

Mechanical



Welcome Letter

Welcome to TechnoTrain! We are proud to be recognized by The Daily Telegraph for our innovative approach to training and development. TechnoTrain is UniHouse's professional training brand, created specifically to build strong, skilled, and safe workforces within the oil and gas industry.

With over 25 years of experience, we have partnered with leading companies worldwide, including BP, Shell, Hyundai Engineering, JGC Japan, Shimizu Japan, Gazprom, PetroChina, Lukoil, SONANGOL, and UNDP. Our expertise in engineering, management, and oil and gas enables us to deliver comprehensive training solutions tailored to support the success and growth of companies across this critical industry.

TechnoTrain's programs cover all essential areas for a successful career, from technical skills to essential soft skills, addressing all major oil and gas competencies. Our team of trainers comprises seasoned professionals from various backgrounds and nationalities, enriching each course with a diverse wealth of knowledge.

We proudly partner with some of the world's top learning and research centers in the UK, the US, and Canada. Our training facilities are equipped with the latest technology, allowing participants to learn and practice on state-of-the-art industry equipment.

At UniHouse, we prioritize customer satisfaction, welcoming every client as part of our family. We are committed to offering customized programs, whether for a small group or hundreds of employees, no matter where in the world you are located. TechnoTrain provides individual courses or complete training programs to help clients achieve their goals.

What We Offer

TechnoTrain's globally accredited programs are trusted in over eighty countries and support career growth across numerous industries. Our services include:

- Curriculum Design & Development
- Training & Capacity Building
- Framework Design for Training and Quality Assurance
- Technical Knowledge Transfer
- Managing Technical Training Centers
- Vocational Training & Competency Building
- Engineering Standards Training
- On-the-Job Training

Our courses cover areas like Power, Upstream & Downstream, Mechanical, Supply Chain, Health & Safety, and Soft Skills, addressing the needs of technical staff and management alike. TechnoTrain is more than just training; it is a pathway to success for every level within the oil and gas sector.

Join us at TechnoTrain to take the next step toward a successful and sustainable future in the oil and gas industry.

Sincerely,

The UniHouse Team



Mechanical

Equipment and Installation



The courses in this section are designed for participants at an intermediate level. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for staff members to build upon existing knowledge and skills.

Section Courses

1. Compressor Systems – Mechanical Design and Specification
2. Gas Compressor Operation, Monitoring, and Maintenance
3. Gas Turbine Operations
4. Heavy Duty Diesel Engine Operation and Maintenance
5. Mechanical Installation Techniques
6. Oil & Gas Equipment Maintenance and Operation
7. Piping Systems and Process Equipment
8. Pressure Vessel and Heat Exchanger Design
9. Pumps and Compressors
10. Valve and Actuator Technology



Compressor Systems – Mechanical Design and Specification

UHMIE001



This course aims to enable participants in developing their knowledge in the different types of compressors, their appropriate selection, the working and application stages, and the main problems and errors and their maintenance and troubleshooting. This covers also the operation of the compressors, taking into consideration the economical matter.

This course is designed for mechanical, facilities, plant, or pipeline engineers and technicians.

Course Objectives:

At the end of this course the participants will be able to:

- Define compressors.
- Understand the different types of compressors, including their sizes specifications, components and selection criteria.
- Understand the technical features of compressors.
- Explain compressor application stages (operation, maintenance, and troubleshooting of compression).
- Understand compressors' economic issues.

Course Content:

- Types of compressors, components, performance, and controls
- Compressor application stages
- Economical usage principles

Related Courses:

- Gas Compressors

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Compressors

1. Definition
2. Importance
3. Selection

Day 2 and 3

Types of Compressors, Components, Performance, and Controls

1. Centrifugal compressor
2. Reciprocating compressor
3. Rotary screw

Day 4

Compressor Application Stages

1. Installation
2. Operation
3. Testing
4. Maintenance
5. Troubleshooting

Day 5

Economical Usage Principles

1. CAPEX
2. OPEX
3. CAPEX and OPEX comparison

Gas Compressor Operation, Monitoring, and Maintenance

UHMIE002



This course aims to enable participants in developing their knowledge in operation, control, maintenance and troubleshooting of gas compressors.

This course is designed for engineering personnel responsible for mechanical systems.

Course Objectives:

At the end of this course the participants will be able to:

- Understand an overview of gas compressors (types, components, and performance measurements).
- Explain the problems and failures of gas compressors.
- Apply elements of monitoring and controlling systems.
- Determine the causes of compressor vibration.
- Understand bearing failures.
- Apply effective maintenance and troubleshooting systems.

Course Content:

- Gas compressor operations
- Gas compressor controlling and monitoring
- Gas compressor troubleshooting and maintenance

Related Courses:

- Pumps and Compressors

Duration
4 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Compressors

1. Definition
2. Importance
3. Selection

Day 2

Gas Compressor Operations

1. Definition
2. Types
3. Fundamentals and components
4. Performance measurements

Day 3

Gas Compressor Controlling and Monitoring

1. Protection and safety systems
2. Control systems and instrumentation
3. Monitoring systems
4. Vibration monitoring and control
5. Bearing failures and lubricant oil analysis

Day 4

Gas Compressor Troubleshooting & Maintenance

1. Operational problems of each compressor type
2. Types of maintenance
3. Inspection of most critical parts
4. Root Cause Analysis (RCA)
5. Troubleshooting procedures

Pumps and Compressors

UHMIE003



This course aims to enable participants to develop their knowledge and skills in pumping and compressor systems and equipment.

This course is designed for engineering personnel responsible for mechanical systems.

Course Objectives:

At the end of this course the participants will be able to:

- Understand the main pump and compressor types and their specifications and components.
- Identify the operational performance and control of each pump and compressor type.
- Understand the principles of application, installation, and operation of pumps and compressors.
- Know the different types of drivers (motors, engines, turbines).
- Define pump and compressor troubleshooting techniques.

Course Content:

- Gas compressor operations
- Gas compressor controlling and monitoring
- Gas compressor troubleshooting and maintenance

Related Courses:

- Pumps and Compressors

Duration
7 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Pumps

1. Types
2. Applications
3. Codes and standards
4. Piping integration
5. Troubleshooting

Day 2 and 3

Centrifugal Pump

1. Components
2. Hydraulics
3. Controls

Reciprocating Pump

1. Components
2. Hydraulics
3. Controls

Rotary Pump

1. Types
2. Components
3. Hydraulics
4. Controls

Day 4

Introduction to Compressors

1. Applications
2. Selection
3. Piping integration
4. Troubleshooting

Day 5 and 6

Centrifugal Compressor

1. Components
2. Performance
3. Controls

Reciprocating Compressor

1. Components
2. Performance
3. Controls

Day 7

Introduction to Rotary Screw Compressors

1. Operation
2. Types

Rotary Screw Compressor Performance

1. Components
2. Performance
3. Controls

Gas Turbine Operations

UHMIE004



This course aims to provide participants with a broad knowledge of the basic operation, controls, monitoring, and problem analysis of gas turbines.

This course is designed for experienced mechanical engineers and facilities engineers.

Course Objectives:

At the end of this course the participants will be able to:

- Define gas turbine types.
- Understand the basic components of a gas turbine.
- Explain the usage of compressor and pump types in gas turbines.
- Explain the operation and construction of gas turbines, including installation procedures and selection criteria.
- Evaluate gas turbine performance.
- Apply proper monitoring procedure.
- Determine common gas turbine problems.
- Perform appropriate troubleshooting and maintenance practices.

Course Content:

- Gas compressor operations
- Gas compressor controlling and monitoring
- Gas compressor troubleshooting and maintenance

Related Courses:

- Pumps and Compressors

Duration
8 Days

Level
Intermediate

Programme Schedule

Day 1 and 2

Introduction to Gas Turbines

1. Definition
2. Gas turbines in the oil & gas industry
3. Types
4. Frame type
5. Heavy duty gas turbines
6. Industrial types of gas turbines

Day 3 and 4

Gas Turbine Components

1. Pumps and compressors
2. Types
3. Air compressor performance characteristics
4. Combustor performance and efficiency
5. Rotors
6. Blades
7. Turbines
8. Fuel nozzles and igniters
9. Emission control
10. Miscellaneous

Day 5 and 6

Materials of Construction

1. Operation principles
2. Electric machinery usage
3. Installation
4. Blade materials

Day 7 and 8

Gas Turbine Monitoring and Troubleshooting

1. Monitoring procedures
2. Performance parameters
3. Vibration monitoring
4. Troubleshooting systems

Piping Systems and Process Equipment

UHMIE005



This course aims to provide participants with knowledge of the mechanical design of piping systems and process equipment. This also covers the safety operations accompanying designation processes; which includes inspection and monitoring procedures, in addition to after-operation maintenance and troubleshooting.

This course is designed for process, mechanical, and chemical engineers, as well as technical personnel involved in inspection, and operation and maintenance engineers.

Course Objectives:

At the end of this course the participants will be able to:

- Understand how to make a safe designation.
- Apply the best procedures for process equipment inspection and monitoring.
- Understand the different methods of failure analysis.
- Calculate the remaining life of equipment.
- Select the proper type of maintenance and alteration of pressurized process equipment.

Course Content:

- Process equipment and piping systems
- Process equipment safety and failures
- Process equipment inspection and monitoring
- Process equipment maintenance and troubleshooting

Related Courses:

- Pumps and Compressors

Duration
8 Days

Level
Intermediate

Programme Schedule

Day 1 and 2

Process Equipment and Piping Systems

1. Safety in design
2. Pressure vessels and storage tank designation
3. Piping system designation
4. Design characteristics of fluid handling and thermal equipment
5. Overpressure protection

Day 3 and 4

Process Equipment Safety and Failures

1. Process equipment safety
2. Uncontrolled chemical reactions
3. Piping system vibration
4. Boiler tubes overheating
5. Fluid handling equipment problems
6. Process equipment and piping system failure modes
7. Failure causes
8. Material degradation

Day 5 and 6

Process Equipment Inspection and Monitoring

1. Condition monitoring
2. Inspection and testing techniques: API 572, API 510, API 570
3. Risk Based Inspection (RBI): API 580
4. Fitness for service assessment: API 579/ASME FS1
5. Remaining-life calculation of components

Day 7 and 8

Process Equipment Maintenance and Troubleshooting

1. Maintenance types
2. Positive Material Identification (PMI)
3. Hot-line stopping
4. Piping systems and process equipment re-rating
5. Troubleshooting procedures

Heavy Duty Diesel Engine Operation & Maintenance

UHMIE006



This course aims to enable participants in to develop their knowledge in operation, control, maintenance, and the troubleshooting of heavy duty diesel engines. This covers the proper usage of engines in all aspects (safety, environment, and economic).

This course is designed for vehicle fleet maintenance engineers and technicians, and fleet maintenance supervisors.

Course Objectives:

At the end of this course the participants will be able to:

- Identify diesel engines and their principles and features.
- Understand the difference between heavy duty diesel engines and other types of diesel engines.
- Explain the types of components of fuel injection systems used in HDD.
- Define Diesel Electronic Control (DEC).
- Explain the principle of emission control systems.
- Understand the procedure and requirements for servicing HDD.
- Determine the HDD general problems; apply the proper maintenance and troubleshooting operations.

Course Content:

- HDD engine working operations
- Fuel injection systems in HDD engines
- Electronic Diesel Control (EDC)
- Maintenance and troubleshooting of HDD engines

Related Courses:

- Valve and Actuator Technology

Duration
7 Days

Level
Intermediate

Programme Schedule

Day 1

Introduction to Heavy Duty Diesel (HDD)

Engines

1. Definition
2. Designation
3. Features and characteristics
4. Materials
5. Standards and applications

Day 2 and 3

HDD Engine Working Operations

1. Diesel fuel types
2. Properties of each diesel fuel type
3. Combustion process and chamber shapes
4. HCCI
5. Types of air charging
6. Turbocharger

Day 4

Fuel Injection Systems in HDD Engines

1. Types and principles
2. Components
3. Fuel injection control (hydraulic, pneumatic, and electronic)
4. Diesel fuel filtration and water separation

Day 5 and 6

Electronic Diesel Control (EDC)

1. Definition
2. Components
3. Processes
4. Quantitative control systems and fuel limits
5. Emission control systems:
 - 5-1. DOC
 - 5-2. DPF
 - 5-3. SCR
 - 5-4. UI
 - 5-5. EGR
 - 5-6. CCV

Day 7

Maintenance and Troubleshooting of HDD

Engines

1. Inspection tips for HDD engines
2. HDD engine maintenance procedures
3. HDD engine troubleshooting

Mechanical Installation Techniques

UHMIE007



This course aims to enable participants in developing their knowledge in mechanical system installation techniques. This includes HVAC, firefighting, pumps, and pumping systems; and their types, components, designation, application, and troubleshooting procedures.

This course is designated for engineering personnel responsible for mechanical systems.

Course Objectives:

At the end of this course the participants will be able to:

- Identify HVAC, pumps, firefighting, and pumping systems.
- Understand each mechanical system's fundamental concepts, types, and proper material selection.
- Know how to design each system and its installation procedures.
- Explain the general problems of these systems, in addition to the maintenance and troubleshooting processes.

Course Content:

- Firefighting systems
- HVAC
- Plumbing systems
- Pumps

Related Courses:

- Piping Systems and Process Equipment

Duration
4 Days

Level
Intermediate

Programme Schedule

Day 1

Firefighting Systems

1. Definition and introduction
2. Types
3. Designation and installation

Day 2

HVAC

1. What is HVAC?
2. Air-condition definition
3. HVAC procedures
4. HVAC interior design
5. Types of HVAC systems and selection procedures
6. HVAC system type applications

Day 3

Plumbing Systems

1. Water network types and components
2. Material selection and performance parameters
3. Complementary systems
4. Efficiencies and design
5. Design of water networks
6. Pipe sizing
7. Steam and condensate piping

Day 4

Pumps

1. Types
2. Features
3. Selection procedures
4. Performance parameters
5. Cavitations and NPSH
6. Water hammer calculations
7. Installation and testing
8. Possible failures
9. Maintenance and troubleshooting procedures

Valve and Actuator Technology

UHMIE008



This course aims to enable participants in improving their knowledge in valves and actuators. This covers all valve and actuator aspects and operations, which includes: designation, material selection, construction, application, and maintenance.

This course is designed for maintenance personnel and instrumentation technicians and engineers.

Course Objectives:

At the end of this course the participants will be able to:

- Identify HVAC, pumps, firefighting, and pumping systems.
- Understand each mechanical system's fundamental concepts, types, and proper material selection.
- Know how to design each system and its installation procedures.
- Explain the general problems of these systems, in addition to the maintenance and troubleshooting processes.

Course Content:

- Overview
- Valve sizing, actuators and positioners
- Safety systems and valve-actuator combinations

Related Courses:

- Piping System and Process Equipment

Duration
6 Days

Level
Intermediate

Programme Schedule

Day 1 and 2

Valves and Actuators – Overview

1. Identifications
2. Uses, purposes, and principles
3. Characteristics
4. Conditions and operation
5. Pressure drops and recovery
6. CV, choked flow and flashing, and cavitations
7. Material selection
8. Construction and operations
9. Complementary equipment
10. Valve seat leakage rates and classifications

Day 3 and 4

Valve Sizing, Actuators and Positioners

1. Valve sizing for liquids and gases
2. Actuators, bench-setting and valve positioners
3. Cavitations' control and noise reduction
4. Valve inspection, maintenance, and troubleshooting

Day 5 and 6

Safety Systems and Valve-Actuator Combinations

1. Pressure relief devices
2. Valve safety systems
3. Pipe sizes and pressure classifications
4. Valve-actuator combinations, applications, and maintenance
5. Codes and standards

Pressure Vessel and Heat Exchanger Design

UHMIE009



This course aims to provide participants with a broad knowledge of pressure vessels and heat exchangers. This covers material selection, design calculations, and design codes and standards.

This course is designed for mechanical engineers and facilities engineers.

Course Objectives:

At the end of this course the participants will be able to:

- Know the international codes and standards related to oil & gas equipment.
- Explain the designation of pressure equipment.
- Understand how to design heat exchangers, both mechanically and thermally.
- Specify correct and commonly used materials.
- Understand how to calculate fatigue.

Course Content:

- Vessel codes and standards
- Mechanical design of pressure equipment
- Mechanical design of flanged connections
- Thermal design of shell and tube heat exchangers
- Mechanical design of shell and tube heat exchangers
- Pressure equipment and heat exchanger fatigues

Related Courses:

- Tactics of Mechanical Installation

Duration
6 Days

Level
Intermediate

Programme Schedule

Day 1

Vessel Codes and Standards

1. ASME B&PV Code
2. TEMA
3. API

Day 2

Mechanical Design of Pressure Equipment

1. Material selection
2. Types of risks
3. Pressure equipment designation
4. Loads and stresses
5. Failure modes
6. Stresses

Day 3

Mechanical Design of Flanged Connections

1. Flanged connection features
2. Types of flanges
3. Flanged connections' plans and calculations
4. Gasket selection criteria

Day 4

Thermal Design of Shell and Tube Heat Exchanges

1. Heat exchanger operation principles
2. Types of heat exchangers
3. Baffles definition and types
4. Heat exchange transferring classifications
5. Heat exchange condensers and re-boilers
6. Feed water heaters
7. Fouling factor

Day 5

Mechanical Design of Shell and Tube Heat Exchangers

1. High pressure heat exchangers
2. Tube sheet design
3. Expansion bellows
4. Floating heads

Day 6

Pressure Equipment and Heat Exchanger Fatigues

1. Pressure equipment fatigue principles
2. Heat exchanger fatigue principles
3. Fatigue calculation
4. Troubleshooting processes

Oil & Gas Equipment Maintenance & Operation

UHMIE010



This course aims to enable participants in developing their knowledge in the operation and maintenance of oil & gas production equipment. This covers the storage tanks and piping systems maintenance and inspection through the API standards' application, in addition to pump and compressor monitoring and troubleshooting operations.

This course is designed for engineering personnel responsible for mechanical systems.

Course Objectives:

At the end of this course the participants will be able to:

- Understand the types of oil & gas production equipment, in addition to their features and operational aspects (operations, technical characteristics, and safety).
- Explain failures and apply the appropriate failure analysis and risk management technique.
- Apply failure inspection operations for pressure equipment, vibration monitoring, and control of rotating equipment.
- Correctly complete the maintenance and troubleshooting procedures.

Course Content:

- Stationary equipment
- Rotating equipment
- Failures and causes analytics

Related Courses:

- Tactics of Mechanical Installation

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Stationary Equipment

1. Above ground storage tanks
2. Pressure vessels, heat exchangers and steam boilers
3. Pipelines and piping systems
4. Pressure relief valves
5. ASME BPV VIII and ASME B31.3 Standards
6. API Inspection Code

Day 2

Rotating Equipment

1. Centrifugal pumps
2. Reciprocating and rotary pumps
3. Centrifugal compressors
4. Reciprocating and rotary compressors

Day 3

Failures and Causes Analytics

1. Failures of stationary and rotating equipment
2. FMEDA
3. FFS
4. RCFA
5. ALARP criteria

Day 4

Inspection and Monitoring Operations

1. RBI API 580 for stationary pressure equipment (NDT)
2. ICDA and ECFA
3. Piping of complex onshore and offshore pipelines
4. Rotating machinery condition monitoring
5. Vibration analysis

Day 5

Maintenance and Troubleshooting Operations

1. Storage tank and pipeline maintenance techniques
2. Types of protection for pipelines and storage tanks
3. Rotating equipment troubleshooting techniques
4. Rotating equipment vibration control

Mechanical

Troubleshooting



The courses in this section are designed for participants at an intermediate level. The course descriptions and content will help training managers to determine which courses to select to set-up training plans for staff members to build upon existing knowledge and skills.

Section Courses

1. Risk-Based Inspection (RBI)
2. Troubleshooting Rotating Equipment



Risk-Based Inspection (RBI)

UHMET001



This course aims to provide participants with the essential knowledge of risk-based inspection (RBI) methodology. This covers the fundamentals of inspection and after-inspection risk management; developing the methods of inspections and building the appropriate inspection plans, analyses, and studies.

This course is designed for inspection maintenance engineers and technicians.

Course Objectives:

At the end of this course the participants will be able to:

- Identify the RBI methodology.
- Understand the fundamental principles of RBI.
- Know the risks which may affect pressure equipment in the oil & gas industry.
- Assess quantitative and semi-quantitative risk-based inspection approaches and build an appropriate inspection plan and analysis.
- Apply RBI methods and the appropriate usage of inspection results.
- Understand the application and usage of RBI API rules and their contents.

Course Content:

- Overview
- Quantitative risk-based inspection approach
- Application of the RBI method

Related Courses:

- Troubleshooting Rotating Equipment

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1 and 2

Overview of Risk-Based Inspection (RBI)

1. Definition
2. Fundamentals
3. Planning the RBI
4. Risk-based decisions
5. Pressure equipment in the oil & gas industry
6. After-inspection management
7. Overview of several risk types (fires, VCE, and BLEVE)

Day 3 and 4

Quantitative Risk-Based Inspection Approach

1. Comparison of the qualitative and quantitative RBI-API 581 approaches
2. Damage, inspection, and failure modes
3. Inspection plan preparation stages
4. Risk-based studies
5. Inspection types

Day 5

Application of the RBI Method

1. Analysis practices
2. Corrosion monitoring and diagnosis tools
3. Use of inspection results
4. Documentation and record keeping

Troubleshooting Rotating Equipment

UHMET002



This course aims to provide participants with a broad knowledge in rotating equipment failures. This covers the techniques of effective troubleshooting and maintenance after determining the causes of failure.

This course is designed for maintenance and operations engineers.

Course Objectives:

At the end of this course the participants will be able to:

- Understand different types of rotating equipment.
- Evaluate the performance of rotating equipment.
- Understand maintenance principles.
- Understand the fundamentals of vibration monitoring and analysis.
- Explain Root Cause Failure Analysis (RCFA) procedures and techniques.
- Build rotating equipment troubleshooting trees.

Course Content:

- Overview
- The causes of machinery failures (5 whys)
- Root Cause Failure Analysis (RCFA)
- Auxiliary and lubrication in oil systems
- Processes for effective troubleshooting

Related Courses:

- Risk-Based Inspection (RBI)

Duration
5 Days

Level
Intermediate

Programme Schedule

Day 1

Overview of Rotating Equipment

Fundamentals

1. Compression principles
2. Compressors: elements and technical characteristics
3. Pump elements and technical characteristics

Day 2

The Causes of Machinery Failures (5 Whys)

1. Process condition changes
2. Installation errors
3. Operating procedures
4. Design shortcomings
5. Component wear-out

Day 3

Root Cause Failure Analysis (RCFA)

1. Pump and compressor mechanical seals
2. Rotors
3. Vibration
4. Thrust bearings and balance drums
5. FA, RCA and RCFA

Day 4

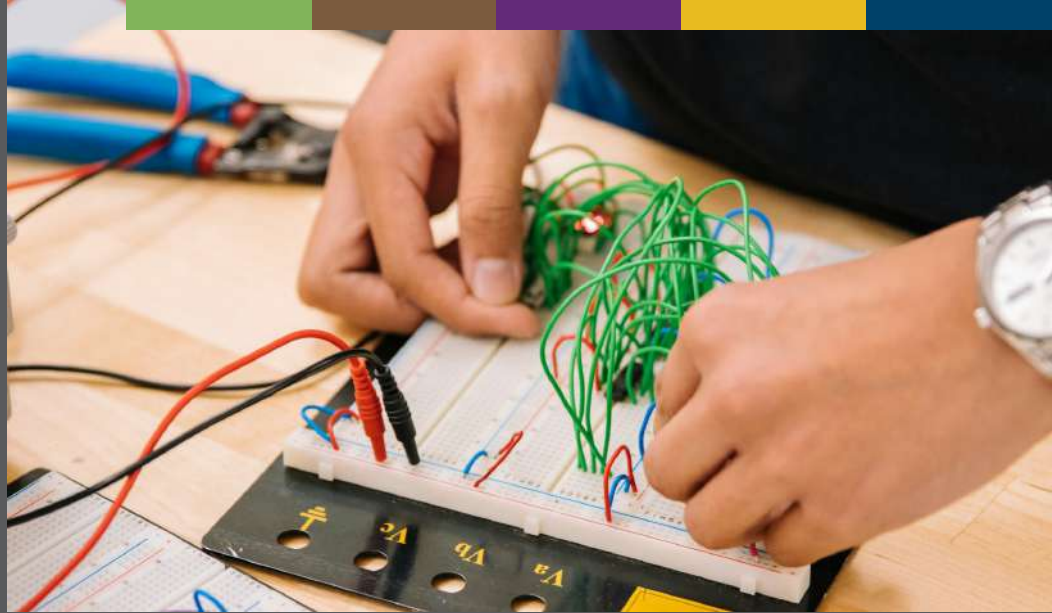
Auxiliary and Lubrication in Oil Systems

1. Oil reservoirs
2. Pumps and oil jets
3. Lubrication oil filters
4. Relief valves
5. Lubricant selection
6. Oil system cleaning and conditioning
7. Filter selection
8. Oil sampling and testing

Day 5

Processes for Effective Troubleshooting

1. Troubleshooting tree
2. Inspection process
3. Possible causes
4. Significant causes
5. Non-related causes



United Kingdom

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