



# Food Processing Technology Course: Unit Operations, Thermal Processing and Line OEE



## **Food Processing Technology Course: Unit Operations, Thermal Processing and Line OEE**

### **Introduction:**

Food processing technology, covering unit operations, thermal processing and line OEE, is a 10-day course for production, process, quality and maintenance staff in food and beverage factories, ending with a Process Flow, Critical Parameter Plan and OEE Improvement Plan for a case production line. Plants lose product, energy and capacity when heat treatment, drying, separation and cleaning settings are run by habit rather than by understood process science. Nominees already run, check or maintain processing equipment, and the course is taught through inspection walkthroughs of real lines and their records. CoreConcept Training Center delivers this food processing technology course.

### **Course Objectives:**

- Explain how raw material composition, moisture and microbial load drive the choice of process route for a food or beverage product
- Apply material and energy balances to mixing, size reduction, separation, evaporation and drying steps on a production line
- Set and verify heat treatment parameters for pasteurisation, UHT, retort and aseptic systems using log reduction and lethality principles
- Operate dairy, juice, bakery, confectionery, fermented and extruded product lines within their critical process parameters
- Assess hygienic equipment design and CIP and SIP cycles, and link preservation choices to the shelf life a product must reach
- Measure yield, give-away, waste, utility use and line OEE and turn the losses into a ranked improvement plan

### **Target Audience:**

- Production staff who run processing, filling and packing lines and record shift output
  - Process technologists responsible for recipes, set points and heat treatment parameters
  - Quality staff who check in-process samples, release batches and investigate product defects
  - Maintenance technicians responsible for heat exchangers, homogenisers, ovens, dryers and pumps
  - Utilities operators who supply steam, refrigeration, compressed air and process water to the lines
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## **Course Outline:**

### **Day 1: Food Industry Structure, Food Composition and Raw Material Quality**

- Food Industry Sector Map by Product Category and Process Route
- Primary and Secondary Processing Distinctions Across Plant Types
- Food Composition Profile of Water, Protein, Fat and Carbohydrate
- Water Activity, pH and Microbial Load as Process Drivers
- Raw Material Specification and Intake Grading Sheet

### **Day 2: Unit Operations, Material Balances and Mechanical Processing**

- Unit Operations Flow Sheet Built From Product Recipe
- Material Balance Worksheet for Mixing and Standardisation Steps
- Size Reduction Equipment Selection Across Mills, Cutters and Homogenisers
- Mechanical Separation by Centrifuge, Sieve, Filter and Decanter
- Membrane Filtration Choices From Microfiltration to Reverse Osmosis

### **Day 3: Thermal Processing and Process Lethality**

- Heat Transfer Modes in Plate, Tubular and Scraped-Surface Exchangers
- Log Reduction and Thermal Death Time Curves Explained
- HTST Pasteurisation Holding Tube and Flow Diversion Checks
- UHT Direct Steam Injection Versus Indirect Heating Comparison
- Retort Sterilisation and Aseptic Filling Sterility Maintenance

### **Day 4: Chilling, Freezing, Drying, Evaporation and Extrusion Equipment**

- Chilling Rate and Cold Chain Temperature Logging Practice
- Blast, Plate and Cryogenic Freezer Selection Factors
- Spray, Drum and Tray Dryer Operating Parameters
- Falling Film Evaporator Concentration and Fouling Control
- Extruder Screw Speed, Barrel Temperature and Moisture Settings

### **Day 5: Guided Case Study on a Dairy and Snack Process**

- Case Plant Briefing With Flow Sheet and Batch Records
  - Mass Balance Reconciliation for Case Milk Standardisation
  - Heat Treatment Parameter Review Against Case Lethality Targets
  - Extruded Snack Expansion Defects Traced to Moisture Settings
  - Week-One Findings Brief and Peer Process Challenge
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## **Day 6: Specialised Product Lines Across Dairy, Juice, Bakery, Confectionery and Fermentation**

- Dairy Line Sequence of Separator, Homogeniser and Pasteuriser
- Juice Extraction, Deaeration and Concentrate Reconstitution Steps
- Bakery Dough Mixing, Proofing and Oven Temperature Profiling
- Confectionery Sugar Boiling and Chocolate Tempering Curves
- Fermentation Starter Culture, pH and Temperature Control Charts

## **Day 7: Hygienic Design, CIP and SIP, and Shelf Life Preservation**

- Hygienic Equipment Design Principles for Drainability and Dead Legs
- CIP Cycle Sequence Using TACT Parameters and Riboflavin Coverage
- SIP Steam Sterilisation of Tanks, Lines and Filler Valves
- Hurdle Technology Combining Heat, Acidity, Water Activity and Chilling
- Shelf Life Study Design With Accelerated Storage Trials

## **Day 8: Line Interfaces, Changeovers and Operator Communication**

- Process-to-Filler Interface With Buffer Tank Sizing Rules
- Product Changeover Sequence and Line Flush Volume Calculation
- Standard Operating Procedures and One-Point Lessons for Operators
- Shift Handover Log Covering Set Points and Deviations
- Daily Tier Meeting Between Production, Quality and Maintenance

## **Day 9: Yield, Waste, Utilities, Energy and Line OEE Measurement**

- Process Yield and Fill Weight Give-Away Analysis
- Product Loss Mapping From Intake to Finished Pallet
- Line OEE Calculation Around the Filler Bottleneck
- Steam, Refrigeration and Compressed Air Consumption per Tonne
- Water Use and Effluent Load Reduction Opportunities

## **Day 10: Inspection Walkthrough and the Process Flow, Critical Parameter and OEE Plan**

- Case Production Line Walkthrough Against a Process Inspection Checklist
  - Process Flow Diagram Drafting With Unit Operation Symbols
  - Critical Parameter Plan Listing Set Points, Limits and Checks
  - OEE Loss Ranking and Improvement Actions for the Case Line
  - Process Flow, Critical Parameter and OEE Plan Completion
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## Skills You Will Gain:

- Unit Operations Analysis
- Material and Energy Balancing
- Heat Treatment Parameter Setting
- Freezing and Drying Control
- Extrusion Process Adjustment
- Hygienic Design Assessment
- Yield and Give-Away Reduction
- Line Loss Measurement

## Why Attend This Course:

- Hand a Process Flow, Critical Parameter Plan and OEE Improvement Plan for a case line to the plant or production manager for adoption
- Decide whether a heat treatment, drying or cleaning setting can be changed safely, using lethality, balance and cycle data rather than habit
- Avoid underprocessed batches, burnt-on fouling, overfilled packs and unplanned line stops that waste product, energy and capacity
- Share flow sheets, balance worksheets, changeover sequences and inspection checklists with line operators and technicians

## Conclusion:

Back at the plant, the participant gives the production manager and process technologist a Process Flow, Critical Parameter Plan and OEE Improvement Plan for one production line. Production uses it to fix set points and checks for each unit operation, maintenance uses it to target the stoppages and fouling that cost the most output, and quality uses it to confirm heat treatment and cleaning records. After the first month of use, the team should review yield, give-away, utility use per tonne and OEE losses against the plan.

## Frequently Asked Questions FAQ:

### What should participants know before a food processing technology course?

Participants should already work on or around a food or beverage processing line in production, quality, process or maintenance roles. Basic arithmetic for balances is enough; no engineering degree is needed. Bringing a flow sheet, batch record or line stoppage report helps them apply the walkthroughs to their own plant.

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## **How does a food processing technology course differ from a food safety management or smart factory course?**

It teaches how unit operations, heat treatment, freezing, drying, extrusion and cleaning actually work and how to run them to specification. Food safety management courses build hazard control systems, and smart factory courses cover connectivity and data platforms, so both appear here only at overview.

## **Why do food processing technology and thermal processing use log reductions instead of a fixed temperature?**

Microbial destruction depends on both temperature and time, so a log reduction expresses how many tenfold reductions a treatment achieves. The same target can be met by a short high-temperature step or a longer lower one, which lets technologists balance safety, product quality and energy use.

## **What does a participant take back from the food processing technology course?**

Each participant takes back a Process Flow, Critical Parameter Plan and OEE Improvement Plan for a case production line, together with balance worksheets, a changeover sequence, an inspection checklist and a loss map they can adapt to a line in their own plant.