Oil and Gas Separator Design and Troubleshooting Training Course

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4100 € (Per Person)

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Course Introduction / Overview:

Effective separation of oil, gas, and water is the cornerstone of any successful production facility, directly impacting operational efficiency, product quality, and profitability. This intensive training course provides a comprehensive exploration of separator design, operation, and troubleshooting, moving from fundamental principles to advanced practical applications. The curriculum is deeply rooted in established industry practices and engineering knowledge, drawing upon foundational concepts detailed by authorities like Ken Arnold and Maurice Stewart in their seminal work, "Surface Production Operations, Volume 1: Design of Oil-Handling Systems and Facilities". Participants will gain a robust understanding of multiphase fluid dynamics, separator sizing calculations, vessel internals, and process control systems. At BIG BEN Training Center, we have designed this program to bridge the gap between theoretical design and real-world operational challenges. The course focuses heavily on diagnosing and resolving common issues such as liquid carryover, gas blowby, emulsion formation, and sand management, equipping attendees with the skills to optimize separator performance and ensure safe, reliable operations from A to Z. This is not just a theoretical overview; it is a practical toolkit for enhancing production efficiency and asset integrity.

Target Audience / This training course is suitable for:

- Process Engineers.
- Production and Operations Engineers.
- Facility Engineers.
- Maintenance Technicians and Supervisors.
- Project Engineers.
- Control Room Operators.
- Engineering Team Leaders.
- Asset Integrity Engineers.

Target Sectors and Industries:

- Upstream Oil and Gas (Exploration and Production).
- Midstream Oil and Gas (Processing and Transportation).
- Engineering, Procurement, and Construction (EPC) Companies.
- Process Equipment Manufacturing and Vending.
- Consulting Firms Specializing in Oil and Gas.
- Governmental Regulatory Bodies and National Oil Companies.

Target Organizations Departments:

- Production and Operations.
- Process Engineering and Design.
- Maintenance and Reliability.
- Projects and Facilities Engineering.
- Health, Safety, and Environment (HSE).
- Technical Support and Services.
- Asset Management.

Course Offerings:

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

- Analyze the fundamental principles of multiphase fluid separation and phase behavior.
- Perform accurate separator sizing calculations for two-phase and three-phase systems using industry-standard methodologies.
- Evaluate the design, function, and selection criteria for various separator internals like mist eliminators and vortex breakers.
- Develop and interpret process flow diagrams (PFDs) and piping and instrumentation diagrams (P&IDs) for separation systems.
- Diagnose and troubleshoot common operational problems, including liquid carryover, gas blowby, and foaming.
- Implement effective strategies for managing emulsions, sand, and solids within production separators.
- Understand the principles of separator process control for level, pressure, and interface management.
- Apply safety protocols and best practices for separator operation, maintenance, and inspection.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a deep and practical understanding of separator technology through a dynamic and interactive learning environment. We move beyond traditional lectures by integrating a powerful blend of theoretical instruction with hands-on application. The course heavily features detailed case studies derived from real-world operational scenarios, allowing participants to analyze complex problems and develop effective solutions in a controlled setting. Interactive sessions, group discussions, and collaborative problem-solving exercises are central to our approach, encouraging the exchange of ideas and experiences among peers. Participants will engage in practical workshops focused on separator sizing calculations and troubleshooting simulations. This immersive methodology ensures that theoretical knowledge is immediately reinforced with practical skills. Our expert instructors facilitate a supportive atmosphere, providing continuous feedback and guiding participants to connect engineering principles with the operational challenges they face daily. The goal is to empower attendees with the confidence and competence to optimize separator performance and reliability within their own operational contexts.

Course Agenda (Course Units):

Unit One: Fundamentals of Separation Technology

- Introduction to oil and gas production facilities.
- The critical role of separators in upstream and midstream operations.
- Fundamental principles of multiphase fluid separation.
- Classification of separators: vertical, horizontal, and spherical.
- Understanding key fluid properties and phase behavior.
- Key terminology and definitions in separation processes.
- Introduction to governing industry codes and standards like API 12J.

Unit Two: Separator Design and Sizing Principles

- Process data requirements for robust separator design.
- Detailed sizing methodologies for two-phase (gas-liquid) separators.
- Advanced sizing calculations for three-phase (gas-oil-water) separators.
- Determining vessel diameter, length, and orientation.
- Residence time calculations for effective liquid-liquid separation.
- Sizing and placement of inlet and outlet nozzles.
- Using process simulation software for design verification and optimization.

Unit Three: Separator Internals and Process Control

- Function and design of inlet diverters for momentum reduction.
- Application of wave breakers, baffles, and defoaming plates.
- Selection and performance of mist eliminators and coalescing plates.
- Design of vortex breakers and sand jetting systems.
- Function and design of weirs for oil-water interface control.
- Instrumentation for level, pressure, and interface measurement.
- Fundamentals of separator control loops and safety logic.

Unit Four: Operational Troubleshooting and Performance Optimization

- Identifying root causes of liquid carryover in the gas outlet.
- Diagnosing and mitigating gas blowby in liquid outlets.
- Strategies for managing and breaking foam and stable emulsions.
- Troubleshooting common level and pressure control system instabilities.
- Effective methods for sand and solids handling and removal.
- Techniques for debottlenecking and optimizing separator throughput.
- Utilizing operational data for continuous performance monitoring.

Unit Five: Advanced Topics, Safety, and Maintenance

- Special considerations for high-pressure and low-pressure separators.
- Design and operational challenges of slug catchers and scrubbers.
- Key safety systems: pressure safety valves (PSVs) and emergency shutdown (ESD) systems.
- Process Hazard Analysis (PHA) for separation facilities.
- Best practices for separator inspection, maintenance, and cleaning.
- Addressing corrosion, scaling, and material selection challenges.
- Future trends and emerging technologies in separation processes.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

As processing conditions change over the life of a field, how can a separator designed for initial production rates be effectively debottlenecked without a complete replacement, and what are the primary trade-offs between performance, cost, and operational risk?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by focusing on the critical intersection of design theory and operational reality, a nexus often overlooked in purely academic or purely operational training. While other courses may cover design principles or troubleshooting in isolation, this program integrates them into a cohesive framework. It moves beyond simply teaching sizing equations by challenging participants to understand how initial design decisions directly impact future operational problems like liquid carryover and emulsion formation. Drawing from the foundational engineering logic of experts like Ken Arnold and Maurice Stewart, the curriculum emphasizes root cause analysis over symptomatic fixes. Participants learn not just what to do when a separator malfunctions, but why it is malfunctioning based on its design, internals, and operating conditions. The extensive use of real-world case studies on performance optimization and debottlenecking provides a practical, problem-solving dimension that is immediately applicable in the field. This holistic approach ensures that engineers and operators leave not just with knowledge, but with the critical thinking skills required to manage the entire lifecycle of a separation system effectively and safely.