Oil and Gas Engineering
for Undergraduates, Graduates & Business Development Team

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Summary: Project Management, Production Systems (Onshore | Offshore | Subsea), Drilling Engineering
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Aim | Objectives

- Appreciation of Oil and Gas Engineering
Outline | Expectations

- **Module 1**: Genesis of Oil & Gas
- **Module 2**: Facilities and Processes
- **Module 3**: Super Majors | Combined Companies
- **Module 4**: Service Companies
- **Module 5**: Oil and Gas Specialist Services
  - Integration – Practical
- **Module 6**: Oil and Gas Production Facilities
- **Module 7**: Practical Oil and Gas Exploration and Development – TULLOW Oil PLC
Module 1: Genesis of Oil & Gas
Introduction

- The first successful oil well was drilled by "Colonel" Edwin Drake in 1859.

- It was located in north-western Pennsylvania.

- The well were shallow by modern standards.

- The oil were collected in wooden tanks.

- This sparked internationally the search for an industrial use for petroleum.
Watch Video Module 1: Genesis of Oil and Gas - Introduction
Introduction

- Oil replaced most other fuels for motorized transport.

- The automobile industry developed at the end of the 19th century, and quickly adopted oil as fuel.

- Gasoline engines were essential for designing successful aircraft.

- At the same time, the petrochemical industry with its new plastic materials quickly increased production.
Introduction

- Gas production is gaining market share as liquefied natural gas (LNG) provides an economical way of transporting gas from even the remotest sites.

- Chemicals derived from petroleum or natural gas – petrochemicals – are an essential part of the chemical industry today.
Introduction

- The demand for synthetic materials to replace costly and sometimes less efficient products caused the petrochemical industry to develop into a major player in modern economy and society.

- With oil prices of $100 a barrel or more, even more difficult-to-access sources have become economically viable.
Introduction

“With increasing consumption and ever-increasing conventional and unconventional resources; the challenge becomes not one of availability, but of sustainable fossil fuels in the face of rising environmental impacts, that range from local pollution to global climate effects.”
Module 2: Facilities and Processes
Facilities and Processes

- The oil and gas industry facilities and systems are broadly defined, according to their use in the oil and gas industry production stream.

- Production stream division comprises of:

  - **Upstream**: Exploration & Production
  - **Midstream**: Transportation & Refining/Processing
  - **Downstream**: Distribution & Retail Sale
Watch Video Module 2: Oil and Gas Production Stream Division
Facilities and Processes

Upstream production system division refers to all facilities for exploration and production.

It covers the search for and recovery and production of crude oil and natural gas.
Facilities and Processes

Oil and Gas exploration take place before the development of a field is finally decided.

It comprises of:

- Prospecting,
- Seismic and
- Drilling activities
A series of surveys, starting with broad geological mapping using increasingly advanced methods such as:

- passive seismic,
- reflective seismic,
- magnetic and
- gravity surveys

Data is collected and transferred with sophisticated analysis tools that identify potential hydrocarbon bearing rock as “prospects.”
Watch Video Module 2: Oil and Gas Exploration
**Exploration**

Oil companies spend much time on analysis models of good exploration data.

The will only go into drilling phase when models give a good indication of **source rock** and **probability** of finding oil or gas in **commercial quantity**.
Exploration

The first wells in a region are called wildcats.

Little is known about potential dangers, such as the downhole pressures that will be encountered.

It requires particular care and attention to safety equipment.

If a find (strike, penetration) is made;
Exploration

Additional reservoir characterization such as production testing, appraisal wells, etc., are needed to determine the size and production capacity of the reservoir.

Note: This is to justify development decisions.
Facilities and Processes

**Midstream** production system division refers to:

- Gas treatment plants,
- LNG production and regasification plants,
- Oil and gas pipeline systems.
Facilities and Processes

**Downstream** production system division refers to where oil and condensates are processed into **marketable products** with defined specifications such as:

- Gasoline,
- Diesel or feedstock for the petrochemical industry.

Refinery offsites such as **tank storage** and **distribution terminals** are also categorized under downstream.
Facilities and Processes

Petrochemical production system division refers to chemical products where the main feedstock is hydrocarbons.

Products include:

- Adhesives,
- Carpeting,
- Cosmetics,
- Plastics,
- Fertilizer,
- Rubber, Fabrics and Paints.
Module 3: Super Majors | Combined
Super majors refers to companies that participate in all the three (3) Oil and Gas divisions i.e. *upstream, midstream* and *downstream*.

Example includes:
Module 4: Service Companies
Watch Video Module 4: Oil and Gas Service Companies
Service Companies

This refers to companies that provide services to the oil and gas companies but do not produce petroleum or petroleum products themselves.

Example include:

- Schlumberger,
- Halliburton,
- Abbeycourt Energy Services,
- Chess Subsea Engineering,
- One Subsea.
Module 5: Oil and Gas Services Integration
Intro Demo 1
Watch Video Module 5: Oil and Gas Service Integration
Module 6: Oil and Gas Production Facilities
Production System Facilities

Onshore

- Onshore production is economically viable from a few dozen barrels of oil a day and upward.
- A gas gathering network is used to gather production from thousands of wells, several hundred Kilometres / miles apart onshore.
Production System Facilities

Onshore Well

- The gathering network is fed into a processing plant.
Production System Facilities

Onshore Well

- Product is sent from the plant by pipeline or tankers.
Production System Facilities

Offshore

- A whole range of different structures is used offshore, depending on size and water depth.
Production System Facilities

Offshore
Module 7: Practical Oil and Gas Exploration and Development – TULLOW Oil PLC
Watch Video Module 7 : Tullow Oil PLC