NATIONAL INSTITUTE OF TECHNOLOGY AGARTALA

Department of Electrical Engineering

WINTER TRAINING REPORT 2023

OIL AND NATURAL GAS CORPORATION

Limited, Tripura Asset

SUBMITTED TO:

SHRI PRASOON KUMAR

SUBMITTED BY:

SHASHWATA DATTA

CERTIFICATE

This is to certify that the candidate Shashwata Datta, a student of 3rd year pursuing Bachelor of Technology in the Department of Electrical Engineering in National Institute of Technology Agartala, has satisfactorily completed the Industrial training from 19th December 2023 to 18th January 2024 under my guidance in our organization. During his training period he has gathered knowledge about different instruments used in Assets Workshop like lathe, milling & drilling machines, crane, pump, welding machines, engines etc. He has also gathered knowledge about operations of various levels, workshops (Electrical & Gas Genset House), equipment used & various procedures of drilling rig, CGS, etc.

The training was carried out under my guidance and supervision. The report covers the required contents, covered during the training period.

MENTOR

TRAINING CO-ORDINATOR

ACKNOWLEDGEMENT

I would like to express my utmost gratitude to Dr. Rup Narayan Ray , our esteemed Head of Department, for affording me the invaluable opportunity to undergo Winter Training at ONGC on Asset Workshop. His support and encouragement have been instrumental in shaping my professional growth.

Furthermore, I would like to extend my sincere appreciation to Miss Chanda Rana, the HR representative of ONGC Agartala, and the entire HR department for graciously allowing us to pursue our training within their esteemed institution. Their willingness to accommodate and support us has been truly commendable.

I am deeply obliged to Mr. Febin Kuryan Sir, Mr. Prasoon Kumar Sir and Mr. Anik Sarkar Sir for their unwavering support, cooperation, and motivation throughout the training period. His guidance and mentorship have been invaluable, enabling me to navigate challenges and achieve personal and professional milestones.

Additionally, I would like to express my heartfelt gratitude to Mr. Debajyoti Siva Sir for his valuable suggestions and the time he dedicated to assisting us. His expertise and insights have significantly enriched our training experience.

Finally, I would like to extend my thanks to my group members, whose collaboration and assistance have been crucial in successfully completing the training report. I am grateful to all individuals who have offered their support, guidance, and contributions along this journey.

Sincerely,

Shashwata Datta

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ABOUT ONGC

INTRODUCTION

Oil and Natural Gas Corporation Limited (ONGC) is Indian multinational oil and Gas company having headquarters at Tel Bhavan. Dehradun, and Uttarakhand, India. It is a under control of the Ministry of Petroleum and Natural Gas. It is India's largest oil and gas exploration and production company. It produces around 77% of India' s crude oil and around 62% of its natural gas. They provide the necessary energy fir carrying out the day to-day activities. It is involved in exploring for and exploiting hydrocarbons in 26 sedimentary basins of India and owns and operate 11.000 kilometers of pipelines in the country. Its international subsidiary ONGC Videsh currently has project in 17 countries.

EXPLORATION AND PRODUCTION

ONGC is primarily involved in exploration, production and development of crude oil and natural gas. The company explores hydrocarbons reserves both onshore and offshore in India and various other countries.

HISTORY

ONGC was founded on 14th August 1956 by Government of India, under the supervision of K.D. Malaviya. In a government survey of fiscal year 2011-2012, it was ranked the largest profit-making PSU in India. ONGC has been 499th in the Fortune Global 500 list of the world's biggest corporations for the year 2015. It is ranked 17th, among the Top 250 Global Energy Companies by Platts.

MISSION & VISION

To be the global leader in integrated energy business through sustainable growth, knowledge excellence and exemplary governance practice.

Dedicated to excellence by leveraging competitive advantages in R&D and technology with the people involved.

Imbibe high standard of business ethics and organizational values. Abiding commitment to safety, health and environment to enrich quality of community life.

ASSETS/PLANTS

1. Mumbai High Asset. Mumbai
2. Neelam & Heera Asset. Mumbai
3. Bassein & Satellite Asset, Mumbai
4. Uran Plant, Uran
5. Hazira Plant. Hazira
6. Ahmedabad Asset. Ahmedabad
7. Ankleshwar Asset, Mehsana
8. Mehsana Asset. Mehsana
9. Rajahmundry Asset. Rajahmundry
10. Karaikal Asset. Karaikal
11. Assam Asset. Nazira
12. Tripura Asset. Agartala

BASINS

1. Western Offshore Basin, Mumbai
2. Western Onshore Basin Vadodara
3. KG Basin. Rajahmundry
4. Cauvery Basin, Chennai
5. Assam & Assam-Arakan Basin, Jorhat
6. CBM-BPM Basin. Kolkata
7. Frontier Basin. Dehradun

ONGC GROUP OF COMPANIES

ONGC Group of Companies refers to the subsidiaries and associated companies that are part of the Oil and Natural Gas Corporation (ONGC) Limited, an Indian multinational oil and gas company.

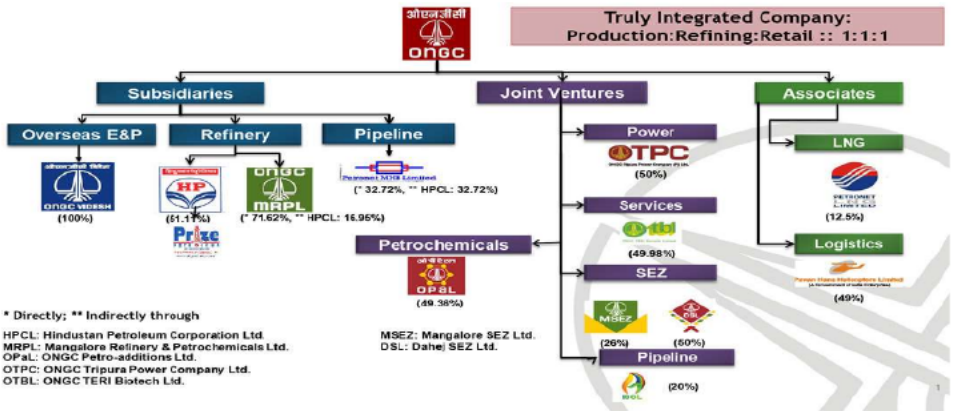


Fig. A schematic representation of ONGC group of companies

ONGC TRIPURA ASSET

INTRODUCTION

Oil & Natural Gas Corporation Ltd. ("ONGC"), a Fortune 500 company of the Government of India, owns significant natural gas reserves in the North Eastern state of Tripura. However, these natural gas reserves were not developed commercially due to low industrial demand in the North-Eastern region. Tripura is one of the main work centers in northeast region of ONGC. It is based in Agartala with a manpower of around 1000. The work force is comprised of people from all over the country. Geographically Tripura is a part of frontal folded basin of the Assam basin and is situated between the proven commercially oil and gas bearing region of Sylhet in Bangladesh.

Exploration activities in Tripura dates to 1939 when Baramura oil company and subsidiary carried out photo geological mapping on 18th July 1972. ONGC has engaged six Bangladeshi contractors to construct the roads and develop a jetty in the river port and the Roads and Highways Department of Bangladesh would supervise the works, he said adding the works were expected to be completed by February 2011. The Oil and Natural Gas Corporation (ONGC) has undertaken a project of Rs 25 crore to build a 50 km road from Ashuganj river port in Exploration activities in Tripura dates to 1939 when Baramura oil company Bangladesh to Agartala and develop the port.

DEPARTMENTS OF ONGC TRIPURA ASSET

1. Asset Workshop
2. Cementing
3. Drilling Fluid Services
4. Drilling
5. Engineering Services
6. Forward-base
7. Fire Services
8. Finance
9. HR-ER
10. HSE
11. Infocom
12. Material Management
13. Medical
14. Sub-Surface
15. Internal Audit
16. Technical & Energy Audit
17. Logging
18. Surface
19. Logistics
20. Security
21. Well Services

POWER PRODUCTION

Fig. OTPC power generation site at Palatana

The complexities of logistics and attendant costs limited the economic viability of transportation of gas to other parts of the country where gas is in deficit. In order to optimally utilize the gas available in Tripura and to supply power to the deficit areas of North Eastern States of India. ONGC along with Infrastructure Leasing and Financial Services Limited (IL&FS) and Government of Tripura (GOT) formed a Special Purpose Vehicle ONGC Tripura Power Company (OTPC) by entering into a Shareholders' Agreement (SHA) on September 18, 2008, to implement a 726.6 MW Combined Cycle Gas Turbine (CCGT) thermal power plant at Palatana, Tripura. The first block (363.3 MW) of the power plant was declared under Commercial Operation from 4th January 2014 and the second block (363.3 MW) of the two blocks was declared under Commercial Operation from 24th March 2015. BHEL was the EPC contractor for setting up of the power plant. Subsequently in April 2015, India Infrastructure Fund-II (managed by Global Infrastructure Partners India LLP (GIP) which is a wholly owned subsidiary of Global Infrastructure management LLC ("GIM LLC"), USA') became an investor in the company by acquiring 23.5% of the equity stake. The ONGC Tripura Power Corporation Ltd (OTPC) has planned to establish one more 360 MW power unit at its Palatana plant in Tripura's Gomati district. State-owned gas major GAIL India has acquired 26 per cent equity stake in ONGC Tripura Power Company Limited (OTPC).

POWER SUPPLY

ONGC Tripura Asset (OTA) primarily supplies power for its own operational requirements. As an oil and gas exploration and production company. OTA requires electricity to run its facilities, equipment, and operations in Tripura. Therefore, the power generated by OTA is primarily utilized to meet the energy needs of its own operations. However, if OTA has surplus power beyond its own requirements, it can supply the excess power to other entities in Tripura. Moreover, ONGC Tripura Asset (OTA) collaborates with various entities for power supply in Tripura. There are interdependencies and collaborations between these entities in the power sector in Tripura. Here's a brief overview:

1. **GAIL:** GAIL operates the Palatana Gas-based Power Plant in Tripura. This power plant has a capacity of 726.6 MW and is primarily responsible for power generation in the state. GAIL sources natural gas for the power plant, which is utilized for electricity generation. GAIL supplies the electricity generated by the Palatana Power Plant to various consumers in Tripura, including industrial, commercial, and residential users.

Fig. GAIL INDIA LIMITED at Abhay Nagar, Agartala

2. **OTPC (ONGC Tripura Power Company):** OTPC is a joint venture between ONGC, Infrastructure Leasing & Financial Services Ltd. (IL&FS), and the Tripura government. It operates the Palatana Thermal Power Station in Tripura, which has a capacity of 726.6 MW. OTA supplies natural gas from its production facilities to

OTPC, which utilizes the gas to generate power. The electricity generated by OTPC is then supplied to various consumers in Tripura.

Fig. OTPC at Palatana

3. **NEEPCO (North Eastern Electric Power Corporation):** NEEPCO is a government-owned company responsible for hydropower generation and development in northeastern India. While OTA primarily focuses on oil and gas operations, it also collaborates with NEEPCO for power supply. NEEPCO supplies hydropower generated from its Ranganadi Hydro Electric Plant in Arunachal Pradesh to Tripura, including OTA's facilities.

Fig. NEEPCO at Laxmipur, Tripura

4. **Tripura State Electricity Corporation Limited (TSECL):** TSECL is the state-owned electricity distribution company in Tripura. If OTA has surplus power, it can supply it to TSECL, which can then distribute it to meet the electricity needs of consumers in the state.

5. **TNGCL (Tripura Natural Gas Company Limited):** TNGCL is a state-owned company responsible for the distribution of natural gas in Tripura. OTA collaborates with TNGCL for the supply of natural gas. OTA provides natural gas from its production facilities to TNGCL, which is then distributed for various purposes, including power generation.

SAFETY MEASURES

INTRODUCTION

Oil and gas wells can expose workers to hydrogen sulphide gas. If our workplace uses sand for any process, such as hydraulic fracturing, workers may be exposed to crystalline silica. Crystalline silica is a known lung carcinogen, and can cause silicosis, which can be debilitating and even fatal. Oil-and-gas-related flash fires can reach up to 1900 degrees Fahrenheit and can last up to five seconds. These fires most commonly occur in well drilling, servicing, and production-related operations. There are a lot of measures taken to avoid the accidents/hazards. And fortunately, there are many different types of personal protective equipment (PPE) to protect against these hazards.

MEASURES TAKEN

Ensure safe system of work:

Strictly adhere to SOP for all operations.

Carry out Tool Box before starting your work.

Career job safety analysis for nonroutine and complex jobs.

Always use appropriate tools for caring out jobs.

Ensure that job is to be performed in clearly defined well communicated and understood and appropriate authorization is obtained.

Inspection of worker to ensure their safety barriers/controls, which are suitable for jobs undertaken, are in place and its impact on other work is assessed.

If there are any unplugged changes, review the safety barriers/controls.

Work with valid permit where required:

Ensure a very Permit to Work (PTW)is in place when required by procedure.

Understand the work permit and follow it.

When required, ensure that equipment is electrically isolated, tagged and lookout and interlinked to the PTW.

Gas test for hydrocarbon, oxygen deficiency, toxic gases etc. shall be conducted as applicable as a prerequisite to issue permit for hot work/vessel entry etc. Subsequently. periodic gas test shall be carried out and recorded.

Proper ventilation & lightning and means for evacuation shell be provided in confined spaces in event of emergency.

Work shell be supervised by appropriate person.

Work shell be suspended in case the conditions or not safe.

After completion of job, release the interlinked lockout before closing the PTW.

Protect yourself by using PPE:

Use PPE as mandated risk assessment and site requirement.

Always wear core PPE such as overall safety shoes, helmet, gloves, safety goggles and ear plug at workplace.

Ensure use of kits and liveries as per the requirement of MSDS. Where appropriate kits and liveries while caring out electrical and other specialized jobs.

And so that PPE is suitable for task, is in good condition and serviced as required.

Ensure that visitors, contractual workers are also in appropriate PPE at workplace.

Obtain Authorization Prior to Bypassing Safety Critical Equipment:

Any safety critical equipment or device design for protection cannot be bypass or overridden without authorization.

All the authorized bypasses must be entered in bypass register.

Appropriate alternate protective measures must be in place as per procedure for the systems bypassed.

Ensure that all the bypassing or overriding of any safety system in place is appropriately communicated to persons affected.

Safe working at height:

Ensure ABCD pf working at height.

All tools and loose objects are secure to prevent their fall.

Ensure that area below is covered off, if there is a risk of falling objects.

A rescue plan must be in place for the person working at height in case he is incapacitated to come down on his/her own.

Always use escape device like TEED in case of any emergency.

No Smoking Use of Illegal Drugs Consumption of Alcohol:

Deposit lighter, matchboxes, etc. Before entering the operational area. Smoking is prohibited in operational areas.

Smoking is permitted in designated areas only.

Use of alcohol and illegal drugs at workspace is totally prohibited.

Do not use/keep sell or distribute illegal drugs.

Report if you see a case of alcohol or drug abuse.

Do Not Use Mobile Phones in Operational Areas:

Do not use mobile phones in operational areas.

Deposit your mobile phones before entering operational areas.

Male use of safe mechanism of communication like walkie talkie PA system FCT etc.

Safe Hand long of loads:

Ensure that lifting accessories (sign etc.) are certified and are valid for use.

Operators must be suitably qualified and trained to operate the lifting equipment.

Ensure that all safety systems, overloads and alarms are tested prior to the lift.

The lifting load must be suitably secured prior to the lift.

Identify all potential obstacles in the path of lifting.

Do not work or walk under immediate load as that can fall on you.

Drive safety:

Driving under the influence of alcohol is strictly prohibited.

Do not drive without a valid driving license.

Conduct pre trip vehicle checks to ensure tracks, light, signals wipes etc. and functional.

Check tire condition and air pressure daily.

Always wear seatbelts as a driver or passenger in a vehicle

Obey all road safety rules.

Do not drive exceeding the prescribed speed limit.

Never use a mobile phone while driving.

Avoid driving in night and when driver is too tired.

Keep Your Workplace and Environment Clean:

Ensure the implementation of approved waste management and environment policy.

Keep your workplace clean and throw the waste in designated bin only.

Ensure segregation, storage, transportation, processing treatment and final disposal of wastes.

Keep your tools at designated place after completion of your job.

ASSET WORKSHOP

Fig. Asset workshop in ONGC Tripura Asset at Badharghat, Agartala

INTRODUCTION

In ONGC (Oil and Natural Gas Corporation), an asset workshop refers to a facility or department dedicated to the maintenance, repair, and overhaul of equipment and machinery used in the company's operations. Asset workshops play a crucial role in ensuring the reliability, availability, and optimal performance of assets, such as drilling rigs, production platforms, pipelines, and other oil and gas infrastructure.

Asset Workshop in ONGC are essential for maintaining the reliability and longevity of assets used in oil and gas operations. They contribute to minimizing downtime, improving safety, and optimizing operational efficiency, thereby supporting the company's objectives in exploration. production, and refining activities.

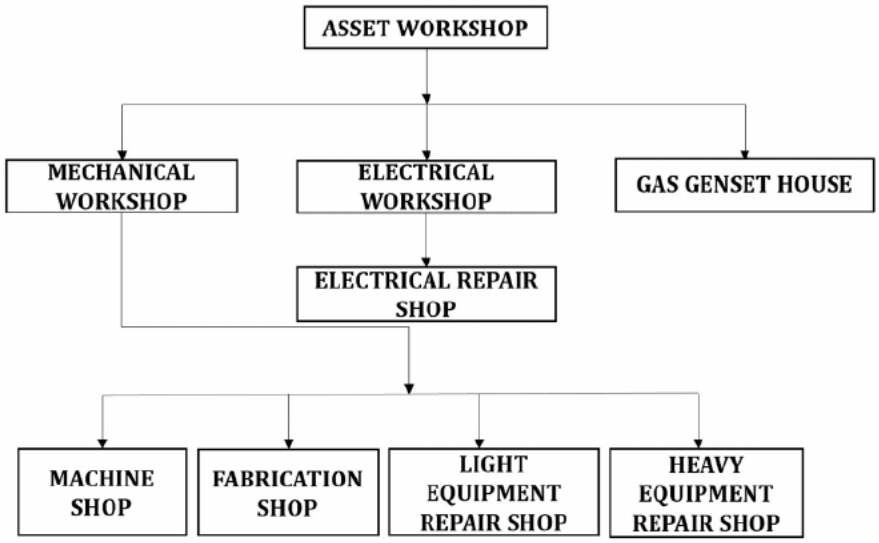
In ONGC Tripura Asset, the Asset Workshop is divided into three parts, and these are Mechanical Workshop, Electrical Workshop & Gas Genset house. Further, the mechanical workshop is divided into four shops, these are:

i. Machine Shop

ii. Fabrication Shop

iii. Light Equipment Repair Shop

iv. Heavy Equipment Repair Shop



ELECTRICAL WORKSHOP

The electrical workshop is a specific area or department dedicated to electrical maintenance. repair, and servicing of equipment, systems, and installations. The electrical workshop plays a crucial role in ensuring the reliability, safety, and proper functioning of electrical systems used in ONGC's operations. The electrical workshop in the asset workshop of ONGC plays a vital role in maintaining the electrical infrastructure, systems, and equipment required for the company's operations. By conducting maintenance, troubleshooting, and repairs, the electrical workshop helps ensure a reliable and safe supply of electricity, contributes to efficient operations, and enhances the overall safety of ONGC's facilities.

Fig. Electrical Workshop of ASSET WORKSHOP in ONGC Tripura Asset

GAS GENSET HOUSE

The Gas Genset House is a dedicated facility or area that houses gas generator sets used for power generation. The gas generator house plays a crucial role in providing electricity for Various operations within the asset workshop and other facilities. The gas generator house in the asset workshop of ONGC serves as a vital component for providing reliable and continuous electrical power within the workshop and supporting various operational activities. It ensures that the gas generator sets are properly maintained, fuel supply is managed efficiently, and electrical power is distributed effectively to meet the electrical needs of the workshop.

Fig. Gas Genset House in Asset Workshop of ONGC Tripura Asset

GAS GENSET

A genset is a combination of a prime mover. (typically, an engine), and an alternator. An engine converts the chemical energy of a fuel to mechanical energy. That mechanical energy is used to spin the alternator rotor, converting mechanical energy to electrical energy. An alternator is made of two main parts: a rotor and stator. Spinning the alternator rotor through the magnetic field between the rotor and stator creates a voltage on the alternator stator, through the phenomenon of electromagnetic induction. When the voltage on the stator is connected to a load, electrical current flows, and the generator produces power.

Among the various options for power generation, natural gas generators are widely used and efficient. Natural gas is a cost-effective and reliable fuel source, particularly when compared to other non-renewable resources. It can power both emergency and portable generators. Gas gensets are the primary source of electricity for ONGC's facilities. These gensets utilize natural gas, a byproduct of the oil and gas extraction processes, to generate electrical energy. By harnessing the power of natural gas, ONGC reduces dependence on external power sources and optimizes energy utilization within their operations. Gas gensets provide a cost-effective and environmentally friendly solution for power generation, aligning with ONGC's commitment to sustainable practices.

To generate electricity, a gas engine is mechanically coupled to an electrical generator, creating a genset. The generator is then connected to the electrical system through a circuit breaker. If operating in parallel with the grid supply, the circuit breaker is used to synchronize the generator with the mains. The engine rotates at a constant 1,500 revolutions per minute regardless of the load. The generator has 4 poles which at 1,500 revolutions per minute operates at 50Hz to match the frequency of the mains.

ONGC's operations involve critical processes where uninterrupted power supply is essential. Gas gensets serve as reliable backup systems during emergencies or instances of grid power failure. These backup gensets ensure continuous power supply to critical equipment, control systems, safety systems, and other essential infrastructure. The ability to quickly restore power during emergencies minimizes production downtime, enhances safety, and prevents potential environmental hazards.

MAIN COMPONENTS OF GAS GENSET:

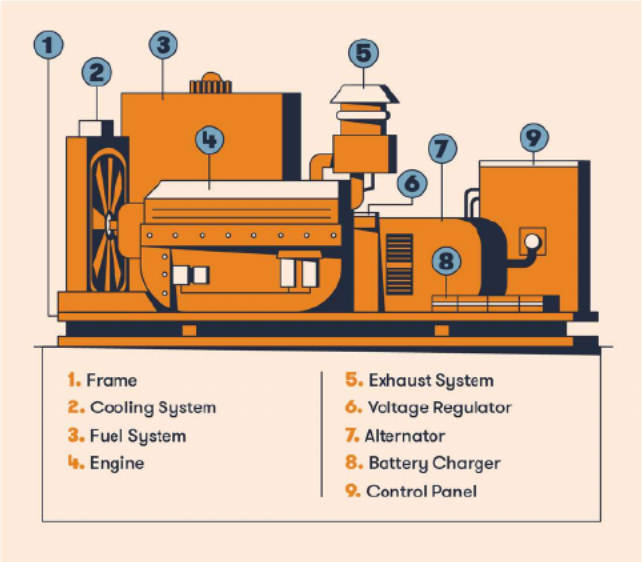


Fig. A diagram of the construction of a Gas Genset

Parts of the Gas Generator are:

Engine: Running on fuel, the combustion engine or motor is the primary component of a genset.

Fuel System: The fuel system consists of fuel tanks and hoses that send fuel to the engine. You can use diesel fuel or gas depending on whether you're using a diesel genset or one that runs on gas.

Voltage Regulator: A voltage regulator is used to ensure a generator's voltage levels remain constant, rather than fluctuate.

Alternator: Another key component-without it, you have no power generation-the alternator converts mechanical energy into electricity.

Cooling System: A cooling system in a generator uses coolant to absorb excess heat from the engine and alternator. The coolant is then circulated through a heat exchanger to dissipate the heat outside the generator, preventing overheating.

Exhaust System: The exhaust system collects gases from engine cylinders and releases them as quickly and silently as possible.

Lubrication System: the main task of the lube oil system is to supply clean lubrication oil under the required pressure and circulate it inside the engine.

Battery: Perhaps self-explanatory, the battery charger "trickle charges" your generator's battery to ensure it is always full.

Control Panel: Consider the panel the brains of the operation because it controls and regulates all the other components.

Main Assembly Frame: The frame or base frame, supports the generator and holds the components together.

WORKING OF A GAS GENSET :

Fig. Gas Genset G3516 in Gas Genset House at ONGC Tripura Asset.

The most basic explanation is that these generators are fueled by natural gas, either a direct line piped in by utility suppliers or via a tank and generate electricity. inside of a natural gas generator, "an internal combustion engine injects a mixture of fuel and air into a combustion chamber, where a piston compresses the mix. A spark plug ignites the fuel, driving the piston down and turning a crankshaft. The crankshaft, in turn, spins the generator's rotor in an electromagnetic field, generating an electric current that can charge batteries, power appliances or even run high-wattage tools, depending on the generator's size."

NATURAL GAS GENERATOR OVER OTHER FUEL

Benefits of choosing a natural gas generator include:

Convenience: If your home or facility already receives natural gas, installing a natural gas generator is easily done. When gas is piped directly to the generator, you don't need to worry about checking fuel tank levels or providing fuel yourself.

Environmental Impact: A more environmentally friendly option than diesel, natural gas burns fairly cleanly, reducing the negative impact on the environment. Buying secondhand generators is also a great way to give a second life to gently used. refurbished units.

Affordable: Opting for a used model is a smart way to save on your investment. Used generators are sold by Woodstock at great discounts, save up to 75% by shopping our inventory.

DIESEL GENSET

Diesel gensets, also known as diesel generator sets, are essential equipment used for generating electrical power in various applications. They provide reliable and efficient power backup solutions in situations where a stable electricity supply is unavailable or unreliable. This report aims to provide an overview of diesel gensets, including their components, working principle. applications, advantages, and considerations. Diesel gensets play a crucial role in ensuring uninterrupted power supply for various operations and infrastructure requirements in the oil and gas industry. This report aims to evaluate the significance of diesel gensets for ONGC, assess their performance, and explore potential areas of improvement.

MAIN COMPONENTS OF DIESEL GENSET

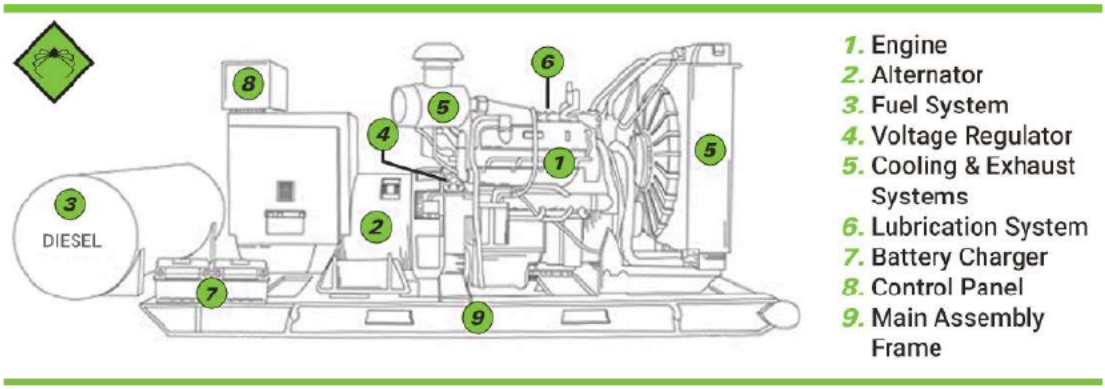


Fig. A diagram of Diesel Genset with its components

Every diesel generator is made up of at least nine different but equally important parts. These are the:

Diesel Engine: The engine is the source of the mechanical energy input to the generator. The size of the engine is directly proportional to the maximum power output the generator can supply.

Alternator: The alternator, or genhead, converts mechanical input from the engine into electrical output. It consists of stationary and moving parts that create relative movement between magnetic and electric fields, generating electricity.

Fuel System: The fuel tank of a generator provides enough capacity for 6 to 8 hours of operation. It can be integrated into the generator's base or mounted on top of the frame. External fuel tanks may be required for larger commercial applications.

Voltage Regulator: It ensures that the generator produces electricity at a nice steady voltage. There will be massive fluctuations dependent on how fast the engine is working. So, this part works its magic to keep everything smooth and steady.

Cooling System & Exhaust System:

A generator's cooling system prevents overheating by circulating coolant to absorb and remove excess heat through a heat exchanger. This helps maintain optimal operating temperatures and prevents damage to the generator components.

The exhaust system works in the same way as your car exhaust. It takes any gases produced by the diesel engine, brings them through a piping system, and exhausts them away from the genset.

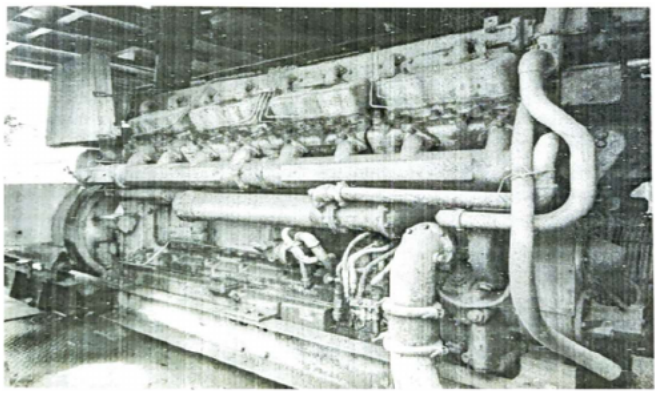
Lubrication System: This component attaches to the engine and pumps oil through it to ensure all the parts work smoothly and don't grind against one another. Without it, the engine will break down.

Battery Charger: All diesel engines need a tiny little electrical motor to help kick it into action. This small motor requires a battery, which needs to be charged. The battery charger keeps it nice and full of charge, by an external source of the generator itself.

Control Panel: The control panel of a generator houses various controls and indicators for operating and monitoring the generator, including start button, frequency switch, fuel indicator, coolant temperature indicator.

Main Assembly Frame: The main assembly frame of a generator houses and holds all the components together. It can be open or enclosed (canopied) for added protection and sound reduction. Outdoor generators are usually housed in weatherproof frames to prevent damage.

WORKING OF DIESEL GENSET



A diesel generator works based on the principle of energy conversion according to the laws of thermodynamics. The process involves the conversion of chemical energy from diesel fuel into rotational mechanical energy. This mechanical energy drives a crankshaft, which in turn rotates the rotor of the generator. The rotor, consisting of magnets, spins inside the stator, which is made up of conductive copper wiring.

As the magnets pass through the wiring, a magnetic field is created, inducing electrical charges in the circuit. This movement of magnets across the wiring generates an alternating current (AC) in the stator. The AC power is then converted into direct current (DC) using a rectifier.

To create the necessary magnetic field in the rotor, an excitation system is employed. This system uses direct current, typically ranging from 50 amps to 9000 amps or more, depending on the generator size. Modern excitation systems utilize static components, such as power potential transformers (PPTs) and saturable current transformers (SCTs), to generate the required DC.

The voltage regulator controls the output voltage and ensures that the generated electricity is delivered at the desired level. Overall, the diesel generator converts the chemical energy of diesel fuel into mechanical energy, which is further converted into electrical energy through the operation of the alternator.

ADVANTAGES

a) Reliable and Robust

b) Fuel Efficiency

c) Availability of Fuel

d) Easy Maintenance

CHALLENGES

a) Environmental Impact

b) Noise and Vibration

c) Initial Investment

MACHINE SHOP

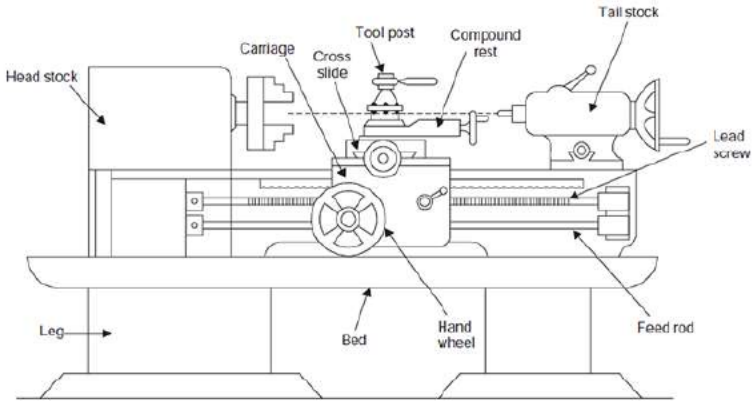
THE LATHE

Lathe is a machining tool primarily used for giving shapes to metals and wood. It works by rotating the workpiece about its axis of rotation around a stationary tool, thus removing material in the form of chips. Various operations, such as facing, turning, knurling, drilling, etc. can be done on Lathe.

MAIN PARTS OF THE LATHE

It consists of various parts:

Bed
Headstock
Tailstock
Carriage
Legs
Feed mechanism



The main parts of a lathe machine can be summarized as follows:

1. **Bed**: Foundations of the lathe machine with longitudinal guideways for accurate alignment of other parts.
2. **Headstock**: Located at the left end of the lathe, it supports the spindle, provides power for rotating the work at different speeds, and allows attachment of job holding devices.
3. **Tailstock**: Positioned at the right end of the bed, it can slide along the bed to accommodate different work lengths. It provides support for turning between centers, use with chucks, and attachment of tools like drills.

4. **Carriage**: Supports, guides, and controls the cutting tool. It consists of the saddle (slides on the bed), cross slide (moves tool perpendicular to the lathe axis), compound rest (enables angular cuts and tool positioning), tool post (holds and adjusts the cutting tool), and apron (contains gears and controls for carriage operation).

5. **Legs**: Provide support and stability to the lathe machine, typically made of cast iron.

6. **Feed Mechanism**: Enables relative motion between the tool and the workpiece. It includes the carriage, gears, levers, and pulleys that transmit motion from the headstock spindle to the carriage. There are three types of tool feed: longitudinal (parallel to lathe axis), cross-slide (perpendicular to lathe axis), and angular (with the compound rest).

WORKING OF THE LATHE

Fig. Lathe Machine at Machine Shop of Asset Workshop

A lathe machine works on the principle of rotation and cutting. The workpiece is mounted on the spindle in the headstock and rotates at a desired speed. The cutting tool, held by the carriage, moves along the workpiece to remove material and shape it as per the desired specifications. The feed mechanism controls the movement of the carriage, allowing for longitudinal, cross. and angular feeds.

APPLICATION

Lathe machines find applications in various industries and are used for a wide range of machining operations, including:

Turning: Lathe machines are primarily used for turning operations to shape cylindrical or conical workpieces.

Facing: Lathe machines can perform facing operations to create flat surfaces perpendicular to the workpiece's axis.

Drilling: With the use of a tailstock spindle or drill chuck, lathe machines can drill holes in the workpiece.

Threading: Lathe machines enable precise threading operations, creating threads on the workpiece.

Tapering: Lathe machines can produce tapered shapes by adjusting the tool's position or the workpiece's angle.

ADVANTAGES

Versatility: Capable of performing a wide range of machining operations.

Precision: Enables accurate shaping and machining of workpieces.

Efficiency: Allows for high productivity and repeatability in manufacturing processes.

Flexibility: Different tooling options and attachments for diverse applications.

Cost-effectiveness: Reduces the need for multiple specialized machines.

MILLING MACHINE

A milling machine is a versatile machining tool used to shape and modify solid materials. It operates by removing material from the workpiece using rotary cutters to create various complex shapes, contours, and patterns. Milling machines are widely used in industries such as manufacturing, metalworking, woodworking, and construction.

MAIN PARTS OF MILLING MACHINE

Following are the different parts of milling machine:

Base
Column
Knee
Saddle
Table
Overhanging arm
Front brace
Spindle
Arbor

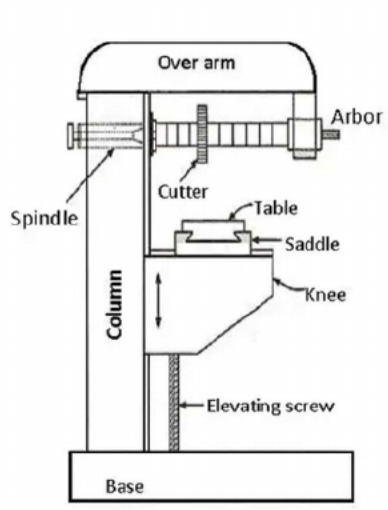


Fig. Diagram of Milling Machine

The main components of a milling machine can be summarized as follows:

1. **Base**: Made of grey iron casting, it serves as the foundation for all other parts and supports the entire machine structure. In some cases, the base may also function as a reservoir for cutting fluid.

2. **Column**: Mounted on the base, it is a box-shaped frame that houses the driving mechanisms for the spindle and feed table. The front vertical face of the column has dovetail guideways for supporting the knee, and the top of the column holds an overarm.

3. **Knee**: A fixed grey iron casting that slides vertically on the column's ways. It is adjusted in height using an elevating screw mounted on the base. The knee houses the feed mechanism and controls for operating the table. The top face of the knee forms a slideway for the saddle, allowing for cross travel.

4. **Saddle**: Placed on top of the knee, it slides on guideways set at 90 degrees to the column face. The saddle can be moved horizontally by hand or power for cross-feed. The top of the saddle provides guideways for the table.

5. **Table**: Rests on the saddle and travels longitudinally. It has accurately finished top surfaces and T-slots for clamping the workpiece and fixtures. A lead screw under the table engages with a nut on the saddle to enable horizontal movement. In universal machines, the table may also swivel horizontally.

6. **Overhanging Arm**: Acts as a support for the arbor and is mounted on the top of the column. extending outward. It provides bearing support for the other end of the arbor, which holds milling cutters.

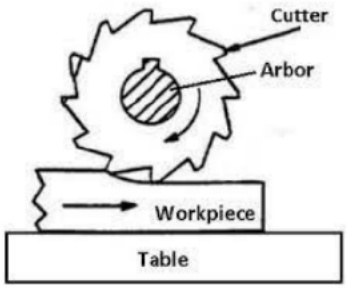
7. **Front Brace**: Provides additional support and rigidity to the arbor and knee. It is fitted between the knee and overarm, allowing for height adjustment.

8. **Spindle**: Located in the upper part of the column, it receives power from the motor through belts, gears, and clutches. The spindle transmits power to the arbor and is equipped with a tapered hole for inserting various cutting tools.

9. **Arbor**: An extension of the spindle, it securely holds and rotates milling cutters. Arbors have taper shanks that align with the machine spindles, and they can be supported at the far end or be of a cantilever type (stub arbor).

WORKING OF MILING MACHINE

The working principle of the milling machine, applied in the metal removing operation on a milling machine. The work is rigidly clamped on the table of the machine and revolving multi teeth cutter mounted cither on a spindle.



The cutter revolves at a normal speed and the work fed slowly past the cutter. The work can be fed in a longitudinal, vertical or cross direction. As the work progress further, the cutter teeth remove the metal from the work surface to produce the desired shape.

APPLICATION

Milling machines have a wide range of applications and are used for various machining operations, including:

1. **Face Milling:** Milling flat surfaces perpendicular to the axis of rotation.
2. **End Milling:** Milling grooves, slots, or profiles on the edge of a workpiece.
3. **Drilling:** Creating holes in the workpiece using milling cutters.
4. **Contouring:** Creating complex shapes and contours on the workpiece.
5. **Thread Milling:** Milling threads on the workpiece to create screw threads.
6. **Gear Cutting:** Milling gears or gear-like structures on the workpiece.

Fig. Milling Machine at Machine Shop of Asset Workshop

SHAPER MACHINE

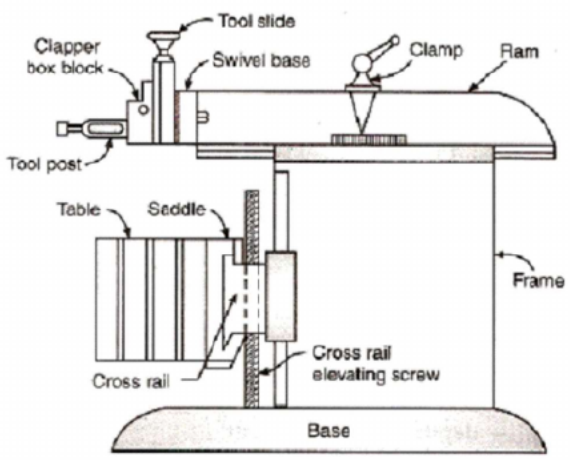
Fig. Shaper Machine at Machine Shop of Asset Workshop

Shaping machine is used to machine flat metal surfaces especially where a large amount of metal must be removed. Other machines such as milling machines are much more expensive and are more suited to removing smaller amounts of metal, very accurately. The reciprocating motion of the mechanism inside the shaping machine can be seen in the diagram. As the disc rotates the top of the machine moves forwards and backwards, pushing a cutting tool. The cutting tool removes the metal from work which is carefully bolted down.

MAIN PARTS OF SHAPER MACHINE

The main parts of shaper machine are as follows:

Base
Column
Table
Cross Rail
Ram
Tool Head



Base is the necessary bed or support required for all machines tools. All other parts are mounted on and above the base. The bed takes up the total dead weight of the machine as well as the dynamic load during machining operations.

Column of the shaper is a hollow casting and is mounted on the base. It houses the drive mechanism for the ram and the table.

The **worktable** of a shaper is fastened to the front of the column. The table moves across the column on Cross rail to give the feed motion to the job.

Cross rail is mounted on the front of the body frame and can be moved up and down. The vertical movement of the cross rail permits jobs of different heights to be accommodated below the tool. Sliding along the cross rail is a saddle which carries the worktable.

Ram carries the tool head at its front end and travels in "guideways" to give straight line reciprocating motion to the tool. The ram is either mechanically driven or hydraulically operated. A single point tool is fastened in the tool post.

Tool Head holds the cutting tool and is fastened to the front of the ram. The tool is held in a tool holder/tool post similar to the lathe tool post. The tool post and the tool block fit snugly in the clapper box and is hinged at the upper edge.

WORKING OF SHAPER MACHINE

The working principle of a shaper machine involves the use of a ram and a cutting tool. The workpiece is firmly held on a worktable, and the cutting tool, known as a single point cutting tool, is clamped in the shaper's tool holder. The ram moves the cutting tool back and forth in a horizontal direction, known as the cutting stroke, while the workpiece remains stationary. During the cutting stroke, the tool removes material

from the workpiece, shaping it according to the desired contour. After completing the cutting stroke, the ram returns to its starting position (return stroke), preparing for the next cutting stroke.

APPLICATION

Shaper machines are commonly used in various industries, including:

Metalworking: Shaping and machining flat surfaces, keyways, slots, and irregular profiles.
Tool and Die Making: Manufacturing dies, moulds, and specialized tooling components.
Automotive: Producing engine components, gears, and other precision parts.
Maintenance and Repair: Restoring worn or damaged surfaces on machine parts.
Prototyping and R&D: Creating prototypes and testing new designs.

ADVANTAGES

Versatility: Suitable for shaping various workpiece sizes and materials.
Precision: Enables precise machining with controlled cuts and finishes.
Efficiency: Can remove material rapidly and efficiently.
Cost-effectiveness: Offers a cost-effective solution for shaping operations.
Simplicity: Relatively simple to operate and maintain.

LIMITATIONS

Limited Cutting Speed: Shaper machines are generally slower compared to other machining methods.
Limited Cutting Direction: Mostly used for linear and flat surface shaping operations.
Manual Operation: Requires manual setup and adjustment for different cutting operations.

GRINDING MACHINE

Fig. Grinding Machine at Machine Shop of Asset Workshop

A **grinding machine**, often shortened to grinder, is any of various power tools or machine tools used for grinding, which is a type of machining using an abrasive wheel as the cutting tool. Each grain of abrasive on the wheel's surface cuts a small chip from the work piece via shear deformation.

WORKING OF GRINDING MACHINE

The working principle of a grinding machine involves the rotation of an abrasive wheel or belt that is brought into contact with the workpiece. The abrasive grains on the wheel or belt remove small chips of material from the workpiece's surface through abrasion. The workpiece is securely held in place, and the grinding machine's motor drives the wheel or belt to rotate at high speeds. The movement of the abrasive material against the workpiece's surface results in the removal of material, shaping the workpiece to the desired form or achieving the desired surface finish.

MAIN PARTS OF GRINDING MACHINE

Base: The base provides a stable foundation for the machine and supports all other components.

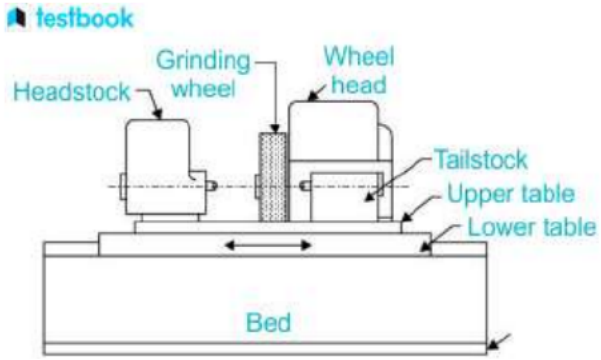
Table: There are two tables, a lower table, and the upper table. The table provides support for the workpiece and can be adjusted vertically and horizontally to position the workpiece accurately during grinding.

Headstock: The headstock fixed over the bed and supports the workpiece by means of a dead center and drives it by means of a dog or it may hold the workpiece in a chuck and drives it.

Tailstock: The tailstock can be adjusted and fixed in any required position to accommodate different lengths of the workpiece.

Wheel Head: It consists of a grinding wheel and its driving motor. The wheel head is mounted on a slide at the rear end of the base and moves perpendicularly to the table ways by hand or power to feed the grinding wheel to the work.

Cross feed: The grinding wheel can be fed to the work by engagement of the cross-feed control lever by hand or power.



Block diagram of a Plain Cylindrical Grinder

APPLICATIONS:

Grinding machines are used for various applications, including:

Surface Finishing: Grinding machines are commonly used to achieve smooth and precise surface finishes on workpieces.

Dimensional Accuracy: Grinding machines can be employed to achieve precise dimensions and tight tolerances on workpieces.

Material Removal: Grinding machines are used to remove excess material from workpieces, shaping them to the desired form or size.

Tool Sharpening: Grinding machines are crucial for sharpening cutting tools, such as drills. end mills, and lathe tools, to restore their sharpness and cutting efficiency.

Surface Preparation: Grinding machines are used for surface preparation tasks, such as removing paint, rust, or imperfections from surfaces.

DRILLING MACHINE

Fig. Drilling Machine at Machine Shop of Asset Workshop

A **drilling machine** is a powerful tool used to cut a round hole into or through metal, plastic. wood, or other solid materials through turning and advancing rotary drill bits into a workpiece. This drilling cutting tool is held in the drill press by a chuck and fed into the work at variable speeds. The speed and feed should be set properly, and coolant needs to be provided for the desired finished part. The drilling machine can not only be applied in the drilling process, but also useful for many other machining operations. There are various operations can be performed on a drilling machine, such as plane drilling, step drilling, core drilling, boring. counterboring, reaming, countersinking, spot facing, tapping, and trepanning.

WORKING OF DRILLING MACHINE

The working principle of a drilling machine involves the rotation of a drill bit and the application of axial force to create holes. The drill bit is mounted in a chuck, which is attached to a spindle. The spindle rotates the drill bit at high speeds, while a feed mechanism controls the downward pressure applied to the workpiece. As the drill bit rotates and penetrates the workpiece, it cuts through the material and creates the desired hole.

MAIN COMPONENTS OF DRILLING MACHINE

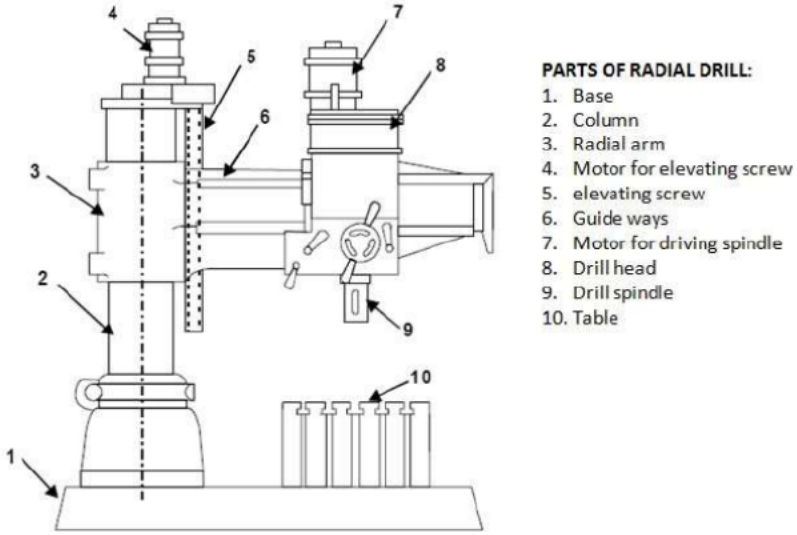


Fig. Block Diagram of Drilling Machine

A drilling machine is usually composed of several or all of the following parts:

Base: Generally bolted with the ground to support the weight of the drilling machine.
Column: Located on one side of the base, can carry the load of the arm and drill head, with a sliding table mounted on it.
Arm: At the top of the column, carries the drill head and the housing of the driving mechanism.
Drill head: Mounted on one side of the arm, consists of feed and driving mechanism. It can slide up and down.
Worktable: Mounted on the column, can move vertically and horizontally.
Feed mechanism: Hand and automatic feed by an electrical motor.
Spindle: It holds the drill or cutting tool and revolves in a fixed position in a sleeve.
Chuck: Situated on the spindle, holds the drill jig.

APPLICATION

Metalworking: Drilling machines are commonly used for metalworking operations, such as drilling holes in metal sheets, plates, pipes, and profiles.

Woodworking: Drilling machines are used in woodworking for creating holes in wood. making it suitable for furniture manufacturing, cabinetry, and carpentry.

Construction: Drilling machines are used in construction projects for drilling holes in concrete, masonry, and other building materials.

Electrical and Plumbing: Drilling machines are utilized in electrical and plumbing installations to create holes for wiring, pipes, and conduits.

Automotive: Drilling machines are used in automotive repair and maintenance for drilling holes in metal components, such as engine parts and body panels.

ADVANTAGES

Versatility: Can drill holes in different materials and workpiece sizes.

Efficiency: Rapid drilling speeds and high productivity.

Precision: Accurate drilling with controlled depth and diameter.

Flexibility: Adjustable table and spindle for various drilling positions and angles.

Ease of Use: Relatively simple operation and setup.

HEAVY EQUIPMENT REPAIR SHOP

HYDRAULIC TEST BENCH

Fig. Hydraulic Test Bench

A hydraulic test bench, also known as a hydraulic test rig or hydraulic test stand, is a specialized piece of equipment used to test and verify the performance and reliability of hydraulic components, systems, and assemblies. It simulates real-world operating conditions to ensure that hydraulic equipment meets specified standards and requirements.

WORKING PRINCIPLE

During a test, the hydraulic component or system is connected to the test bench using appropriate fixtures. The hydraulic power unit generates the necessary pressure and flow, which is controlled by the test control panel. The component is subjected to various hydraulic conditions, such as different pressure levels, flow rates, and temperature variations, to evaluate its performance and identify any potential issues or weaknesses.

APPLICATION

Hydraulic test benches are commonly used in industries such as automotive, aerospace, manufacturing, and heavy machinery, where hydraulic systems are integral to the operation of various equipment. These test benches are designed to apply hydraulic pressure, measure flow rates, detect leaks, and assess the overall functionality of hydraulic components.

WATER JET PUMP

Fig. Water Jet Pump

Water jet pumps are specialized equipment used in offshore oil and gas operations for well intervention and maintenance activities. These pumps are designed to provide high-pressure water jets for various purposes such as well cleaning, scale removal, sand flushing, and hydrate prevention.

The water jet pumps used by ONGC typically consist of the following components:

High-Pressure Pump: This is the primary component of the water jet pump system. It is designed to generate high-pressure water flow by using a reciprocating piston or plunger mechanism. The pump is powered by an electric or diesel engine.

Water Storage and Treatment: Water for the pump is sourced from either the offshore platform's water supply system or from dedicated storage tanks. The water may undergo treatment processes like filtration and desalination to remove impurities and ensure optimal pump performance.

Control System: A control panel or system is used to monitor and regulate the operation of the water jet pump. It enables the operator to adjust parameters such as pressure, flow rate, and nozzle configuration.

AIR COMPRESSOR

Fig. Air Compressor in Asset Workshop of ONGC Tripura Asset.

INTRODUCTION

An air compressor is a device that converts power into potential energy stored in pressurized air. It forces air into a storage tank, increasing the pressure until it reaches the upper limit and shuts off. The compressed air is held in the tank until needed. When the tank pressure drops to the lower limit, the air compressor turns on, re-pressurizing the tank. Air compressors work with any gas/air, distinguishing them from pumps that work with liquids.

COMPONENTS OF AIR COMPRESSOR

Components of an air compressor are:

Motor: Provides the power source to drive the compressor
Compressor Pump: The primary component that compresses the air.
Compression Chamber: The space where air is compressed.
Intake Valve: Allows atmospheric air to enter the compression chamber.
Discharge Valve: Releases compressed air from the compression chamber.
Air Receiver Tank: Stores the compressed air for later use.
Control Panel: Houses the gauges, switches, and controls for operating the air compressor.

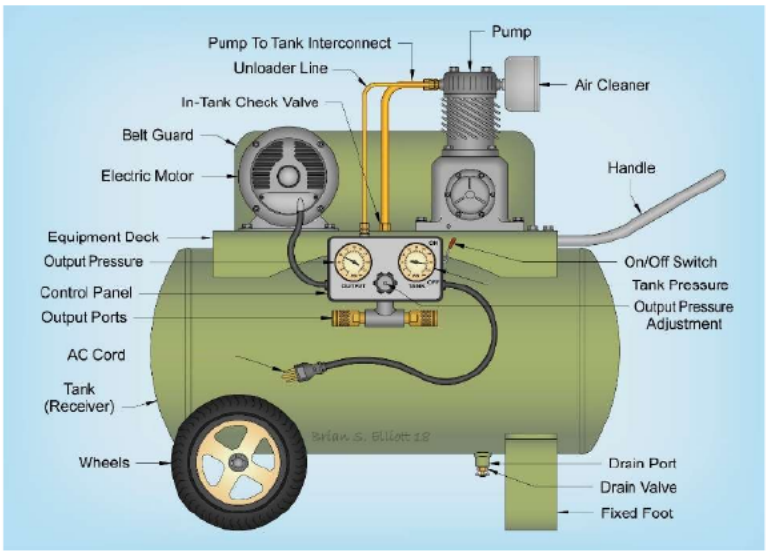


Fig. Diagram of Single Stage Air Compressor

WORKING OF AIR COMPRESSOR

The working principle of an air compressor involves converting power, typically from an electric motor or engine, into potential energy stored in compressed air. The compressor draws in atmospheric air and then compresses it to a higher pressure using various methods such as reciprocating motion, rotating screws, or high-speed impellers. This compression process reduces the volume of the air, resulting in increased pressure. The compressed air is stored in a tank or receiver for later use. When the compressed air is released, it carries kinetic energy and can be utilized for various applications such as powering pneumatic tools or operating pneumatic systems.

APPLICATION

Pneumatic Tools: Powering pneumatic tools such as drills, impact wrenches, sanders, and nail guns.

Manufacturing and Industrial Processes: Providing compressed air for pneumatic machinery, assembly lines, and automation systems. HVAC Systems: Assisting in air conditioning and ventilation systems. Paint Spraying: Supplying compressed air for spray guns used in painting applications.

Automotive and Tire Inflation: Inflating tires, powering pneumatic tools, and operating pneumatic systems in vehicles.

Aerospace: Supporting various pneumatic systems and equipment in the aerospace industry.

ADVANTAGES

Versatility: Suitable for a wide range of applications in various industries.

Efficiency: Provide a continuous and reliable source of compressed air.

Power Generation: Deliver high-pressure air for pneumatic tools and equipment.

Convenience: Enable portability and easy operation in portable air compressors.

Energy Savings: Employing energy-efficient technologies in modern air compressors.

CONCLUSION

Air compressors play a vital role in numerous industries, offering a reliable source of compressed air for various applications. With different types and components, air compressors contribute significantly to manufacturing processes, construction projects, automotive maintenance, and more. Understanding the working principles and applications of air compressors is crucial for professionals and industries relying on compressed air systems.

ELECTRIC OVERHEAD TRAVELING(EOT) CRANE

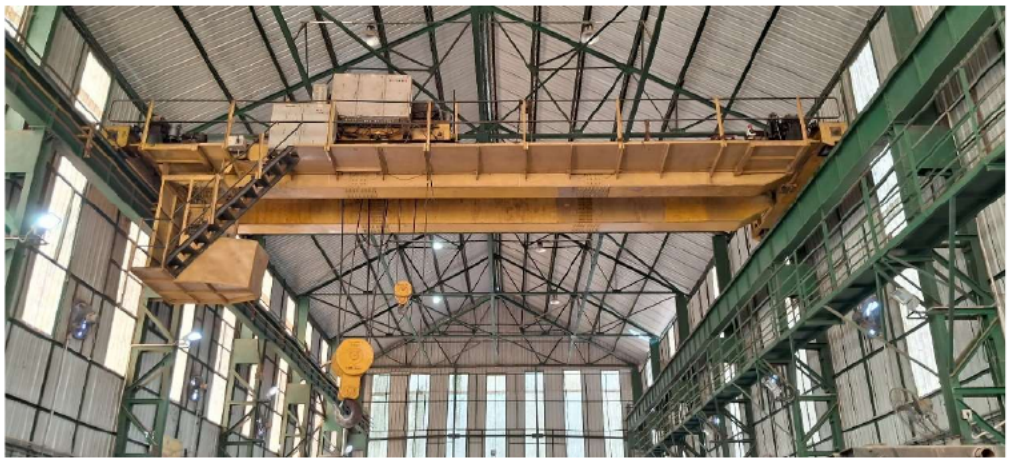


Fig. EOT Crane in Heavy Equipment Repair Shop of Asset Workshop

INRODUCTION

Electric Overhead Traveling Crane or EOT Crane is one of the most common types of overhead cranes, or called bridge cranes, which consists of parallel runways with a travelling bridge spanning the gap. As obvious from the name, EOT crane is operate by electric. Generally, there is an operator cabin or a control pendant along with the EOT crane. EOT crane is forbidden to use in the explosive, combustible or corrosive environment and the working temperature is approximately from -20-40-degree C.

DIFFERENT PARTS OF EOT CRANE

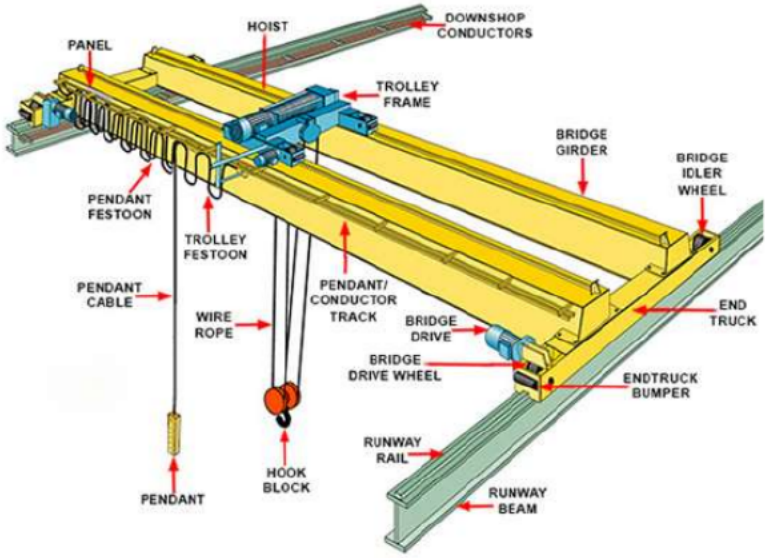


Fig. Diagram of EOT crane with its essential parts

Bridge: The most important structural component of an EOT crane system. It is made up of one or more load bearing beams or girders that span the breadth of the structure and support the roof.

Runway: The track and supporting structure on which the crane is mounted and used to operate.

End trucks: Responsible for housing the wheels on which the whole crane is transported.

Hoist: A device that includes the following components: a motor drive, a coupling and brakes; gears; an overhead drum, ropes, and a load block. It is intended to lift, hold, and reduce the maximum rated load.

Trolley or Crab (TC): The cross-travel unit wherein the hook is lowered and lifted.

Bumper: An energy-absorbing device used to reduce the impact when a moving crane or trolley approaches the limit of its allowed journey, or when two moving cranes or trolleys come into contact.

Remote Controls: The remote controls for an EOT crane are often housed in an operator cabin or remote panel, and they consist of a variety of push buttons and switches which thus activate relays and contactors placed on the crane's mainframe.

WORKING PRINCIPLE

The Electric Overhead Traveling Crane has three operational movements

1) Crane hook up and down lifting.

2) Trolley lateral movement, and

3) Long travelling longitudinal movement are the three options.

ADVANTAGES

Efficient Material Handling: Provide smooth and precise movement of heavy loads.

Increased Productivity: Speed up material handling operations and reduce manual labour

Versatility: Suitable for a wide range of load capacities and operating conditions.

Safety: Equipped with safety features such as limit switches, emergency stops, and overload protection.

Space Optimization: Reduce floor space requirements

LIGHT EQUIPMENT REPAIR SHOP

PORTABLE GRINDER

Fig. Portable Grinder

A portable grinder refers to a handheld power tool used for grinding, cutting, and polishing various materials. Portable grinders are commonly used in maintenance, repair, and construction activities within ONGC facilities, including offshore platforms and onshore installations.

BASIC COMPONENTS

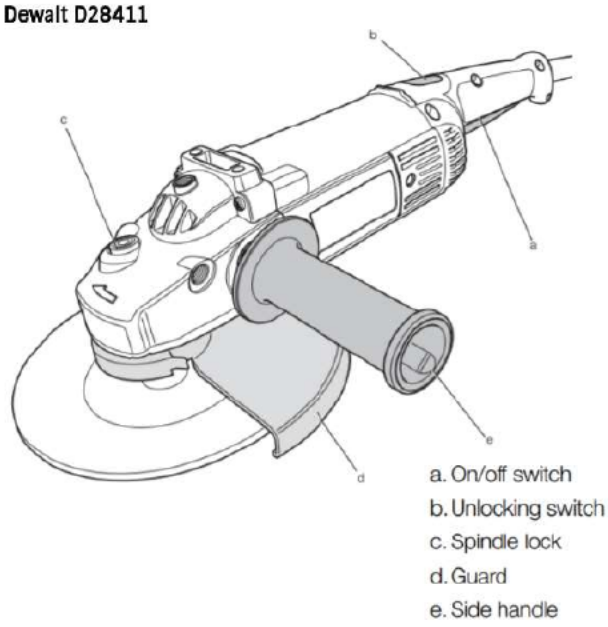


Fig. Diagram of Portable Grinder

Motor: The grinder is equipped with an electric motor that provides the power to rotate the grinding wheel or cutting disc. The motor can vary in power and speed based on the specific application and requirements.

Grinding Wheel/Cutting Disc: These are replaceable attachments that are mounted on the spindle of the grinder. Grinding wheels are used for grinding, while cutting discs are used for cutting through metal or other materials.

Adjustable Guard: Portable grinders have an adjustable guard that serves as a safety feature to protect the operator from sparks, debris, and accidental contact with the rotating wheel or disc. The guard can be positioned to cover a specific area during operation.

Handle: The grinder is typically designed with a handle or grip to provide stability and control to the operator while using the tool. The handle may have a vibration-damping feature to reduce operator fatigue during prolonged use.

APPLICATION

Metalworking: Cutting, grinding, and polishing metal surfaces and removing rust or paint.

Masonry: Cutting bricks, tiles, and concrete blocks.

Woodworking: Shaping, sanding, and polishing wood.

Welding: Removing weld beads, smoothing rough welds, and cutting metal sheets.

ADVANTAGES

Versatility: Suitable for a wide range of tasks, eliminating the need for multiple tools.

Portability: Lightweight and easy to carry, enabling work in various locations.

Efficiency: Cuts and grinds materials quickly and precisely, increasing productivity.

Cost-effectiveness: An affordable tool that saves time and labour in multiple applications.

FABRICATION SHOP

ARC WELLDING

Fig. Arc Welding Machine in Fabrication Shop of Asset Workshop

INTRODUCTION

Arc welding is a fusion welding process that uses an electric arc to melt the base metal and filler metal to create a weld joint. The arc is created between an electrode and the base metal, and the heat from the arc melts the metal at the welding point. The filler metal is then added to the molten pool, and it solidifies to form the weld joint.

WORKING PRINCIPLE

The working principle of arc welding is based on the principle of electric arc. When an electric current is passed through a gap between two electrodes, an arc is created. The arc is a very hot plasma, and it can reach temperatures of up to 6500°F. The heat from the arc melts the base metal and the filler metal, and the molten metal. As the pool cools, it solidifies and creates a strong metallurgical bond between the two materials.

MAIN COMPONENTS AND EQUIPMENTS

Welding Power Source: Provides the electrical energy required to generate the arc.

Electrode Holder: Holds the electrode securely and conducts the electric current to the electrode.

Electrode: Consumable or non-consumable rod or wire that acts as a filler material and provides the electrical contact.

Shielding gas: The shielding gas is used to protect the weld area from the atmosphere. The shielding gas prevents the oxygen and nitrogen in the air from reacting with the molten metal, which can create defects in the weld.

Welding Cable: Carries the electric current from the power source to the electrode holder.

Protective Gear: Includes welding helmet, gloves, and clothing to ensure the safety of the welder.

Welding Machine: Consists of controls, switches, and transformers to regulate and supply the welding current.

Workpiece: The workpiece is the metal that is being welded.

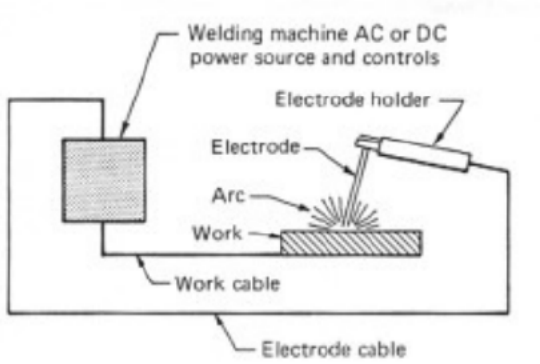


Fig. Diagram of Arc Welding with its components.

APPLICATION

Construction: Joining structural steel, bridges, and building components.

Manufacturing: Fabrication of metal products, machinery, and equipment.

Automotive: Welding vehicle frames, bodies, and components.

Aerospace: Welding aircraft parts and components.

Pipeline and Oil/Gas Industry: Welding pipelines and pressure vessels.

Repair and Maintenance: Repairing damaged metal components and machinery.

ADVANTAGES

It is a versatile welding process that can be used to join a wide variety of metals.

It is a relatively inexpensive welding process.

It is a relatively easy welding process to learn.

GAS WELDING

Fig. Gas Welding Machine in Fabrication Shop of Asset Workshop

INTRODUCTION

Gas welding is a fusion welding process that uses the heat from a flame to melt the base metal and filler metal to create a weld joint. The flame is created by burning a mixture of oxygen and fuel gas, typically acetylene. The heat from the flame melts the metal at the welding point, and the filler metal is then added to the molten pool, and it solidifies to form the weld joint.

COMPONENTS OF GAS WELDING

Welding torch: The welding torch is the device that is used to create the flame.

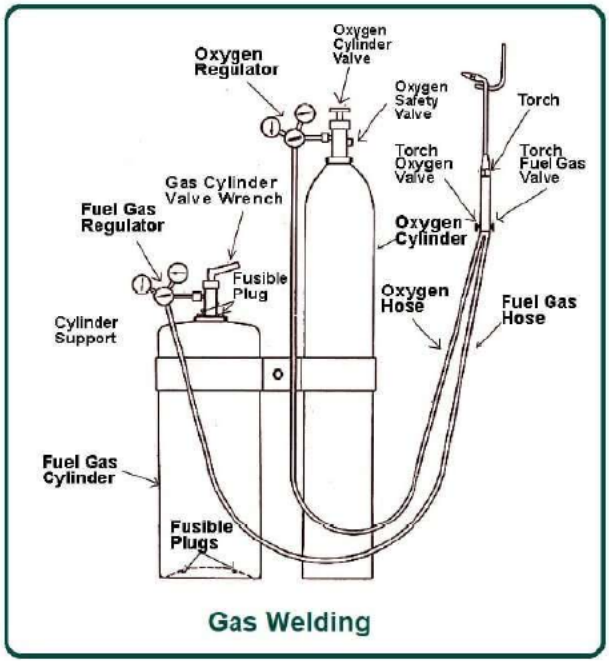
Oxygen cylinder: The oxygen cylinder is the source of oxygen for the welding torch.

Fuel gas cylinder: The fuel gas cylinder is the source of fuel gas for the welding torch.

Welding hoses: The welding hoses connect the oxygen cylinder, the fuel gas cylinder, and the welding torch.

Welding helmet: The welding helmet protects the welder's eyes from the intense light of the arc.

Other equipment: Other equipment that may be used in gas welding includes gloves, apron, leathers, and safety glasses.



APPLICATION

Metal Fabrication: Joining metal components in fabrication shops.

Automotive Repair: Repairing and modifying vehicle frames, exhaust systems, and body panels.

Plumbing and Pipefitting: Welding metal pipes and fittings in plumbing systems.

Construction: Joining structural steel beams, columns, and plates in building construction.

Artistic Welding: Creating decorative metal artwork and sculptures.

ADVANTAGES

It is a versatile welding process that can be used to weld a wide variety of metals.

It is a relatively inexpensive welding process.

It is a relatively easy welding process to learn.

ONGC OIL AND GAS DRILLING

Drilling is a process whereby a hole is bored using a drill bit to create a well for oil and natural gas production. Oil and gas exploration use several drilling methods and platforms based on the formations, geographic location, soil type and other factors. Here are five of the most common drilling methods used in extracting oil and gas:

1. Percussion or Cable Drilling

2. Directional Drilling

3. Electro-Drilling

4. Rotary Drilling

5. Dual-Wall Reverse-Circulation Drilling

1) **Cable Drilling**

Cable drilling is a manual method that attaches a hammering bit on a long cable, which gets lowered into a hole. The tools get supported above the hole by a tripod stand. As the bit and cable go forth and back, soil loosens in the hole, which gets removed. Workers remove the bit at intervals and cuttings suspended in water and pumped to the surface.

2) **Directional Drilling**

In directional drilling, the drill moves along a curved path as the drill hole deepens. The technique allows oil explorers to reach unreachable oil deposits by vertical drilling. As a result, it reduces the extraction costs. Besides, miners can use this method to extract oil deposits from undersea reservoirs onshore.

3) **Electro-Drilling**

In this technique, electric motors drive the winches and rotary tables to extract oil from the earth's crust, improving operations flexibility. This new oil and gas exploration technique is very effective because the electric motor provides direct power to the drill bit. It's ideal for drilling regions with complex geological conditions.

4) **Rotary Drilling**

Rotary drilling uses lightweight drills to drill low-depth wells on the land, followed by rotary mobiles and floating drills of different sizes to drill exploration wells. The drill

pipe used here rotates at a speed of 40-250 revolutions per minute with the drill. Rock cuttings are then removed from the hole by fluid circulating in the drill pipe.

5) **Dual-Wall Reverse-Circulation Drilling**

The dual-wall reverse-circulation technology works like rotary drilling. However, it uses two concentric drill pipes to establish a controlled flow. Drilling fluid gets pumped into the drill pipe through the outer swivel to flow to the bit's bottom. The fluid then flows back upwards into the main pipe. The cuttings move upwards via the internal pipe.

ONSHORE DRILLING

Onshore drilling is the process of extracting resources from beneath the earth's surface, while offshore drilling is the process of extracting resources from beneath the ocean's seabed.

OFFSHORE DRILLING

Offshore drilling is the process which involves drilling into the ocean floor to access oil and gas. It involves using a fixed or mobile platform located off the coast to extract petroleum and natural gas.

RIG COMPONENTS

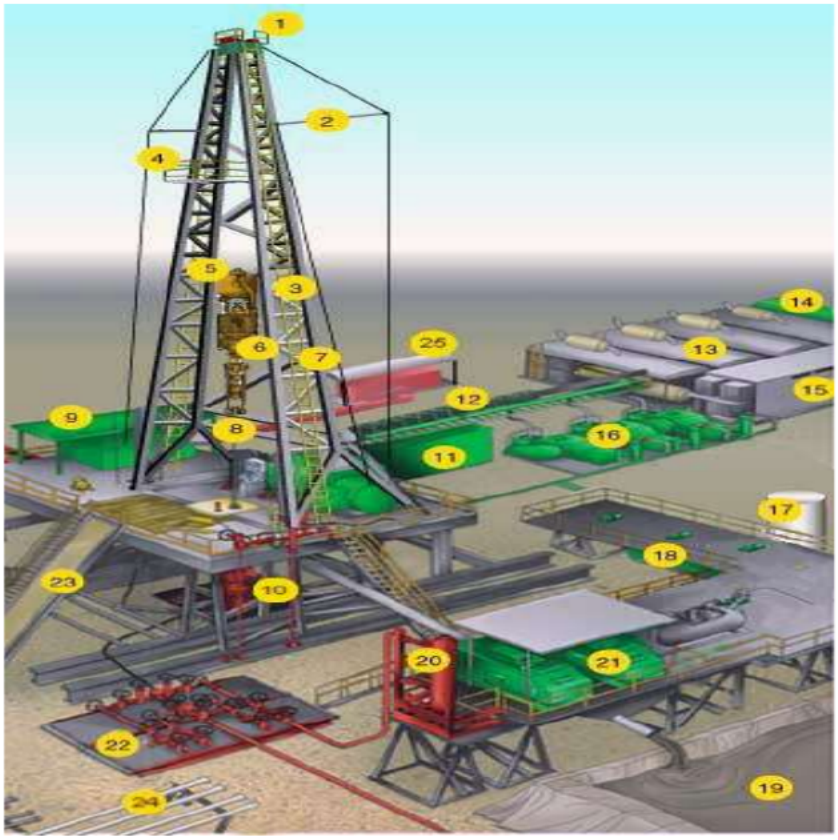


Fig. Components of Drilling Rig

1. Crown Block and Water Table	6. Top Drive	11. Water Tank	16. Mud Pump	21. Shale Shaker
2.Catline Boom and Hoist Line	7. Mast	12. Electric Cable Tray	17. Bulk Mud Components Storage	22. Choke Manifold
3. Drilling Line	8. Drill Pipe	13. Engine Generator Sets	18. Mud Pits	23. Pipe Ramp
4. Monkey board	9. Doghouse	14. Fuel Tanks	19. Reserve Pits	24. Pipe Racks
5. Traveling Block	10. Blowout Preventer	15. Electric Control House	20. Mud Gas Separator	25. Accumulator

WHAT HAVE I LEARNT

During the Winter Training at ONGC, I had the privilege of gaining firsthand experience in the operations of a leading company. This opportunity has broadened my knowledge and provided valuable insights into the workings of a company at the forefront of its industry

One of the most enlightening aspects of the training was witnessing the meticulous maintenance of various machines used in the operations. I had the chance to observe the comprehensive maintenance procedures for different machines, gaining a deeper understanding of their functioning. In particular, the drilling rig and the entire drilling process captivated my interest. Exploring the intricacies of the mud pump, draw works, and other components involved in offshore and offshore drilling was a fascinating experience.

The training also afforded me a comprehensive overview of the entire process, from start to finish. I gained invaluable insights into the operations of gas gensets, diesel gensets, light machines, heavy machines, and fabrication. This encompassed not only understanding their components but also learning about their maintenance and upkeep.

Overall, the Winter Training at ONGC provided me with a holistic understanding of the company's operations. I am grateful for the opportunity to witness firsthand the dedication, precision, and innovation that goes into running a successful company. The knowledge and exposure gained during this training will undoubtedly prove beneficial as I progress in my career.