



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

Propellant Manufacturing Process Control Techniques Training

Manufacturing, Engineering and Technology / Manufacturing and Assembly

Unit Standard 116009 · NQF Level 3 · 20 Credits · 17 Days

COURSE OVERVIEW

This course equips learners with the knowledge and skills to monitor and control propellant manufacturing processes, ensuring consistent quality, safety, and efficiency. Participants will gain expertise in process control techniques, quality assurance, and compliance with industry standards, enabling them to optimize production and minimize risks.

Category	Manufacturing, Engineering and Technology
Subfield	Manufacturing and Assembly
Unit Standard	116009
Accreditation	SAQA Accredited · NQF Level 3 · 20 Credits
Duration	17 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Apply process control principles to monitor and adjust propellant manufacturing parameters.
- Analyze production data to identify deviations and implement corrective actions.
- Evaluate the impact of process variables on product quality and safety.
- Design process control strategies to optimize yield and reduce waste.
- Implement quality assurance procedures in accordance with SAQA standards.
- Demonstrate compliance with relevant health, safety, and environmental regulations.

WHO SHOULD ATTEND

- This course is designed for production supervisors, process engineers, quality control technicians, and manufacturing managers involved in propellant or energetic materials production within the defense, aerospace, or pyrotechnics industries.

COURSE OUTLINE

Day 1: Introduction to Propellant Manufacturing and Process Control

- Overview of propellant types and applications
- Basic manufacturing steps: mixing, casting, curing
- Introduction to process control: variables, setpoints, feedback loops
- Safety regulations (SANS 10228, OHS Act)
- Quality management systems (ISO 9001)
- Process documentation and record-keeping

Day 2: Raw Material Properties and Incoming Quality Control

- Oxidizers, binders, fuels, additives
- Material handling and storage requirements
- Sampling plans (e.g., ANSI/ASQ Z1.4)
- Testing methods: particle size, moisture, purity
- Non-conformance handling and supplier communication
- Documentation of raw material quality

Day 3: Mixing Process Control

- Mixer types (planetary, twin-screw, etc.)
- Control parameters: speed, temperature, vacuum
- Rheological measurements and viscosity control
- SPC charts for mix uniformity
- In-process sampling and testing
- Troubleshooting mixing issues

Day 4: Casting and Moulding Process Control

- Casting methods: gravity, vacuum, pressure casting
- Mould design and preparation
- Process parameters: preheat, pour rate, cure time
- Defect analysis: voids, cracks, segregation
- Process capability studies (C_p , C_{pk})
- Validation protocols (IQ, OQ, PQ)

Day 5: Curing Process Control

- Cure chemistry: crosslinking, exothermic reactions
- Oven control systems and temperature profiling
- Cure monitoring: DSC, rheometry, hardness testing
- Mechanical testing: tensile, elongation, modulus
- Curing defects and corrective actions
- Process optimization for throughput

Day 6: Machining and Finishing Process Control

- Machining methods: turning, milling, grinding
- Cutting parameters: speed, feed, depth of cut
- Dimensional inspection: micrometers, CMM
- Surface roughness measurement
- Tool wear monitoring and replacement

- Safety protocols for machining energetic materials

Day 7: Non-Destructive Testing (NDT) in Process Control

- Radiography: X-ray and gamma-ray techniques
- Ultrasonic testing: pulse-echo, through-transmission
- Visual inspection and borescope use
- Thermography for defect detection
- NDT acceptance criteria and standards (e.g., ASTM E1742)
- NDT personnel certification (ASNT, SAQCC NDT)

Day 8: Statistical Process Control (SPC) Implementation

- X-bar and R charts, p and u charts
- Process capability: Cp, Cpk, Pp, Ppk
- Run rules and out-of-control action plans
- Gauge repeatability and reproducibility (GR&R);
- SPC software tools (e.g., Minitab, QI Macros)
- Case studies in propellant manufacturing

Day 9: Automation and Control Systems

- PLC programming basics (ladder logic)
- SCADA interfaces and data acquisition
- PID controller tuning
- Alarm management and safety instrumented systems
- HMI design for operator interface
- Maintenance and calibration of sensors

Day 10: Process Safety Management (PSM) and Hazard Analysis

- Process hazard analysis (PHA) techniques
- HAZOP study for a propellant process
- Layer of protection analysis (LOPA)
- Safety instrumented functions (SIF) and SIL determination
- Mechanical integrity and inspection programs
- Emergency shutdown systems

Day 11: Environmental Control and Waste Management

- Air quality regulations: VOC, particulate emissions
- Wastewater treatment: neutralization, filtration
- Solid waste handling: recycling, incineration
- Spill prevention and control
- Environmental monitoring and reporting
- ISO 14001 requirements

Day 12: Quality Management Systems and Auditing

- QMS documentation: quality manual, procedures, work instructions
- Audit planning and checklists
- Non-conformance reporting (NCR) and root cause analysis
- Corrective and preventive actions (CAPA)
- Supplier quality management
- Continuous improvement tools (PDCA, Kaizen)

Day 13: Advanced Process Control Techniques

- Model predictive control fundamentals
- Principal component analysis (PCA) for process monitoring
- Partial least squares (PLS) for quality prediction
- Real-time optimization and supervisory control
- Machine learning for anomaly detection
- Case studies in advanced control

Day 14: Process Validation and Regulatory Compliance

- Process validation stages: design, qualification, continued verification
- Validation master plan
- Change control procedures
- Deviation investigation and impact assessment
- Regulatory submissions: FDA, SAHPRA requirements
- Good manufacturing practices (GMP) for propellants

Day 15: Data Analysis and Process Optimization

- Design of experiments: factorial, fractional factorial
- Response surface methodology
- Lean manufacturing principles: 5S, value stream mapping
- Six Sigma DMAIC approach
- Yield improvement case studies
- Data visualization dashboards

Day 16: Integration of Process Control Systems

- Manufacturing execution systems (MES) functions
- ERP integration for material and production planning
- Batch record management and electronic signatures
- Data integrity (ALCOA+ principles)
- System validation and testing
- Cybersecurity for control systems

Day 17: Capstone Project and Course Review

- Capstone project: design a process control strategy for a propellant line
- Group presentations and peer review
- Instructor-led review of course objectives
- Final assessment (written and practical)
- Course evaluation and feedback
- Certification of completion

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 **20 NQF credits** at **NQF Level 3**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 53,800.00	R 53,800.00
1	In-House	R 69,900.00	R 69,900.00
1	On-Campus (Pretoria)	R 80,700.00	R 80,700.00

UPCOMING SESSIONS

Start	End	Method	Venue
04 Aug 2026	26 Aug 2026	On-Campus	Dubai, UAE
05 Aug 2026	27 Aug 2026	On-Campus	Pretoria, South Africa
05 Aug 2026	27 Aug 2026	On-Campus	Lagos, Nigeria
06 Aug 2026	28 Aug 2026	On-Campus	Johannesburg, South Africa
07 Aug 2026	31 Aug 2026	On-Campus	Mauritius
10 Aug 2026	01 Sep 2026	On-Campus	Dubai, UAE
11 Aug 2026	02 Sep 2026	On-Campus	Pretoria, South Africa
12 Aug 2026	03 Sep 2026	On-Campus	Abu Dhabi, UAE

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 116009) 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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