

POLYMER MATERIALS - DESIGN AND SELECTION FOR THE OIL AND GAS INDUSTRY

"Maximizing Material Performance and Longevity in Harsh Oilfield Environments"

Schedule

Date	Venue	Fees (Face-to-Face)
14 - 18 Sep 2026	London - UK	USD 3495 per delegate

► Available delivery methods: Face-to-Face & Online Training

Introduction

Polymeric materials play a critical role in modern oil and gas applications due to their corrosion resistance, weight savings, flexibility, and chemical compatibility. However, selecting the right polymer for a specific environment—especially one involving extreme temperatures, pressures, or aggressive chemicals—requires in-depth understanding of both material science and operational demands.

This 5-day training course provides technical guidance on polymer selection, design, testing, and application specific to the oil and gas sector. It covers the chemical, mechanical, and thermal behavior of polymers, failure mechanisms, standards, and field-proven best practices to ensure safe, cost-effective, and durable material solutions.

Objectives

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

- Identify and evaluate key types of polymers used in upstream, midstream, and downstream operations
- Select appropriate polymer materials based on environmental and mechanical conditions
- Understand the impact of chemical exposure, temperature, and pressure on polymer performance
- Apply industry standards (API, ISO, NORSOK) for material qualification and compliance
- Troubleshoot common failure modes such as swelling, embrittlement, and stress cracking

Why Attend

- Understand polymer material behavior under oilfield-specific operating conditions
- Learn how to match polymer properties to function, application, and design life
- Reduce material failures and maintenance costs through informed selection
- Improve collaboration with material suppliers, design teams, and quality assurance
- Explore current developments in high-performance thermoplastics and elastomers

Target Audience

This program is designed for:

- Materials, mechanical, and chemical engineers in the oil & gas industry
- Design engineers and component developers for seals, coatings, and linings
- Corrosion engineers and asset integrity specialists
- QA/QC professionals and procurement engineers
- Project managers and consultants responsible for material specification and selection

Individual Benefits

Key competencies that will be developed include:

- Understanding the structure-property relationships of polymers
- Capability to evaluate material compatibility and degradation risks
- Skill in interpreting data sheets, test results, and material certifications
- Awareness of selection criteria for subsea, topside, and pipeline environments
- Proficiency in identifying material failure modes and their causes

Organizational Benefits

Upon completing the training course, participants will demonstrate:

- Improved reliability and performance of polymer components in the field
- Better-informed material decisions aligned with safety and lifecycle requirements
- Fewer unplanned outages due to premature material failures
- Enhanced cross-functional collaboration on materials projects
- Stronger compliance with industry standards and regulatory expectations

Instructional Methodology

The course follows a blended learning approach combining theory with practice:

- Strategy Briefings - Key insights into polymer chemistry, processing, and design requirements
- Case Studies - Real-world failures and successes in polymer use across oil and gas operations
- Workshops - Exercises in material evaluation, test data interpretation, and failure analysis
- Peer Exchange - Group discussions on application-specific material strategies
- Tools - Material selection flowcharts, compatibility guides, and performance calculators

MAWA EVENTS

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Course Outline

DETAILED 5-DAY COURSE OUTLINE

Training Hours: 7:30 AM - 3:30 PM Daily Format: 3-4 Learning Modules | Coffee breaks: 09:30 & 11:15 | Lunch Buffet: 01:00 - 02:00

Day 1: Fundamentals of Polymer Materials

- Module 1: Introduction to Polymers (07:30 - 09:30) • Overview of polymers: thermoplastics, thermosets, and elastomers • Key properties: tensile strength, modulus, elongation, permeability • Polymer structure and its influence on behavior
- Module 2: Chemical and Thermal Properties (09:45 - 11:15) • Temperature resistance, thermal degradation, and glass transition • Chemical compatibility with hydrocarbons, acids, bases, and solvents • Long-term aging and oxidative stability
- Module 3: Processing and Fabrication Techniques (11:30 - 01:00) • Molding, extrusion, calendaring, and bonding methods • Quality control during manufacturing • Impact of processing on material integrity
- Module 4: Workshop - Polymer Identification (02:00 - 03:30) • Comparing data sheets • Matching materials to function • Group discussion on product applications

Day 2: Material Selection for Oil & Gas Applications

- Module 1: Service Environment Mapping (07:30 - 09:30) • Upstream, midstream, and downstream exposure scenarios • Temperature-pressure charts and chemical envelopes • Sour service and HPHT conditions
- Module 2: Material Specification and Testing Standards (09:45 - 11:15) • API 6A, ISO 23936, NORSOK M-710 requirements • Standard tests: tensile, compression set, permeability, and fluid aging • Certification and quality documentation
- Module 3: Thermoplastics and High-Performance Polymers (11:30 - 01:00) • PA, PEEK, PVDF, PTFE, PPS, and their oilfield applications • Advantages and limitations • Cost vs. performance tradeoffs
- Module 4: Workshop - Selection Decision Matrix (02:00 - 03:30) • Evaluating multiple polymers for a given service condition • Using weighted criteria • Risk-based selection approach

Day 3: Elastomers and Sealing Systems

- Module 1: Elastomer Fundamentals (07:30 - 09:30) • Nitrile, FKM, EPDM, HNBR, FFKM - key properties and uses • Rubber formulation and compounding impact • Shore hardness and compression set considerations
- Module 2: O-rings, Seals, and Gaskets in Oil & Gas (09:45 - 11:15) • Application-specific design considerations • Dynamic vs. static sealing • Failures due to extrusion, nibbling, chemical attack
- Module 3: Aging, Swelling, and Embrittlement (11:30 - 01:00) • Environmental stress cracking (ESC) • Swelling due to fluid absorption • Mitigation strategies in design and material choice
- Module 4: Workshop - Seal Material Case Study (02:00 - 03:30) • Seal failure analysis from a field case • Root cause discussion • Redesign recommendations

Day 4: Failure Modes, Field Performance, and Inspection

- Module 1: Common Failure Mechanisms (07:30 - 09:30) • Creep, fatigue, cracking, blistering • Effects of UV, temperature cycles, and pressure shocks • Case-based failure interpretation
- Module 2: Inspection and Testing of Polymeric Components (09:45 - 11:15) • Visual inspection, NDT, and in-service evaluation • Accelerated aging and qualification tests • Tracking performance over time
- Module 3: Coatings, Linings, and Composite Pipes (11:30 - 01:00) • Internal linings and corrosion barriers • GRP/FRP pipe applications • Challenges in bonding and repair
- Module 4: Workshop - Failure Mode Mapping (02:00 - 03:30) • Group analysis of component failures • Failure prediction modeling • Documentation and reporting

Day 5: Advances and Lifecycle Strategies

- Module 1: Innovation in Polymer Technology (07:30 - 09:30) • Nanocomposites, self-healing materials, and smart polymers • Digital material tracking and RFID tagging • Circular economy and recyclability in the oil & gas context

- **Module 2: Lifecycle Management and Asset Integration (09:45 – 11:15)** • Design life, requalification, and degradation tracking • Documentation for long-term field use • Role of digital twins and predictive models
- **Module 3: Final Review and Lessons Learned (11:30 – 01:00)** • Summary of key selection and design principles • Common errors and how to avoid them • Integrating material knowledge into project workflows
- **Module 4: Final Assessment and Wrap-Up (02:00 – 03:30)** • Knowledge check and feedback • Personal action planning • Course closeout and certification

Certification

Participants will receive a Certificate of Completion in Polymer Materials – Design and Selection for the Oil and Gas Industry, confirming their expertise in choosing, applying, and managing polymer materials across oilfield environments.

Why Choose MAWA Events

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