

Industrial Crystallisation Equipment Design and Control Training Course

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Overview

Industrial Crystallisation Equipment Design and Control Training Course is a one-week course for process, chemical, production, operations, and control functions who leave with an Industrial Crystalliser Design and Operating-Control Dossier. Participants connect solubility data, supersaturation, nucleation, crystal growth, equipment selection, heat duties, residence time, crystal-size distribution, and plant control. Agile Leaders Training Center presents industrial crystallisation equipment through traceable engineering and operating decisions.

Who Should Attend

- Process-engineering functions responsible for separation design, balances, scale-up, and process performance
- Production and operations functions responsible for stable crystalliser campaigns and product consistency
- Process-control functions responsible for instrumentation, control loops, alarms, and operating trends
- Maintenance and reliability functions responsible for fouling, encrustation, circulation, and equipment availability
- Technical-management functions responsible for design reviews, operating risk, and improvement priorities

The course assumes participants use process data, flow diagrams, operating procedures, or equipment records at work and leaves laboratory crystal-structure determination and biopharmaceutical purification outside its scope.

Departments and Industries

The course supports departments and industries that produce, separate, and handle crystalline solids at plant scale.

- Process design, engineering, operations, and process-control departments
- Chemical, mineral, fertilizer, and inorganic-salt processing
- Food-ingredient, sugar, and specialty-material production
- Utilities, wastewater concentration, and resource-recovery operations
- Maintenance, reliability, technical services, and project teams

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Learning Objectives

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

- Analyze solubility, metastable-zone, and supersaturation evidence
- Evaluate crystalliser type, size, circulation, and heat duties
- Apply population-balance and crystal-size distribution concepts
- Build instrumentation and operating-control strategies
- Diagnose fouling, encrustation, fines, and product-variability causes
- Develop an industrial crystalliser design and operating-control dossier

Course Agenda

Day 1: Establish the Crystallisation Design Basis

- Solubility Curve and Phase-Behavior Data Sheet
- Supersaturation and Metastable-Zone Operating Map
- Nucleation, Growth, Agglomeration, and Breakage Mechanism Matrix
- Material, Energy, and Yield Balance Worksheet
- Product Purity, Morphology, and Crystal-Size Distribution Specification

Day 2: Select and Size Crystallisation Equipment

- Cooling, Evaporative, Antisolvent, and Reactive Mode Decision Matrix
- Forced-Circulation, DTB, OSLO, and MSMPR Selection Guide
- Vessel Volume and Residence-Time Sizing Method
- Heat-Exchanger Duty and Vacuum-System Calculation Sheet
- Mixing, Circulation, Shear, and Suspension Review Checklist

Day 3: Engineer Population and Product Control

- Population-Balance and Method-of-Moments Calculation Framework
- Seeding Strategy and Seed-Mass Design Worksheet
- Fines Removal, Classification, and Mother-Liquor Management Scheme
- Turbidity, FBRM, Spectroscopy, and Temperature Measurement Plan
- Supersaturation, Level, Temperature, and Feed Control Narrative

Day 4: Operate and Troubleshoot the Plant

- Start-Up, Steady-State, Grade-Change, and Shutdown Procedure Map
- Scaling, Fouling, and Encrustation Cause-and-Response Matrix
- Crystal Breakage, Agglomeration, and Wide-Distribution Fault Tree
- Filtration, Washing, Centrifugation, and Drying Interface Review
- Scale-Up, Safety, Alarm, and Performance-Indicator Dashboard

Day 5: Practice Crystalliser Design and Control

- Suggested Exercise: Interpret a Solubility and Supersaturation Map
- Suggested Exercise: Select and Size a Crystalliser Configuration
- Suggested Exercise: Build a Seeding and Population-Control Strategy
- Suggested Exercise: Diagnose an Encrustation and Product-Size Deviation
- Capstone Exercise: Present an Industrial Crystalliser Design and Operating-Control Dossier

Practical Exercises

The course uses suggested activities to convert plant and design evidence into defensible crystallisation decisions.

- Suggested activity: compare cooling and evaporative duties for a chemical-salt case.
- Suggested activity: evaluate residence time, circulation, and crystal-size targets for a food-ingredient case.
- Suggested activity: assemble an instrumentation and control narrative from process measurements.
- Suggested activity: trace fouling, fines, filtration, and drying symptoms to corrective actions.

FAQs

Who suits industrial crystallisation equipment training, and what does it assume?

Industrial crystallisation equipment training suits engineering and operations functions that already work with process data, flow diagrams, operating procedures, equipment records, or production trends.

How does industrial crystallisation equipment training differ from distillation training?

Industrial crystallisation equipment training controls solid formation, crystal population, slurry behavior, and solid-liquid interfaces, while distillation training separates vapor-liquid mixtures through volatility and column operation.

How is supersaturation controlled in an industrial crystalliser?

Supersaturation is controlled through temperature, evaporation, feed composition, circulation, residence time, seeding, and product withdrawal, supported by suitable process measurements and operating limits.

What determines industrial crystalliser selection?

Industrial crystalliser selection depends on solubility behavior, required yield and crystal size, viscosity, scaling tendency, heat duty, residence time, circulation needs, product handling, and operating mode.

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Why does crystal-size distribution vary during operation?

Crystal-size distribution varies when nucleation, growth, agglomeration, breakage, fines removal, mixing, seeding, residence time, or supersaturation changes across a campaign.

Conclusion

Participants take an Industrial Crystalliser Design and Operating-Control Dossier back to their organization. It connects the design basis, equipment selection, balances, population strategy, control narrative, operating procedures, troubleshooting evidence, and downstream interfaces. The dossier changes isolated calculations and operating reactions into a traceable basis for design reviews and plant decisions.

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