



Accredited Africa Training Institute for Capacity Development

Unit FO409, Hatfield Plaza · 1122 Burnett St, Hatfield 0028 · Pretoria, Gauteng · South Africa

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COURSE BROCHURE

Juice Evaporation Process Optimisation Techniques Training

Agriculture and Nature Conservation / Secondary Agriculture

Unit Standard 114289 · NQF Level 5 · 16 Credits · 13 Days

COURSE OVERVIEW

This course equips learners with advanced techniques to optimise juice evaporation processes in food and beverage manufacturing. Participants will gain skills to improve energy efficiency, product quality, and process control while reducing operational costs. The training aligns with South African industry standards and SAQA unit standard 114289.

Category	Agriculture and Nature Conservation
Subfield	Secondary Agriculture
Unit Standard	114289
Accreditation	SAQA Accredited · NQF Level 5 · 16 Credits
Duration	13 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Analyse current evaporation process parameters to identify inefficiencies and quality deviations.
- Evaluate the impact of temperature, pressure, and feed flow on evaporation performance and product concentration.
- Design optimisation strategies to enhance energy efficiency and minimise product degradation.
- Implement control system adjustments to maintain consistent brix levels and reduce downtime.
- Apply predictive maintenance techniques to extend equipment lifespan and prevent process disruptions.
- Demonstrate compliance with food safety and environmental regulations during evaporation operations.

WHO SHOULD ATTEND

- Process engineers, production supervisors, and technical managers in the fruit juice and beverage industry who are responsible for evaporation operations and process improvement.

COURSE OUTLINE

Day 1: Introduction to Juice Evaporation and Process Fundamentals

- Overview of juice processing and concentration
- Principles of evaporation: boiling point elevation, latent heat
- Types of evaporators: falling film, rising film, plate, and scraped surface
- Heat transfer fundamentals: conduction, convection, radiation
- Energy consumption and steam economy concepts
- Quality parameters: brix, acidity, colour, flavour retention

Day 2: Evaporator Design and Configuration

- Single-effect vs multiple-effect evaporation
- Mechanical vapour recompression (MVR) and thermal vapour recompression (TVR)
- Evaporator body geometry: tubes, plates, scraped surfaces
- Condenser types: surface, barometric, jet
- Vacuum systems: steam ejectors, liquid ring pumps
- Hygiene design: CIP, materials, surface finish

Day 3: Process Parameters and Control Variables

- Temperature profiles across effects
- Vacuum levels and boiling point depression
- Feed flow rate and concentration control
- Brix measurement: inline refractometers, density meters
- Viscosity and its impact on heat transfer
- Residence time distribution and thermal degradation
- Control loops: PID, cascade, feedforward

Day 4: Energy Efficiency and Steam Economy Optimisation

- Steam economy calculation: kg water removed per kg steam
- Effect of multiple effects on steam consumption
- Heat integration: preheaters, condensate recovery
- MVR vs TVR: energy savings and capital costs
- Insulation and heat loss reduction
- Energy monitoring and targeting
- Case studies on energy optimisation

Day 5: Fouling, Cleaning, and Maintenance Strategies

- Fouling mechanisms: mineral scaling, protein deposition, caramelisation
- Effect of fouling on heat transfer and capacity
- Monitoring fouling: delta T, pressure drop, heat transfer coefficient
- Cleaning-in-place (CIP): chemicals, flow rates, temperatures
- Mechanical cleaning methods
- Preventive maintenance: inspection, tube cleaning, gasket replacement
- Fouling mitigation: antiscalants, pre-treatment

Day 6: Product Quality and Sensory Attributes

- Impact of temperature and residence time on quality
- Colour measurement: browning index, absorbance

- Flavour retention: volatile compounds, aroma profiles
- Nutritional changes: vitamin C, antioxidants
- Brix and acidity control
- Turbidity and haze formation
- Quality testing: HPLC, spectrophotometry, sensory panels
- Regulatory standards: SA juice regulations, international standards

Day 7: Process Simulation and Modelling

- Mass balance: feed, concentrate, vapour flows
- Energy balance: steam, vapour, condensate enthalpies
- Introduction to simulation software (e.g., Aspen Plus, MATLAB)
- Modelling multiple-effect evaporators
- Sensitivity analysis: feed flow, temperature, pressure
- Model validation techniques
- Case study: simulation of a triple-effect evaporator

Day 8: Advanced Control and Automation

- Model predictive control (MPC) for evaporators
- Fuzzy logic control for non-linear processes
- Sensor selection: temperature, pressure, flow, brix
- Actuators: control valves, variable speed drives
- Data acquisition and SCADA systems
- Alarm management and safety interlocks
- Case study: automated brix control

Day 9: Troubleshooting and Problem Solving

- Common issues: low vacuum, fouling, tube blockage
- Root cause analysis: fishbone diagram, 5 Whys
- Troubleshooting flow: observe, measure, analyse, correct
- Case studies: capacity loss, brix fluctuations, colour problems
- Corrective actions: cleaning, parameter adjustments, repairs
- Preventive measures: monitoring, maintenance, training

Day 10: Environmental and Safety Considerations

- Water consumption and wastewater generation
- Effluent treatment: biological, chemical, membrane
- Energy efficiency and carbon footprint reduction
- Safety hazards: burns, implosions, chemical exposure
- Risk assessment: HAZOP, LOPA
- Personal protective equipment (PPE) and safe work procedures
- Emergency response: vapour releases, equipment failure
- Regulatory compliance: SA environmental laws

Day 11: Optimisation Case Studies in Juice Evaporation

- Case study 1: Orange juice – energy reduction via MVR
- Case study 2: Apple juice – colour preservation through low temperature
- Case study 3: Tomato paste – high brix with minimal fouling
- Case study 4: Grape juice – aroma retention

- Trade-off analysis: energy vs quality vs throughput
- Optimisation tools: pinch analysis, exergy analysis
- Implementation roadmap and cost-benefit analysis

Day 12: Emerging Technologies and Innovations

- Membrane distillation for juice concentration
- Ohmic heating and microwave-assisted evaporation
- Smart sensors: inline NIR, real-time viscosity
- Internet of Things (IoT) for process monitoring
- Hybrid processes: evaporation + reverse osmosis
- Sustainable processing: renewable energy, zero liquid discharge
- Industry 4.0 applications in evaporation
- Research and development trends

Day 13: Practical Integration and Final Assessment

- Group project: design an optimisation strategy for a juice plant
- Presentation of proposals with peer review
- Practical session: pilot evaporator operation or simulation
- Written assessment: multiple choice and problem-solving
- Feedback session and Q&A;
- Course evaluation and certification ceremony

ASSESSMENT & CERTIFICATION

Delegates are assessed through exercises and a final test. A mark of **50% or above** earns an **AATICD Certificate of Completion**, issued digitally with a unique verification code. This course carries **16 NQF credits** at **NQF Level 5**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 45,700.00	R 45,700.00
1	In-House	R 59,400.00	R 59,400.00
1	On-Campus (Pretoria)	R 68,500.00	R 68,500.00

UPCOMING SESSIONS

Start	End	Method	Venue
10 Aug 2026	26 Aug 2026	On-Campus	Pretoria, South Africa
11 Aug 2026	27 Aug 2026	On-Campus	Abu Dhabi, UAE
12 Aug 2026	28 Aug 2026	On-Campus	Durban, South Africa
12 Aug 2026	28 Aug 2026	On-Campus	Mauritius
13 Aug 2026	31 Aug 2026	On-Campus	Cape Town, South Africa
14 Aug 2026	01 Sep 2026	On-Campus	Dubai, UAE
17 Aug 2026	02 Sep 2026	On-Campus	Abu Dhabi, UAE
18 Aug 2026	03 Sep 2026	On-Campus	Durban, South Africa

Contact us if no suitable date is listed – on-demand sessions can be arranged for groups.

HOW TO GET A QUOTE OR APPLY

1. **Get an instant quotation online:** visit www.aaticd.co.za, open the page for this course (Unit Standard 114289) and click **Get A Quote / Apply**. Select your training method and number of delegates – your quotation is generated immediately and emailed to you with the course brochure attached.
2. **Apply by email:** send the course title, your preferred training method (Online, In-House or On-Campus Pretoria), the number of delegates and your preferred dates to apply@aaticd.co.za – our team will reply with a formal quotation.
3. **Apply by phone or WhatsApp:** call **+27 12 004 8389** or WhatsApp **+27 65 077 6310** and we will prepare your quotation and reserve your seats.
4. **Confirm your booking:** accept the quotation and settle the invoice. As soon as payment is confirmed your delegates are enrolled and receive their AATICD LMS login details by email, along with joining instructions for their chosen training method.

Group discounts apply automatically – the more delegates you enrol, the lower the price per delegate. No payment is required to request a quotation.

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