ESD

ESD Simulation Training

Dynamic Simulation Training Specialists

Training for the Process Industries

Course Portfolio

www.esd-simulation.com

CONTENTS

KEY

- Compressor & related courses
- Process courses
- Oil and gas courses
- FPSO / LNG courses
- Non technical courses

The Training

A complete suite of open access training courses are run throughout the year in a variety of locations. For current information please log on to the website and follow the link to short course schedule.

All courses are also run on an in-company basis - either at one of ESD's purpose built training centres or at the client's own premises. To enquire about in-company training, please contact your nearest ESD office - details on back page.

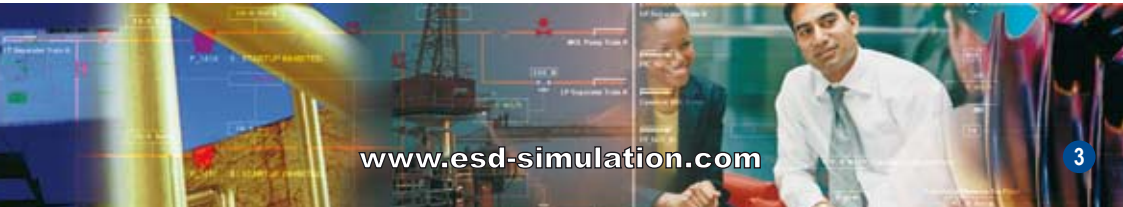
Dynamic Simulation

ESD uses dynamic 'real time' simulation extensively throughout its courses - allowing delegates to experience, explore and solve real-life problems for themselves. Abnormal compressor shutdown, clearance pocket volumes and anti-surge recycle valves are just some of the topics explored using ESD's hands-on simulation methods.

Quality

Quality control is the number one priority at ESD with many courses being approved and recognised by the IChemE, the NFA, APEGGA, the IMechE and Engineers Australia.

Continuing Education Units (CEUs) will be awarded for all ESD courses with either 3.5, 2.1, 1.4 or .7 CEUs awarded based on the number of course days completed.



Control & Operation of Centrifugal Gas Compressors

Course length: 3 days

This hands-on course uses dynamic simulation models to give a practical introduction to centrifugal gas compressors and their operation in process plant.

The practical exercises and workshops will use dynamic simulation models of compression systems running on PCs. They will be easy to use and the participants will require no prior knowledge of dynamic simulation.

Key topics covered in the course include compressor performance and selection, instrumentation and control, surge protection and compressor operation. Case studies will be used and participants will be encouraged to solve problems for themselves.

Suitable for: operations personnel who are either supervisors or persons responsible for the day-to-day operation and maintenance of centrifugal compressor installations. This includes process operators, supervisors, technicians and engineers of all disciplines.

Key topics covered:

- **Compression Principles**
- **Process & Control Description**
- **Compressor Operations**
- **Process Design - Coolers, Check Valves, Pipework Layout**
- **Instrumentation & Control**
- **Simple Anti-Surge Control**
- **Recycle Valve Sizing**
- **Compressor Protection & Complex Anti-Surge Control**
- **Compressor Operations**
- **Case Studies**
- **Course Review**

CEUs awarded: 2.1

Control, Operation & Design of Reciprocating Gas Compressors

Course length: 2 days

This course offers delegates a comprehensive overview of the design, construction, control and operation of reciprocating compressors of the type normally found in the oil, gas, and other process industries.

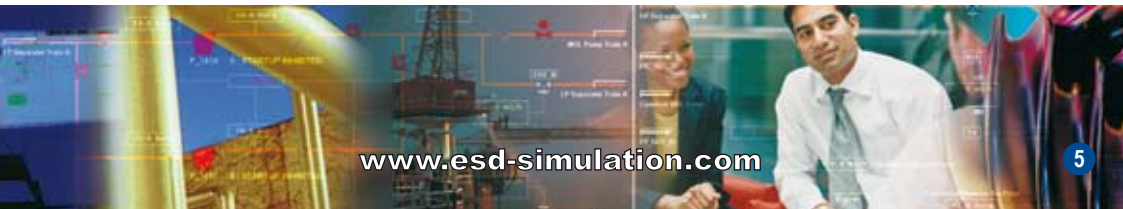
The course describes the principles of operation of the compressor and how, through a combination of the physical constraints both on the gas being processed and the materials of construction of the compressor, the design is adapted to a number of different configurations to meet numerous needs.

Suitable for: operations personnel who are either supervisors or persons responsible for the day-to-day operation and maintenance of reciprocating compressor installations. This includes process operators, supervisors, technicians and engineers of all disciplines.

Key topics covered:

- **Compressor Selection**
- **Principles of the Compression Process**
- **Piston Rod Loading and Rod Reversal**
- **Volumetric and Mechanical Efficiency and Multi-staging Design**
- **Compressor Operation**
- **Compressor Cylinder Assembly**
- **Frame Assemblies and Compressor Configurations**
- **Cooling and Lubrication**
- **Capacity Control**
- **Performance & Design Calculations**
- **Case Studies and Compressor Applications**

CEUs awarded: 1.4



Control, Operation & Design of Screw Compressors

Course length: 1 day

This course gives a thorough introduction to the control, design and operation of positive displacement helical screw compressors. This type of compressor is used for both air and process gas applications.

The course will be a mixture of workshops using computer simulation models, short lectures, practical exercises and videos where appropriate.

Suitable for: engineers, maintenance and operations personnel who work with screw compressors.

Key topics covered:

- **History of Screw Compressors**
- **Compression Principles and Thermodynamics**
- **Oil Free Screw Compressors**
- **Oil Injected Compressors**
- **Control**
- **Operation**
- **Performance Calculations**
- **Compressor Design**

CEUs awarded: 0.7

Control & Operation of Industrial Gas Turbines

Course length: 2 days

This practical course offers a comprehensive overview of the operation and control of industrial gas turbines used for both power generation and as drives for compressors and pumps. The course explains how a turbine works and the different types in common use. How to control and operate turbines efficiently and key troubleshooting techniques and information will also be explained.

The course is structured to address the needs of engineers and operations personnel who have a requirement to understand the principles of the gas turbine and how industrial units are configured to perform driver duties.

Suitable for: chemical, instrumentation, process, mechanical, maintenance and electrical engineers. Also process plant operation, maintenance and supervisory staff together with anyone who requires an understanding of the operation and control of industrial gas turbines.

Key topics covered:

- **Introduction**
- **Basic Design**
- **Thermodynamics**
- **Gas Generator Compressor**
- **Combustion**
- **Control Strategies**
- **Safeguarding**
- **Emissions**
- **Efficiency**

CEUs awarded: 1.4

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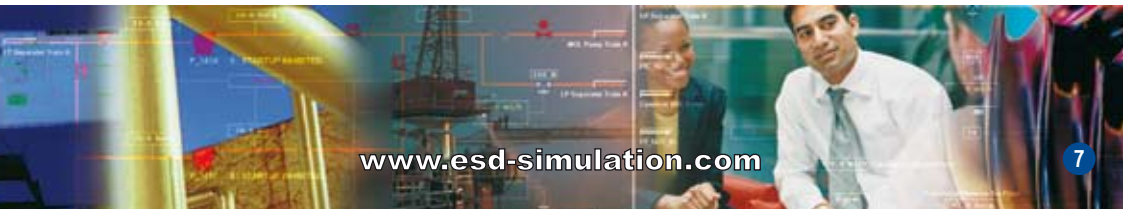


Practical Aspects of Compressor Control using the CCC* System

Course length: 2 days

This course gives a thorough appreciation of the CCC compressor control system, including practice sessions on tuning and setting up the controllers on a CCC simulator.

Suitable for: instrument technicians, supervisors, operations technicians and engineers.

Key topics covered:

- Control Modes Employed
- Functions Implemented
- What the Information from the CCC Controllers Means
- Correct Operational Response to 'Safety On'
- Correct Operational Response to 'Recycle Trip'
- Interface with Distributed Control Systems
- The Importance of DEV (Deviation)

* Compressor Controls Corporation

Mechanical Aspects of Centrifugal Gas Compressors

Course length: 2 days

This course explores the construction and configuration of the centrifugal compressor in some detail.

Suitable for: anyone involved in the specification, maintenance, inspection & operation of centrifugal compressors.

Key topics covered:

- Principles of Operation
- Designs
- Construction
- Configurations
- Rotor Assembly
- Casing/Shaft Seals
- Lubrication
- Condition Monitoring
- Gas Cooling
- Liquid Knockout
- Piping Systems
- Instrumentation
- Compressor Installation
- Compressor Operations

CEUs awarded: 1.4 per course

Optimisation and Troubleshooting of Compressors

Course length: 5 days

This hands-on course uses dynamic simulation models to give a practical introduction to control, operation and troubleshooting of centrifugal and reciprocating compressors. There will be a strong emphasis on the troubleshooting and optimisation of existing compressor operations and on the use of various techniques to analyse performance. These techniques will be supported by specially developed checklists, which will cover all the key troubleshooting activities.

The key issues which will be addressed for existing compression plants are:
- how to maximise throughput
- how to minimise downtime

Suitable for: experienced engineers and operations personnel.

Key topics covered:

Centrifugal and Reciprocating Compressors
- Comparison of centrifs and recips
- Compression principles and thermodynamics
- How do the compressors raise pressure?
- Gas turbine principles
- PV diagram

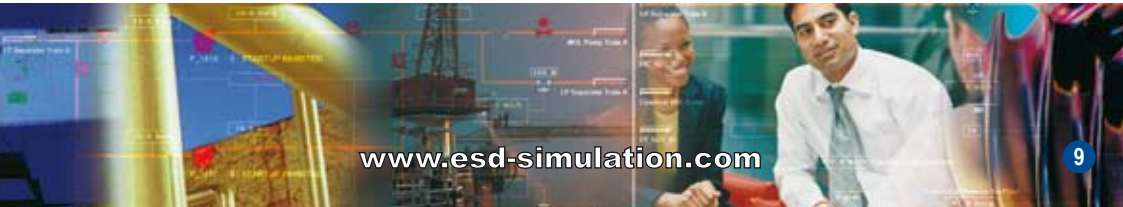
Maintenance Issues-
Reciprocating and Centrifugal Compressors
- Reciprocating compressors - materials of construction, dry-wet running, valves, piston rods
- Centrifugal compressors - dry gas seals, active magnetic bearings, fouling
- Gas turbine reliability
- Checklist for a reciprocating compressor
- Checklist for a centrifugal compressor

Reciprocating Compressors
- Operation
- Troubleshooting

Centrifugal Compressors
- Operation
- Control
- Anti-surge control
- Complex anti-surge control

Workshop Session
- Troubleshooting & optimisation
- Efficiency, head & horsepower calcs
- Case study exercises

CEUs awarded: 3.5 per course



Practical Aspects of Process Control & Instrumentation

Course length: 3 days

This course gives a practical introduction to the principles of measurement and control of process plant. It is a hands-on course and participants will have the opportunity to explore the set-up and tuning of control loops using simulation and other computer-based training packages.

It will also be useful to anyone working in the process industries who would like to understand the techniques used in measurement and control and who have not had the opportunity to learn about them before.

Suitable for: recent graduates, new starts or anyone requiring a practical introduction to measurement and control systems on process plant.

Key topics covered:

- **Principles of Control**
- **Measurement Principles**
- **PID Control**
- **Controller Tuning**
- **Feed-forward, Ratio and Cascade Control**
- **Control Techniques**
- **Computer Control Systems - DCS, SCADA, PLCs**
- **Control Valves**

CEUs awarded: 2.1

For those wishing to go that extra mile.....

Advanced Process Control

A 2 or 3 day intensive course with extensive use of simulation software which allows many practical examples to be used and control strategies to be implemented.

Suitable for: engineers, chemists, operations and maintenance personnel with a basic understanding of process control. Also suitable for previous attendees of the “Practical Aspects of Process Control & Instrumentation” course.

Principles of Glycol Dehydration

Course length: 2 days

This course provides a comprehensive study of the glycol dehydration process including what the plant is designed to do and how the process is controlled as well as the conventional start-up and shutdown operations.

Suitable for: operations personnel who have some level of responsibility for the operation, control or management of the glycol plant.

Key topics covered:

- **Liquid Absorption using TEG (Tri-ethylene Glycol)**
- **Process Flow Scheme**
- **Contactor Tower**
- **Regeneration System**
- **Process Control**
- **Safeguarding**
- **Start-up and Shutdown Operations**

CEUs awarded: 1.4

Control & Operation of Distillation Columns

Course length: 3 days

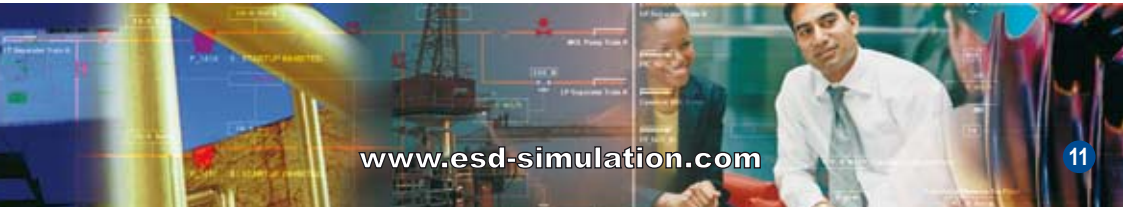
The principles of distillation will be covered in detail on this course in order to provide a platform on which the discussion of distillation column design, control and operation will be based.

Suitable for: operations personnel whose work scope involves any number of tasks related to the management, control and operation of distillation units in a variety of refinery process plants.

Key topics covered:

- **Principles of Distillation**
- **Distillation Process**
- **Process Control**
- **Control Systems**
- **Tower Design**
- **Fractional Distillation**
- **Crude Oil Distillation**
- **Vacuum Distillation**
- **Special Application Distillation**

CEUs awarded: 2.1



Production, Process and Emergency Systems on Oil & Gas Installations

Course length: 3 days

This intensive course offers both an introduction to, and a comprehensive overview of, the production, processing and emergency systems on offshore platforms and floating production facilities.

Suitable for: engineers and operations personnel, recent graduates, engineers moving into or within the industry and regulatory officials and inspectors.

Key topics covered:

Production & Processing

Well Fluids
- hydrocarbon chemistry

Production
- reservoirs and their exploitation
- production wells

Primary Processing
- three phase separation
- developments in subsea processing

Gas Processing
- gas plant flow schemes
- compression systems
- gas treatment
- oil/gas export
- produced water
- utility systems

Emergency Systems

Emergency Systems
- architecture of ESD systems
- designed for safety
- building a protective system
- management of system
- flare and vent systems

Fire & Gas Systems
- architecture of fire & gas systems
- system components
- protection devices

CEUs awarded: 2.1

Natural Gas Treatment Processes

Course length: 3 days

This course is designed to provide comprehensive coverage of the processes used for the treatment and conditioning of natural gas streams, allowing them to be delivered, via long distance pipelines, to end users as either intermediate or sales products.

The course also covers the handling of the treatment by-products by methods of recovery or disposal.

In the context of this course the term "Natural Gas" is used to describe three types of hydrocarbon vapour streams; those which originate from reservoirs where only gas can be economically recovered; those which are the resultant vapour phase of the flash separation of well fluids from gas/condensate reservoirs; or those which result from the flash separation of well fluids from oil reservoirs.

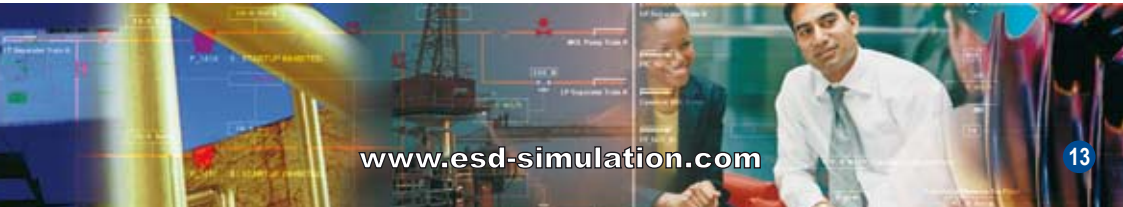
Suitable for: persons of all engineering disciplines who have little or no previous experience of gas processing but due to changes in work scope require a good working knowledge of the industry.

Process personnel who may be transferring from another sector of the oil industry into the primary production area will find the course fulfills their needs for an in-depth overview. The course will also appeal to operations personnel of all disciplines who require to broaden their knowledge of the gas processing industry.

Key topics covered:

- **Natural Gas Characteristics**
- **Gas Treatment Processes**
- **Gas Sweetening**
- **Acid Gas Disposal**
- **Gas Dehydration**
- **Gas Conditioning Processes**
- **Gas Transmission by Pipeline**
- **NGL Recovery**

CEUs awarded: 2.1



Well Management and Artificial Lift

Course length: 2 days

This course provides a comprehensive study of the formation of oil and gas reservoirs, their flow characteristics and the management of them, in order to optimise recovery both naturally and by use of artificial means.

The course studies both the principles and practicalities of well operations including a description of the mechanical design of wells for both natural and artificial lift.

The study of the phase behaviour of well fluids and the process of three-phase separation at the wellhead is also covered as is the design and operation of a typical wellhead separation plant.

Suitable for: operators and technicians.

Key topics covered:

- **Oil & Gas Reservoirs**
- **Reservoir Management**
- **Enhanced Oil Recovery (EOR)**
- **Design of the Well**
- **Well Operations**
- **Fluid Behaviour**
- **Three-Phase Separation**
- **Wellhead Separation Plant**
- **Operation of a Wellhead Plant**

CEUs awarded: 1.4

Subsea Systems

Course length: 2 days

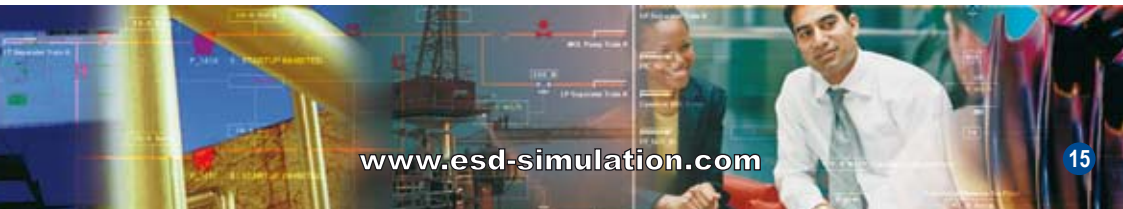
This course is intended to provide a comprehensive study of subsea systems. The coverage will include the design of such systems, the equipment installed and how the system is monitored and controlled from the platform. The course assumes that the participants already have some understanding of petroleum production technology and a basic understanding of process control and safeguarding systems will also be an advantage.

Suitable for: engineers and other personnel whose work scope involves the specification, design, operation or management of offshore projects.

Key topics covered:

- **Field Development**
- **Subsea Completions**
- **Control Umbilical**
- **Control Systems**
- **Well Workover**

CEUs awarded: 1.4



Design & Operation of FPSOs

Course length: 3 days

This course has been designed to provide a comprehensive study into the subject of modern floating production systems. The subject matter is presented in a manner to reflect what might be considered a standard project development path and encompasses the areas of technology, engineering, project management and legislation.

Suitable for: a wide range of personnel whose work scope involves the specification, design, management or operations of FPSO projects.

Key topics covered:

- **Introduction to Floating Production Systems**
- **Field Development**
- **FPSO System**
- **Mooring and Turret Design**
- **Subsea System**
- **Marine Systems**

CEUs awarded: 2.1

Floating LNG - Production Storage Offloading & Re-gasification

Course length: 2 days

This course is designed to give a comprehensive overview of the production, storage and transfer of liquefied natural gas (LNG) in a marine environment.

The course also considers the subject of offshore reception terminals and the re-gasification of the LNG for onward transmission to the onshore distribution network.

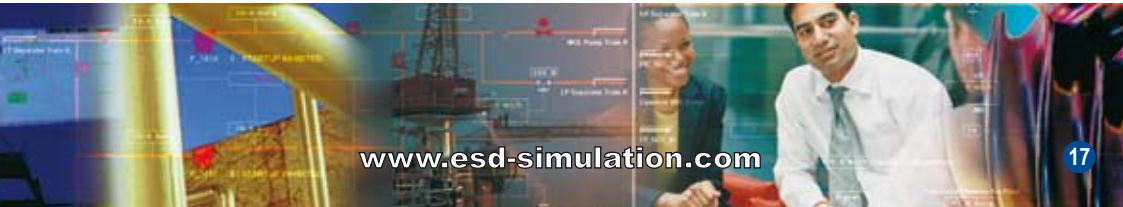
The emphasis is on the safe handling of LNG in the open sea with specific reference to the role of the FPSO and the conversion of standard LNG carriers to FPSO service.

Suitable for: engineers and managers who are involved with the design of offshore LNG facilities. It will also be of interest to those who may have a future need to understand the challenges and technologies being applied to this new area of the offshore industry.

Key topics covered:

- **Physical Properties of LNG**
- **Challenges of Offshore LNG Production**
- **Conversion of Natural Gas to LNG**
- **LNG Storage**
- **LNG Transfer**
- **LNG Loading and Offloading**
- **Offshore Reception Terminals**

CEUs awarded: 1.4



Central Control Room Operations Simulator - 'PEARL'

Reflecting the behaviour of a real plant, this process model consists of the main process areas typically found on an oil & gas plant. Starting up the plant, bringing it to full production, shutting it down - all operations are able to be performed in a controlled way using 'PEARL'.

'PEARL'
Central Control Room Operations Simulator

Fundamentals of Control Room Operations

- 5 days
- prospective control room operators, team leaders, supervisors and anyone wanting to experience control room operations in a simulated environment.

Advanced Control Room Operations

- 2 days
- control room operators who would benefit from refresher training in handling abnormal conditions.

Introduction to Control Room Operations

- 2 days
- supervisors, OIMs, chief engineers.

All courses will offer delegates the opportunity to role-play as control room operators and interact with the process and shutdown systems.

Assessment

ESD are able to carry out assessment against national standards including the following:

- CSA
- NOPSA
- ANSI
- OPITO

Alternatively, for those companies with their own in-house assessors, arrangements can be made for them to observe the relevant sections of the training in order to conduct their own assessment.

Modular Programmes

ESD offers modular training programmes for both operators and engineers. Each module is self contained being either one, two or three days in duration.

The aim of each set of modules is to give the delegates a thorough introduction to the practical issues associated with each of the module topics, with the emphasis being on the real world application of technology in each area.

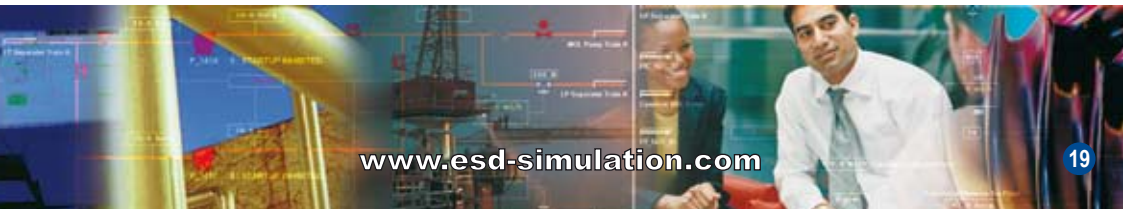
Oil and Gas Process Operations Modules (for operators)

Module No	*Topic*	*Duration*
1	Introduction to the Oil and Gas Business	1 day
2	Oil and Gas Processing and Emergency Systems	3 days
3	FPSO Operations	2 days
4	Process Control for Operators	2 days
5	Compressors	2 days
6	Pumps	1 day
7	Glycol Dehydration	2 days

Mechanical Engineering Appreciation Courses (for engineers)

Module No	*Topic*	*Duration*
1	Compressors	2 days
2	Pumps	1 day
3	Drivers	1 day
4	Vessels	1 day
5	Piping/Pipe Stress	1 day
6	Materials of Construction	1 day
7	Welding	1 day
8	Projects	1 day
9	Heat Exchangers	1 day

As with all ESD training, the particular topics and target audience for modular courses can be altered to suit the specific needs of an organisation.



Non Technical Training

This range of courses has been developed specifically for those without an engineering background. All courses are one day in length and can be run at either an ESD training centre or client facilities.

Floating Production Storage and Offtake Systems (FPSOs)

In Brief: A comprehensive overview of the nature and purpose of a floating production, storage and offtake system, commonly called an FPSO. In the business of offshore oil production, such systems have become very popular over the last 15 years, being used throughout the world.

Key topics covered: The FPSO concept, An FPSO, The ship, How the ship is moored, The oil field, The process plant, Crude oil storage and offloading, The future.

Reservoir Engineering and Drilling

In Brief: Covering numerous topics from how reservoirs are formed through to the actual production phase, this course will provide all those without a technical background with a better understanding of both reservoir engineering and drilling.

Key topics covered: Reservoir engineering, What constitutes an oil/gas reservoir, Planning the exploitation, Natural and artificial flow, Production engineering, Drilling, Drilling equipment, Completing a well, Well workover.

Subsea Systems

In Brief: A comprehensive overview of the subsea systems within the offshore oil and gas industry. By providing a better understanding of the subsea sector of the industry, it will give all those working within this sector the knowledge to offer more effective support to their technical colleagues.

Key topics covered: Oil/Gas reservoirs, How reservoirs produce, Offshore drilling rigs, Getting into deep water, Wells and workovers, Transporting the well fluid, Umbilicals - the life lines, The big subsea challenges.

Non Technical Training

Continued.....

The Oil and Gas Industry - A Non Technical Overview

In Brief: The scope of the course covers all the main sectors of the industry from the reservoir to offshore production and processing to crude oil refining and gas utilisation. For each of the main sectors the activities and technology will be explained in a clear, concise manner with the objective of introducing the day-to-day terminology and phraseology of the industry.

Key topics covered:

- Oil and Gas Reservoirs
- How Reservoirs Produce
- Offshore Production Platforms*
- Separating the Well Fluid
- Oil Sands*
- Crude Oil Processing
- Gas Processing
- Coal Seam Methane (CSM)*
- Gas Export
- The Future

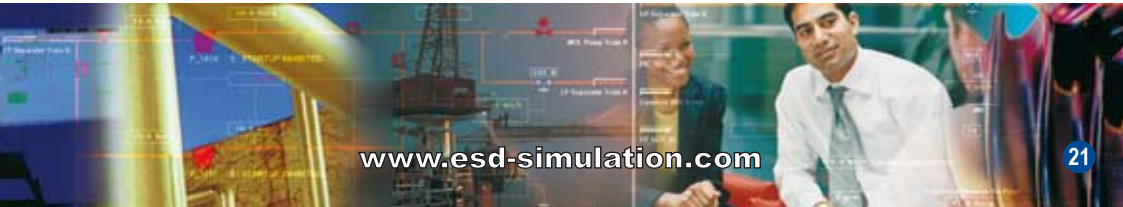
*Depending on type of production facility (adjusted per region)

Mix and match

As with all other courses in the non technical range, this course is one day in duration. However, when the scope of training is required to cover the entire range of topics above, the course duration will be increased to 2 days.

Alternatively, a mix and match of topics can be applied by choosing only those topics above that are required - ESD will advise duration once topics have been selected.

Please note, any variation from the standard course (including full 2 day) is available only on a client specific basis and is not run as part of the open access programme.



Customised Training

With a wide and varied range of courses on offer, together with a significant choice of locations, the ESD open access programme provides something for most people working within the process industries.

Many ESD clients however choose to go one stage further by having courses that are specifically designed for their individual platforms or processes. By using process schematics and extensive dialogue with the client, ESD is able to tailor the training to be representative of the specific processes in question - not forgetting of course the all important suite of dynamic simulation models to aid the learning outcome for delegates.

As with all ESD training, customised courses can be run at an ESD training facility or at the client's premises – whichever is more convenient. Customised courses are not only of the utmost relevance to their target audience but can also prove to be very cost effective. To find out more, just contact a member of the ESD team using the contact information on the back page.

The Trainers

All ESD trainers are time-served process engineers with years of hands-on experience between them (more than they care to admit…) together with those all-important qualifications.

More than that though, they are all very experienced trainers.

It is their ability to share knowledge which ensures that all delegates receive solid, effective training - enabling them to increase their individual skills and performance at work.

ESD locations

This really is where ESD clients are spoilt for choice. With purpose built training facilities in Kelowna (Canada), Aberdeen (Scotland) and Perth (Australia), as well as first class 3rd party facilities in all other ESD locations, possibly the hardest question to answer when deciding on which ESD course to attend is not when, but where!

CANADA, Kelowna

The global headquarters of ESD is based in Kelowna in the heart of the Okanagan Valley. Perhaps most renowned for its internationally recognised wines, this stunning area of British Columbia has everything. From majestic mountains, refreshing waters and lush orchards to one of the longest and driest summers in Canada – a golfer's paradise!

AUSTRALIA, Perth

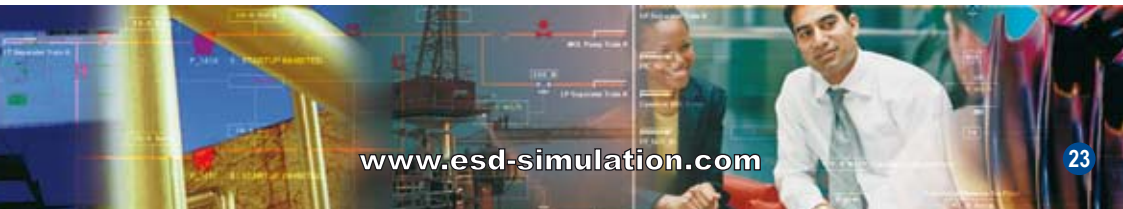
Offset by the vast tranquil waters of the Swan River, the beautiful city of Perth is both modern and vibrant. Commonly referred to as the 'friendly city', Perth is today experiencing record growth being a premier destination for business, entertainment, nightlife, culture and the arts – all helped along by year round sunshine!

UK, Aberdeen

With its sparkling granite buildings, Aberdeen has one of Scotland's most enchanting skylines, while the old town has a magical air of time gone by. The capital of the Grampian Highlands is even more unique thanks to the treasure on its doorstep – malt whisky trail, castle trail, champion golf courses, ski slopes or just head to the coast where vast, empty and dramatic cliff top scenery is waiting to be explored.

USA, Houston

Houston is the nation's fourth largest city, home to 2 million people and a hub of international business. A vibrant international city, Houston is a mecca for visual arts, science, history and cultural heritage. It's cultural diversity and uninhibited attitude combine to boost the local culinary scene, whilst being the land of malls ensures it is the power-shopper's paradise.



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