

INDUSTRIAL VISIT TO OIL INDIA LIMITED MORAN



Submitted by

**FINAL YEAR STUDENTS(BATCH 1 OF VISIT)
MECHANICAL ENGINEERING DEPARTMENT**

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We extend heartfelt thanks to the alumni members for funding and organizing the entire visit, and for their warm hospitality at Moran, as well as for taking the time out of their busy schedules to personally guide and educate us about the workings of the Rig, OCS, and GCS units.

Your efforts in providing such a student-friendly and enriching learning experience have greatly contributed to bridging the gap between classroom learning and industrial application. We deeply appreciate your continuous support and commitment toward the growth and exposure of us.

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INTRODUCTION

Oil India Limited (OIL) is a fully integrated Exploration & Production company in the upstream sector, with origin dating back to the glorious year (1889) of oil discovery in India. A Maharatna Company, OIL is a state-owned enterprise of the Government of India, under the administrative control of the Ministry of Petroleum and Natural Gas and is the second largest national oil and gas company in India.

The story of OIL traces and symbolizes the growth and development of the Indian petroleum Industry. From the discovery of the crude oil in the far east of India at Digboi, Assam in 1889 to its present status as a fully integrated National Exploration and Production company with footprints across entire E&P value chain. The company is India's second largest National E&P Company.

Oil India Private Limited was incorporated on 18th February 1959, to expand and develop the newly discovered oil fields of Naharkatiya and Moran in the North-Eastern region of India. In 1961, it became a joint venture company of Government of India and Burmah Oil Company Limited, UK. In 1981, OIL became a wholly owned Government of India enterprise.

Visions of the company:

- Be a leading and future ready integrated energy company committed to sustainable energy security of India through performance excellence.

DRILLING RIG VISIT

Location: Lakwagaon, Demow, Sivasagar, Assam.

Company: Oil India Limited

Rig: S-6 (E-1400 HPAC SCR)

Visit Duration: 1 Day

Well Type: J-Bend, Development

Target Depth: 3950m, KOP at 1400m

Date: 1/11/2025.

Introduction

We, students of 4th year MED, JEC, undertook one-day industrial visit to the development drilling site at Location Lakwagaon ,Demow operated by Oil India Limited (OIL). The objective of the visit was to gain practical exposure to on-site drilling operations and understand the technical and logistical complexities involved in deep well development. The primary objective of the visit was to gain practical exposure to on-site drilling operations. The visit provided insights into well site operations, Bottom Hole Assembly (BHA) handling, and common operational challenges.

Objective of the Visit

- To observe key drilling activities in real time.
- To understand rig operations, equipment usage, and fluid systems.
- To analyze operational challenges and their engineering solutions.
- To appreciate the role of safety, coordination, and decision making in the field.

Equipment and Systems Observed

- Rotary and Hoisting: Top drive, rotary table, drawworks, traveling block
- Circulation System: Mud pumps, tanks, agitators, shale shakers
- Power System: Diesel-electric generators, SCR controls
- Well Control: BOP stack, choke manifold, accumulator system
- Monitoring Tools: Mud logging unit, trip tank, flow meter, in the field.

4. The key learnings and insights gained from this visit can be summarized as follows:

- **Drilling Operations:** We observed core drilling activities on-site, understanding the function and coordination of rig components such as the hoisting system, rotary equipment, and circulation systems.
- **Mud Engineering:** The visit provided insight into the role of drilling fluids in wellbore stability, cuttings transport, bit cooling, and pressure control. We studied mud properties like density, viscosity, pH, and filtration, and learned about lab testing methods for mud quality monitoring and chemical additive selection.
- **Cementing Operations:** Ensuring mechanical integrity of the well, the cementing process was explained in detail. We understood how Class G cement is mixed, pumped, and set to achieve zonal isolation and casing support. Slurry design considerations and the use of additives to prevent gas migration and fluid loss were also covered.
- **Directional Drilling:** We learned how directional drilling enables precise well placement to reach reservoirs that are not vertically aligned. Various well profiles like J-Bend, S-Bend, and horizontal sections were discussed along with the role of MWD/LWD tools and the use of software for trajectory planning and control.
- **Rig Building and Maintenance:** The rig-up and rig-down procedures were thoroughly explained emphasizing the importance of proper alignment.
- **Health, Safety, and Environment (HSE):** Oil India Limited places utmost importance on safety. We were educated on HSE protocols, Permit to Work systems, risk assessment procedures, and the use of personal protective equipment (PPE). Participation in safety drills and toolbox talks gave us a clear understanding of on-site safety culture.
- **Industry Exposure:** In addition to technical knowledge, we were also exposed to industry curriculum, ethics and code of conduct; an environment of discipline, hardwork and years of glorious legacy.

VISIT TO WORKOVER RIG

Workover rigs are **essential pieces of equipment in the oil and gas industry**, specifically designed for **maintaining and improving the productivity of existing oil or gas wells**. Unlike drilling rigs, which are used to initially bore and complete a well, workover rigs are employed *after* the well has been drilled and put into production. They perform a variety of operations collectively known as "**workover**" operations or "**well intervention**".

Key Role and Function

The primary function of a workover rig is to **pull out and run in well tubing, rods, and other downhole equipment** to perform necessary maintenance, repairs, or stimulation treatments. These interventions are crucial because over time, a producing well's efficiency can decline due to a number of factors:

- **Equipment Failure:** The downhole pumps, rods, or tubing can become worn, corroded, or damaged.
- **Formation Damage:** The reservoir rock near the wellbore can become plugged or damaged, restricting the flow of hydrocarbons.
- **Water or Gas Breakthrough:** Unwanted water or gas may begin to flow into the wellbore, reducing the oil or gas cut.
- **Change of Production Zone:** It may become necessary to switch production to a different geological zone within the well.

Structure and Components

While there is variation in size and capability, a typical land-based workover rig shares many structural similarities with a drilling rig, but is generally **lighter, smaller, and more mobile** since it doesn't need to handle the massive loads required for initial drilling.

1. Mast or Derrick

The **mast** is the tall, vertical structure that supports the *crown block* and provides the necessary height to pull out sections (called "stands") of tubing or rods. Unlike the lattice-style derrick of a drilling rig, workover masts are often **telescoping** and can be raised and lowered hydraulically, significantly speeding up rig-up and rig-down times.

2. Substructure

The **substructure** is the foundational base upon which the mast and *drawworks* are mounted. It raises the rig floor to provide adequate space underneath for the *blowout preventer (BOP)* stack and wellhead equipment.

3. Drawworks

The **drawworks** is essentially the large winch that provides the power to hoist and lower the *travelling block* and, subsequently, the tubing or rods. It's the engine of the hoisting system, utilizing steel cable (wire rope) to manage the movement of the load.

4. Power System

Workover rigs are powered by large **diesel engines** or sometimes electric motors. These engines drive the drawworks, mud pumps (if used), and other auxiliary equipment.

5. Well Control Equipment (BOP)

The **Blowout Preventer (BOP)** stack is a critical safety system installed on the wellhead. It consists of a series of high-pressure valves and rams designed to seal the wellbore in an emergency, preventing the uncontrolled release of oil, gas, or formation fluids (a "blowout"). Workover BOPs are generally smaller than drilling BOPs but serve the same vital purpose.

6. Auxiliary Equipment

- **Tubing and Rod Handling Tools:** Tongs, elevators, slips, and specialized handling equipment for safely gripping and moving the downhole tools.
- **Fluid Pumps and Tanks:** Used for circulating well control fluids (brines or muds), or for pumping stimulation fluids (acids or fracturing fluids).
- **Accommodation and Control Cabin:** A cabin where the *driller* or *operator* controls the rig's main functions.

Typical Workover Operations

The versatility of the workover rig allows for a wide array of interventions:

- **Tubing and Rod Change:** Replacing corroded or damaged production tubing, sucker rods, or downhole pumps (e.g., an Electrical Submersible Pump or ESP).
- **Well Stimulation:**
 - **Acidizing:** Pumping acid to dissolve flow-restricting damage near the wellbore.
 - **Hydraulic Fracturing:** Creating or extending fractures in the reservoir rock to increase the flow path of hydrocarbons.
- **Zonal Isolation (Squeeze Cementing):** Pumping cement under high pressure to seal off unwanted production (e.g., water or gas breakthrough) or to repair leaks in the casing or cement sheath.
- **Reperforation:** Using a specialized gun to create new holes in the casing and cement to establish better communication with the reservoir.
- **Fishing Operations:** Retrieving lost or stuck equipment ("fish") from the wellbore using specialized fishing tools.
- **Recompletion:** Isolating a depleted zone and re-opening a different zone higher or lower

VISIT TO OIL COLLECTING STATION

Oil Collecting Station (OCS) plays a vital role in the oil and gas industry. This facility collects crude oil from various wells and fields in the region, measures its volume and quality, and stores it in tanks. As a key logistics hub, it supports the upstream oil industry in the region, enabling the smooth operation of oil fields and production facilities. By consolidating oil production from multiple sources, OCS 4 is a critical infrastructure for Oil India Limited (OIL) and the entire oil and gas industry in the region.

The overall process of OCS is explained below:

- The OCS-4 collects crude oil from two type of Well, High Pressure (HP) Well and Low Pressure (LP) Well.
- The crude oil of HP Well is connected to HP manifold and of LP Well is connected to LP manifold and further sent to Indirect Heater.
- After Indirect Heating the HP crude oil is sent to Group Unit. Here the gas separates from the crude through Gavity separation and the High Pressure Gas (250 psi) is sent to Disturbing Network passing through High Pressure Master Separation (HPMS). The rest crude is further sent to Three Phase Separator (TPS) with LP Crude oil.
- In the TPS the crude oil separates through Gavity Separation. As water is heaviest among water, gas and oil, formation water settle down to bottom, gas settle to upper and oil in between Gas and Formation Water.
- The Gas separated in TPS is Low Pressure Gas (30 psi) and so sent to Gas Compression Station (GCS) to boost pressure up to 250 psi.
- Now the crude is consist of oil, emulsion and water. So it is sent to Emulsion Theatre (ET). Here a chemical named Oil Soluble Demulsifier (OSD) is dosed for easy separation of formation water.
- The formation water of ET is processed for de -oil (less than 10 ppm) and sent to Formation Water Storage Tank.
- The dehydrated crude from ET is further processed to Stabilizer. After stabilization it stores the dry crude in Crude Oil Storage Tanks.

Visit to a Gas Collecting Station (GCS)

A Gas Collecting Station (GCS) serves as the primary hub for gathering raw gas and associated liquids from multiple wellheads within a field cluster. The station's fundamental role is to perform initial purification and conditioning of the natural gas stream primarily by separating out liquids (oil and water) and removing contaminants to meet the quality specifications required for long-distance pipeline transmission or further processing.

The GCS visited handles an inlet stream of multiphase fluid (natural gas, crude oil/condensate, and produced water) delivered via gathering lines from approximately 15 active wells. The final products are export-quality dry natural gas and stabilized condensate, which are routed to separate sales pipelines.

Key Process:

Gas/Liquid Separation

The incoming stream is highly variable, often containing large slugs of liquid. Initial processing is essential to protect downstream equipment, particularly the compressors.

Gas Compression

The separated gas often arrives at low to medium pressure and must be boosted to meet the required pressure for pipeline export.

SNAP SHOTS



Conclusion

The visit provided a clear understanding of the integrated upstream process:

Rig: Observed large-scale drilling operations and essential safety protocols for accessing hydrocarbon reservoirs.

OCS (Oil Collection Station): Witnessed the initial separation of well fluids (oil, gas, water) post-drilling.

OGS (Oil Gathering Station): Saw the final processing (dehydration and purification) of crude oil to meet quality standards before dispatch.

Overall Takeaway: The entire operation is a continuous, highly coordinated technical chain, demonstrating a commitment to efficiency, advanced technology, and safety from subterranean exploration to market-ready crude oil.