COBBLESTONE

COURSE ID 2637

Atomization and Spray Drying: Applied and Practical Approach

DIRECTED BY

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18 HOUR

ACCREDITED COURSE

Course Topics Include:

- Design and Selection
- Regulations
- Troubleshooting
- Scale Up
- Psychrometric Chart
- Case Studies

about the course

This comprehensive 18-hour accredited course delves into the essential concepts of Atomization and Spray-Drying technology, which play crucial roles in various industries. The course is designed to provide a strong foundation in the scientific principles and practical operations related to Atomization and Spray-Drying, both of which are integral to the daily operations of industries such as Food, Beverages, Chemicals, Pharmaceuticals, Pulp and Paper, and more.

The primary objective of the course is to empower scientists, engineers, and operations professionals with the knowledge and skills necessary to make a significant impact in their respective businesses. Participants will gain a deeper understanding of these vital processes and acquire essential techniques for scaling up operations, enhancing efficiency, troubleshooting challenges, and maximizing throughput.

The course content covers a wide range of topics including Spray Drying, evaporative cooling, and the diverse applications of spray and atomization techniques, such as coating, cooling, and fire protection.

who should attend

The course is intended for professionals working in the Food, Beverage, Specialty Chemical, Pharmaceutical, Pulp/Paper, and Pilot Plant industries. It will be especially valuable to:

- Operations, Engineers, Scientists
- Quality Control, Environmental, Health and Safety Professionals
- Anyone involved with spray-dependent processes

learning objectives

Upon completion of this course, you will be able to:

- State the various types of nozzle atomizers, their applications, and limitations
- Calculate the parameters required for the design and selection of atomizing devices
- Explain the reasons, advantages, and limitations of drying processes
- Explain the zones of a spray drying systems, evaporation & evaporative cooling
- Calculate the thermal efficiency of a spray drying process and main spray drying parameters
- Explain how to dry challenging products and improve drying operations
- Scale-up a process from a pilot plant to a production line

course outline

Review of Learning Objectives/Introduction
Atomization technology

- Definitions
- Atomization in process industries
- Selecting the best atomizer for the process
- Engineering parameters that impact atomizing nozzle selection

Types of atomizers

- Pressure nozzles; Centrifugal; mixed fluids; ultrasonic

Applications

- Flavor application systems
- Chocolate coating
- Fire protection; Humidification

Pressure atomizers

- Applications; Typical assemblies
- Strengths and limitations Impact of inserts – swirl attachments, filter mesh, etc.
- Orifice diameter sizing. Droplet size

Important atomizing systems Centrifugal atomizers

- Disk, wheel and cup shapes
- Surface design and finishes
- Strengths and limitations
- Process variables
- Droplet sizes and correlations; Centrifugal atomizers and spray drying

Two-Fluid atomizers

- Two-Fluid atomizers designs
- Process variables; strengths and limitations
- Gas to liquid ratios
- Droplet size Ultrasonic atomizers
- Ultrasonic nozzle components.
- Process variables Strengths and limitations.
- Droplet size distribution and correlation

Drying in process industries

- Importance of drying in processing industries.
- Indirect and Direct contact dryers
- Feeding methods; Drying line calculations
- Bound x unbound moisture

Spray drying fundamentals

- The spray drying process zones
- Spray drying plant configurations
- The atomization zones
- The spray-air contact zone
- The evaporation zones
- Powders morphology
- The air-powder separation zone. Cyclones, bag houses and scrubbers
- Heat and mass balance calculations

Calculations and methods Thermal efficiency

- The thermal efficiency formula
- Inlet and outlet temperatures
- Adjusting temperatures for output controls
- Case study – Mint powder flavor

Evaporation and Psychrometry

- Psychrometric parameters and chart
- Evaporative cooling and wet bulb temperature
- Case study: An application of the Psychrometric chart to justify an investment in air dehumidification

Air-powder separation

- Objectives of air-powder separation
- Methods of re-introduction of powder back in the process
- Design and selection of cyclones; Calculations

Important design and operational aspects of a spray drying plant

- Explosion suppression and fire protection
- Dust explosion – KST Index
- Methods of detection and suppression
- Fire deluge systems

Spray drying plant HACCAP and food safety

- Principles of sanitary design
- Automated Clean-In-Place (CIP) systems
- HACCP Points

Powder packaging systems

- Types of finished goods packages
- Bulk bag laminations
- Packages weight control

Spray drying plant control methods

- Feed-rate and Heat-input regulation
- Interlocks; Infeed system

Pilot plants

- Residence time
- Scale-up from pilot to production
- Modeling

Operational aspects and troubleshooting
Combining fluid bed drying technology with spray drying

- Powder fluidization
- Advantages of the use of a fluid bed dryer in the drying plant
- Agglomeration
- Internal and external fluid bed dryers
- Vibratory fluid bed dryers versus air conveying fluid beds
- Case study: Increased production throughput by incorporating FBDs in the lay-out

“Hard to dry powders”

- “Sticky” vs “non-sticky” powders
- Drying of products with low Glass Temperature Phase (Tg)
- Encapsulation
- The importance of the residence time
- Temperature and humidity parameters

Spray drying challenges and corrective methods

- Powder discoloration
- Final powder with higher-than-expected moisture content
- Out of spec powder particles
- Drying chamber impingement
- False deployment of dust explosion detection/ suppression systems

Assessment Opportunity

course instructor

Herberto Dutra, is an engineer with 30 years' experience in manufacturing, primarily in food, beverages, specialty chemicals and bio-pharma, having worked in companies like Linde Gas, Kraft Foods, Nestle, Schering-Plough, Sensient and Bay Valley. Mr. Dutra is currently the head of engineering and commercialization for ACH Food Companies, with many years of experience in the design, construction, operation and optimization of processing and packaging lines. Academically, Mr. Dutra holds a B.S. in mechanical engineering from Ueri (Rio de Janeiro State University, Brazil), Master of Business Administration from Keller graduate school of management and Master of Science in mechanical engineering from Purdue University. Mr. Dutra also has many years of experience developing and teaching industry related topics both through his employers and through the Cobblestone.

Accreditations

International Accreditors for Continuing Education and Training (IACET)
Cobblestone has been approved as a CEU Accreditor by IACET and awards CEUs for participation in qualified courses. Cobblestone has demonstrated that it complies with the ANSI/IACET Standards and is authorized to offer IACET CEUs for its programs. CEUs will be awarded for participation in Cobblestone's courses at the rate of .1 CEU per contact hour upon successful completion of the entire course and 70% accuracy in the required Learners' Assessment. A minimum score of 80% is required for all courses within a Cobblestone Certification Program. This course offers a total of 18 contact hours, or 1.8 CEUs. For further information, visit www.iacet.org

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