plan for a case plant

Target Audience:

- Process staff responsible for the capacity and cake moisture of filtration and centrifuge sections
 - Plant technologists who set flocculant dosing, wash ratios and dryer temperature profiles
 - Operations supervisors who run filter, thickener, centrifuge and dryer areas on shift
 - Production support staff who investigate wet product, caking and off-specification powder complaints
 - Energy and utilities staff who track steam, gas and power use in dewatering and drying units
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Course Outline:

Day 1: Separation and Drying Train Foundations and Current-State Assessment

- Slurry Characterisation Sheet for Solids Content and Particle Size
- Separation and Drying Train Flowsheet From Slurry to Powder
- Wet Basis and Dry Basis Moisture Conversion Worksheet
- Equipment Selection Map by Particle Size and Feed Solids
- Current-State Audit of Cake Moisture, Centrate Solids and Dryer Load

Day 2: Filtration, Settling, Centrifugal and Drying Models

- Darcy Cake Filtration Equation With Cake and Medium Resistance
- Filter Leaf Tests for Specific Cake Resistance and Compressibility
- Kynch and Coe-Clevenger Settling Tests for Thickener Area
- Sigma Theory and G-Force for Centrifuge Capacity Scaling
- Psychrometric Chart and Constant and Falling Rate Drying Curves

Day 3: Operating Filters, Thickeners, Centrifuges and Dryers

- Plate and Frame, Recessed and Membrane Filter Press Cycles
- Vacuum Belt, Rotary Drum and Candle Filter Operating Windows
- Thickener Flocculant Dosing and Underflow Density Control
- Decanter Pond Depth, Differential Speed and Disc-Stack Discharge Intervals
- Spray, Fluid-Bed, Rotary, Flash and Contact Dryer Selection

Day 4: Fault Diagnosis, Energy Optimisation and Hazard Cases

- Filter Cloth Blinding and Cake Release Failure Diagnosis
- Cake Washing Efficiency and Air Blowing Dewatering Optimisation
- Centrate Carry-Over and Scroll Wear Root Cause Analysis
- Dryer Specific Energy per Kilogram of Water Evaporated
- Combustible Dust and Dryer Fire Risk Controls Overview

Day 5: Modelling Build of the Separation and Drying Train Plan

- Case Plant Filter Area Sizing From Leaf Test Results
 - Case Thickener and Decanter Capacity Check Using Sigma Values
 - Case Dryer Heat Balance and Evaporation Rate Calculation
 - Wet Product and Caking Fault Tree for the Case Plant
 - Separation and Drying Train Selection and Troubleshooting Plan Completion
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Skills You Will Gain:

- Slurry Characterisation
- Cake Filtration Test Interpretation
- Thickener Area Estimation
- Centrifuge Capacity Scaling
- Psychrometric Analysis
- Dryer Heat Balancing
- Dewatering Fault Diagnosis
- Drying Energy Benchmarking

Why Attend This Course:

- Hand a Separation and Drying Train Selection and Troubleshooting Plan for a case plant to the production manager and the process engineering lead for approval
- Decide whether a wet product problem needs a filter, centrifuge or dryer change by reading test data and balances rather than adjusting set points by trial
- Avoid blinded cloths, solids in the centrate, dryer overloads and dust fire exposure that cost throughput, energy and off-specification product
- Share leaf test worksheets, sigma calculations, dryer heat balances and fault trees with operators and junior engineers

Conclusion:

Back at work, the participant presents the Separation and Drying Train Selection and Troubleshooting Plan to the production manager, the process engineering lead and the maintenance planner. They use it to choose which filter, thickener, centrifuge or dryer change to trial first and to agree target cake moisture, centrate solids and dryer energy per kilogram of water removed. After the first plant trial under the plan, the unit should compare actual moisture, throughput and steam or gas use with the plan estimates and update the fault tree.

Frequently Asked Questions FAQ:

What should participants know before a solid-liquid separation and industrial drying course?

Participants should already run, support or troubleshoot filters, centrifuges, thickeners or dryers and be comfortable with mass balances on a spreadsheet. Bringing anonymised cake moisture, centrate or dryer data from their own plant helps during the modelling build.

How does a solid-liquid separation and industrial drying course differ from a crystallisation or bulk solids handling course?

It covers the dewatering and drying equipment that sits after a crystalliser or reactor and before storage. Crystallisation courses cover how solids form, and bulk solids handling courses cover how dry powders are stored and conveyed, so both appear here only as interfaces.

Why does mechanical dewatering matter so much in solid-liquid separation and industrial drying?

Removing water mechanically in a filter or centrifuge costs far less energy than evaporating it in a dryer. A small drop in cake moisture can cut dryer load noticeably, so dewatering and drying are best optimised together.

What do participants take back from the solid-liquid separation and industrial drying course?

Participants take back a Separation and Drying Train Selection and Troubleshooting Plan for a case plant, with filter sizing and sigma worksheets, a dryer heat balance, a fault tree for wet product and caking, and target operating windows.
