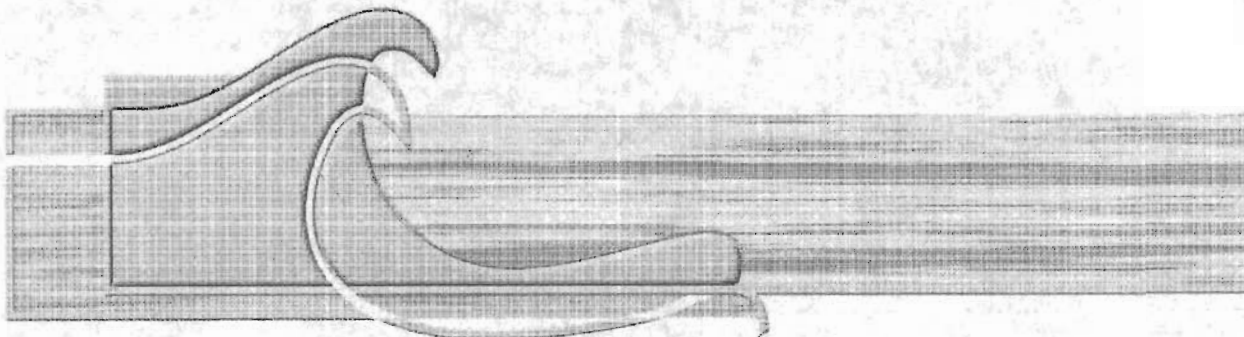




Rig Awareness Training



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How it all Began

Petroleum has been known and used by man for thousands of years. It has been used for road construction, fuel, medicinal and even cosmetic purposes. Today, crude oil is refined and has many more uses.

It was during the period of the "Industrial Revolution" that major changes took place. Industries that had evolved over the centuries made developments that required more and more energy.

As society began to turn to petroleum as a major energy source, drilling technology developed rapidly. In less than 100 years, a simple foot powered spring pole drilling device was transformed into a sophisticated rotary drilling rig.

During the development of the modern petroleum industry, there were two main methods used for drilling. Cable tool drilling was the primary method used and was an improvement on the spring pole technique. A cable above the well bore dropped a cutting tool to the well bottom. The tool was raised and then dropped with heavy weights and it was this impact that drilled the well.

An early cable tool percussion drilling rig was used to drill the first well exclusively for oil at Titusville, Pennsylvania in 1859. Known as "Drake's Well", this well, drilled to a depth of 61 ½ feet, proved that oil could be recovered in sufficient quantities to meet the expanding demand.



Drakes Well, Pennsylvania 1859

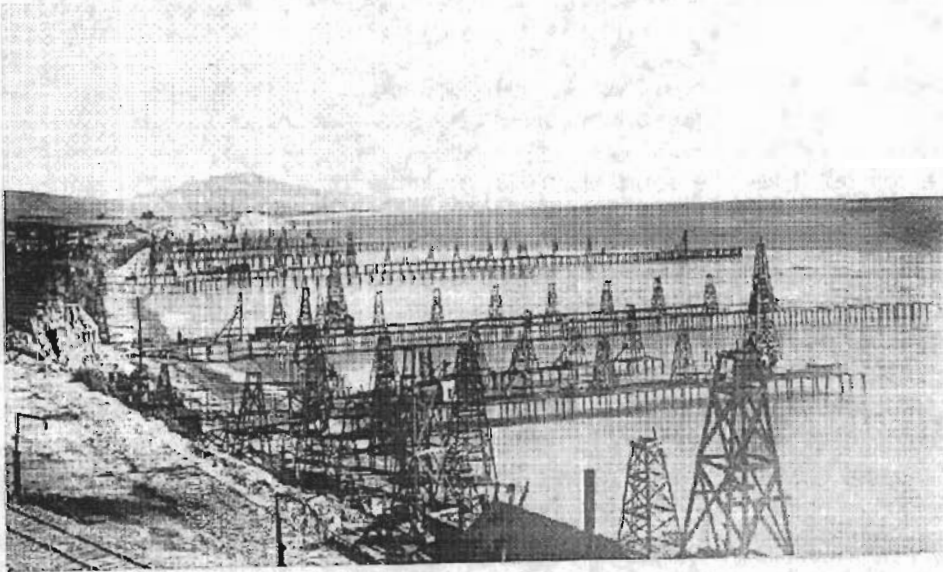
The other main method of drilling was hydraulic rotary drilling where the drill bit was attached to a tubular shaft that was rotated by a turntable at the surface.

Although hydraulic rotary drilling was developed in the 1850's, cable tool drilling dominated the drilling industry from the 1860's until the 1930's. Rotary drilling did not gain acceptance until after 1900 when a well at Spindletop, Texas was drilled to a depth of 1100 feet.

The hydraulic rotary method was an advantage in drilling softer formations. Despite the development of rotary rock type bits in 1909 that could drill in hard formations, it took 20 years for this rotary method of drilling to dominate the industry as it does today.

Locating and extracting oil on land was difficult enough but the search continued offshore and the first oil well drilled intentionally over water was in 1897 from a 250ft long staging in Summerland Beach, California, U.S.A..

Later the same year, a jetty was built perpendicular to the shore and the offshore oil industry was born. In 1898 there were two jetties with 18 wells and by 1902 there were 221 wells on 16 jetties.



Summerland Beach, California 1902

Drilling also took place over inland water. The first well drilled was on Caddo Lake, Texas in 1911. One of the largest inland water drilling areas, Lake Maracaibo in Venezuela, did not have its first well drilled until April 1924.

A drilling barge named the "McBride" unintentionally became the world's first submersible offshore vessel in 1932. The barge was supposed to drill a well in Garden Island Bay, Louisiana, while floating. It was loaded with so much drilling equipment and materials that it rested on the lake's bottom when the well was drilled. The barge was operated exclusively in this manner from then on.

A patent had already been filed in 1928 by Louis Giliasso to build the first intentional submersible barge, the "Giliasso". On November 17, 1933, the "Giliasso" settled in approximately 10ft of water in Lake Pelto, Louisiana, and drilled its first well to 5700ft.

During the 1950's, many ex-naval craft and barges were converted into drillships and the first full scale floating drilling vessel emerged in 1956. A succession of submersible vessels of various designs from different companies continued until tests were carried out and semisubmersible vessels were designed in the early 1960's.

There have been many static and self propelled drilling vessels of rectangular, pentagonal and triangular design. Today there are many types of drilling rig working in many regions of the world. The modern rotary drilling rig is utilized in land drilling operations and in offshore, deep water drilling in up to 10,000 ft of water. In 2007 the newest ultra-deepwater drillships being built will be capable of drilling in water depths of up to 12,000 ft of water.

Although the petroleum industry is involved with the production of natural gas from the wells that are drilled, many valuable products are processed from crude oil.

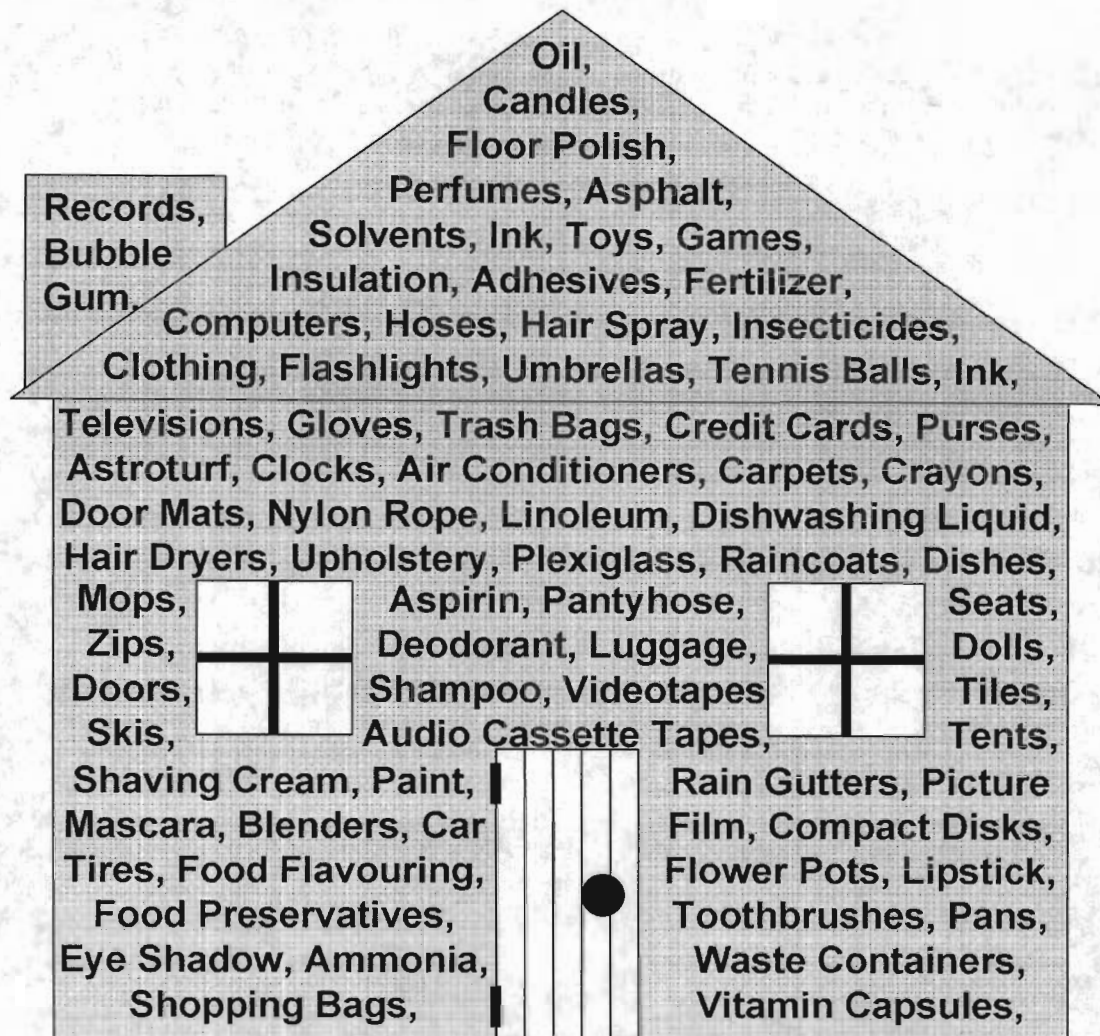
Gasoline and fuel for motor vehicles and aircraft is the most common product produced from crude oil. The second major product is fuel oil that is used for household heating and operating industrial power plants.

Lubricants such as oil and grease are produced in great quantities for all types of machinery, primarily for use on motor vehicles.

There are many, many more products produced from crude oil including plastics, paints, synthetic rubber and cosmetics.

The search for new sources of petroleum is becoming increasingly difficult and the industry is continuously developing ways to improve the drilling and production process.

Today, petroleum is easily transported, refined and stored and remains as one of the world's most vital sources of energy.



Household Products Produced From Petroleum

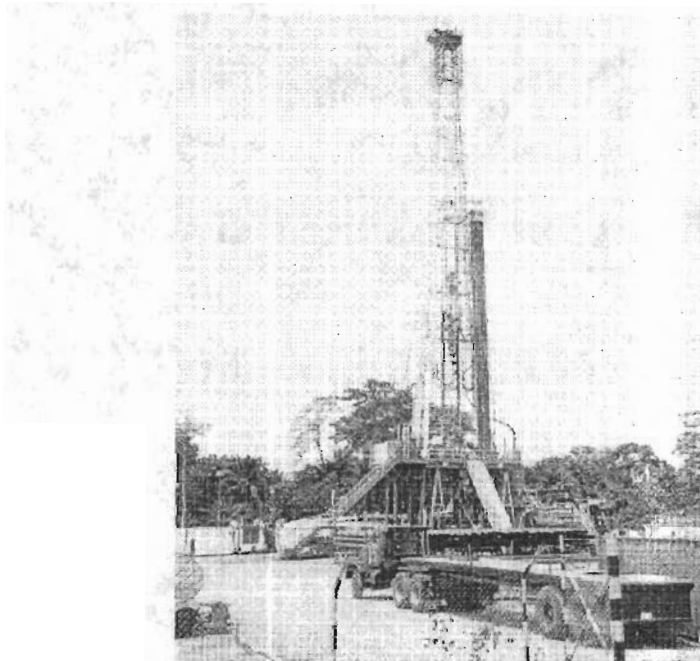
Basic Rig Types

There are a number of considerations that are fundamental to the design of any well program. Selection of the type of rig and its drilling equipment is one of the main considerations.

Some of the items to consider in rig selection include:

- Territory in which to operate
- Ranges of well depths and hole sizes to be drilled
- Casing loads expected
- Range of rotary speeds required
- Drill Strings – Drill Collar weights and sizes
- Limits on package sizes
- Mud system, tanks and manifolding
- Auxiliary services and power required
- Substructure height - clearances
- Blowout prevention equipment
- Controls
- Miscellaneous (racks, tools, instrumentation, etc...)

Land Rig



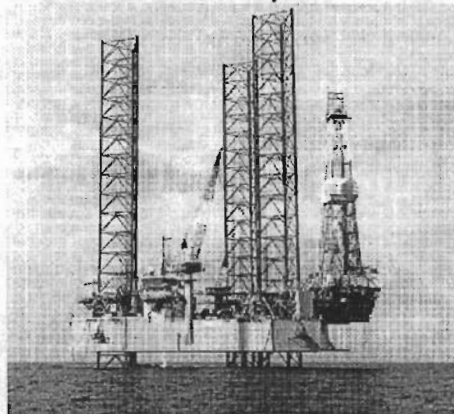
A land rig is any drilling rig located at onshore locations. They typically come in light, medium and heavy configurations and can be moved using heavy lift cranes and trucks.

Submersible / Barge



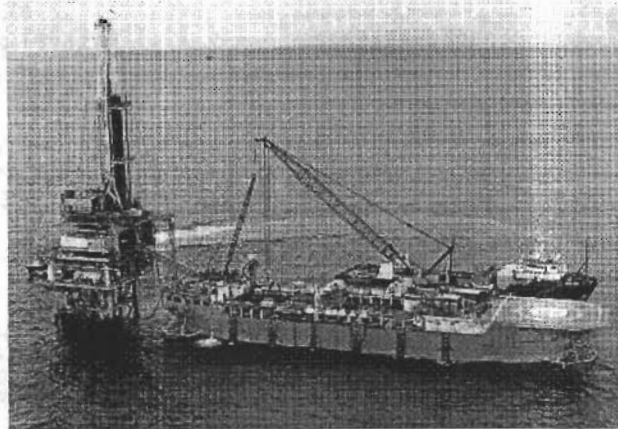
When stationed on the drilling site, submersible rigs can be anchored in the floating mode or submerged to rest on the bottom in water depths up to 175ft. A barge rig, or swamp barge, is a floating drilling structure that is submerged when operating. They are used in shallow water areas such as rivers, swamps and inland bays. "Swamp" barges are typically used to drill wells in shallow water depths of up to 20ft.

Jack-up



A jack-up is a mobile offshore drilling structure with tubular or derrick legs that support the deck and hull. When positioned over the drilling site, the bottoms of the legs rest on the seafloor. Once the legs are firmly positioned on the bottom, the deck and hull height are adjusted and leveled. Jack-ups can drill in water depths up to 400ft.

Platform / Tender



A platform is a self-contained rigid, immobile structure from which development wells are drilled and produced. Tenders are barge shaped vessels that perform drilling operations over a platform or existing wellhead. They are typically used in calm relatively shallow offshore locations.

Semi-submersible



A semi-submersible is a floating structure that has its hulls submerged in the water. Pontoons and columns are flooded which cause the unit to submerge to a predetermined depth. They are either self propelled or towed to the drilling site and can be anchored or dynamically positioned over the drilling site or both.

Drillship



A drillship is a self-propelled floating drilling unit. While not as stable as a semi-submersible, they are capable of drilling wells in deeper waters. They can be anchored or dynamically positioned over the drilling site or both.

The term "MODU" or "Mobile Offshore Drilling Unit" applies to rigs used to drill offshore exploration and development wells. This classification is divided into two basic types:

1. Bottom-supported drilling rigs such as jack-ups and swamp barges.
2. Floating drilling rigs such as semi-submersibles and drillships.

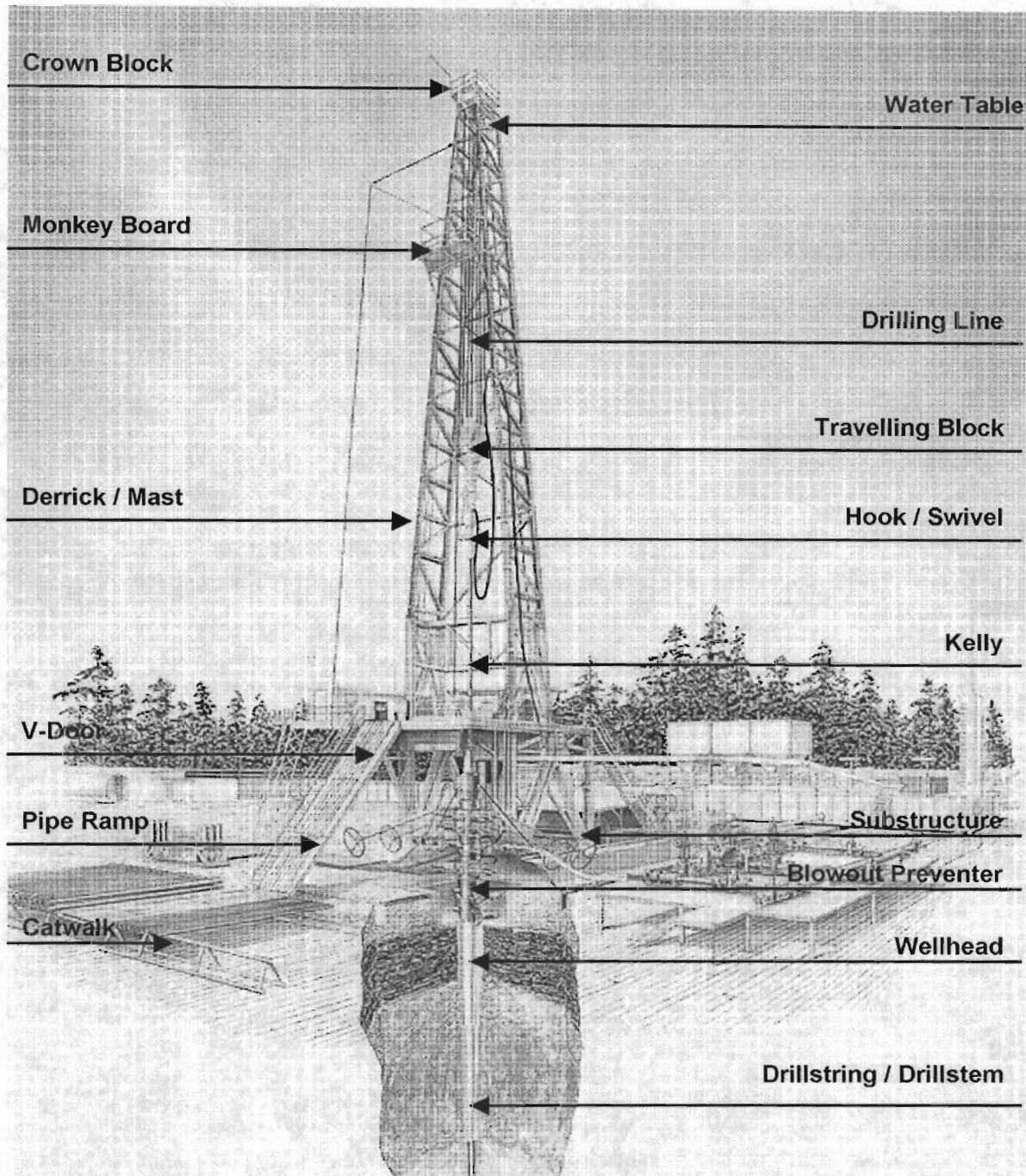
The term "Generation" is traditionally applied to floating rigs and is based on age or year of construction. Rigs are built to satisfy demand and construction dates coincide with peaks in oil price and increased demand.

Generation is also based on the technology of equipment installed on the rig. When rigs are built they generally reflect the technology available at the time. As technology develops more complex work can be carried out and over the past thirty years semi-submersibles have moved into deeper water to drill deeper more complex wells. However, if a rig's equipment is upgraded to a more modern level of technology then it would effectively be a newer generation rig.

Generation	Year of Construction	Examples of Development of Technology
1 st	1962 to 1969	800 ft water depth, 2 x 1250 hp mud pumps, Kelly, 1,450 ton variable deck load (VDL), manual derrick
2 nd	1970 to 1981	1,500 ft water depth, 2 x 1600 hp mud pumps, Kelly, 3,000 ton VDL, manual derrick
3 rd	1982 to 1986	2,500 ft water depth, 2 x 1600 hp mud pumps, Kelly, 3,800 ton VDL, automatic pipehandling
4 th	1987 to 1998	3,500 ft water depth, 3 x 1600 hp mud pumps, TDS3 topdrive, 4,300 ton VDL, automatic pipehandling
5 th	1999 onwards (?)	8,000 ft water depth, 5 x 2200 hp mud pumps, TDS

	8 topdrive , 5,000 ton VDL, dual activity
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Basic Rig Components



Basic Rig Crew

The oil company, also known as the "Operating Company" or more simply the "Operator" or "client", will plan on drilling a well for oil or gas. Once they have acquired the lease for the proposed drilling site then various contracts are awarded to the third party companies necessary.

One of the main contracts issued is a drilling contract with a "Drilling Contractor". A drilling contractor provides the drilling rig, equipment and crew to actually drill the well.

At the rig site, the operating company and its interests are represented by a company representative. Known as the "Company man", will liaise with the drilling contractor to ensure safe and efficient operations take place in line with the drilling contract. During drilling operations it will be necessary for the company man to make on site company decisions but he will generally consult with senior staff on these and other issues.

The drilling rig will have a Rig Manager who is the primary contact between the operator and the drilling contractor for main contractual issues. On site, the drilling contractor and its interests are represented by a "Rig Superintendent", more commonly called a "Toolpusher".

A Toolpusher is an experienced drilling person who will have worked up through the ranks of the drilling crew. He will supervise the drilling operations and associated activities, ensuring they are in accordance with the well program.

He is in direct charge of the drilling operations and the related matters, such as crew coordination and will ensure they are carried out in a safe, efficient and productive manner.

On offshore drilling units the Toolpusher remains in direct charge of the drilling activity but will generally report to an "offshore installation manager". Commonly called the "OIM", he provides certain amount of marine support. He will exercise authority and discretion to take whatever action is required for the safety of the crew, vessel and protection of the environment.

Other functions of the OIM are to manage the manpower and resources of the rig to achieve optimum performance so as to ensure the well program is carried out in a safe, efficient and productive manner and to promote and ensure that all of the drilling contractor policies and procedures are communicated and understood by personnel on the rig.

The rig superintendent or OIM will then have various "department heads" who report to them. There will be someone from the mechanical department, electrical department and so on. Each department head will then have a certain amount of personnel under their supervision.

The amount of personnel required to make up a rig crew will depend mainly on the type of rig. A small land rig can operate with few personnel when you compare it to a large floating drilling unit. There are some common positions between all rigs and some positions that are required only on offshore floating rigs.

Every rig will have drilling crews made up of between 5 to 8 personnel who perform the actual drilling operations. Other personnel are assigned to "support" the drilling operations.

The main drilling crew may consist of the following personnel:

Driller – is in overall charge of a drilling crew.

The driller will operate drilling and mud circulating equipment as instructed in the well program and in accordance to the drilling contractor's policies and procedures.

He will monitor the well condition at all times (i.e. depth, mud weight, weight on bit, possible deviation from course et cetera) and interpret and respond to downhole conditions.

A main function will be to secure the well during an emergency or well control situation and assist in the well killing operations.

Assistant Driller – will assist the driller in the operation of the drilling and mud circulating equipment as instructed in the well program and in accordance to the drilling contractor's policies and procedures.

Known as the "AD" they will perform the drilling department's daily checklists, i.e. QHSE checks, mast inspection, choke and kill manifold set up, et cetera.

They will normally be required to maintain an organized drilling equipment store along with a tubular and subs inventory and to maintain accurate records of tubular and tool dimensions (i.e. internal and external diameter, fish neck, and serial numbers).

Derrickhand – the primary function is to handle tubular goods while working in the derrick during tripping operations (i.e. pulling out of hole and running in hole).

A secondary function is to assist in operating and maintaining drilling fluid pumping and mixing systems and maintaining daily logs of drilling fluid properties, and chemicals and mud materials. The last generation of Drilling vessels having automated or remotely

operated racking systems will utilize the Derrickman as the primary person responsible for the mixing, managing and weighing of drilling fluids and muds.

Floorhand – will assist the Driller in all operations on the rig floor.

Also known as “Roughneck”. The Floorhand also handles drilling tools and tubular on the rig floor for the purpose of making up/breaking down drill sting, riser and other drilling systems.

Drilling operations are conducted around the clock, 24 hours per day, 7 days per week. For this reason, crews will work various shift patterns to cover 24 hours.

Other members of a rig crew may include:

Crane Operator – Operate the rig’s crane in a safe and efficient manner in accordance to the company’s policies and procedures and perform regular preventive maintenance on the cranes and components. The Crane Operator typically supervises the Roustabouts.

Roustabout – Carry out cargo handling duties, general cleaning, maintenance, and other manual labor as assigned/directed by the Crane Operator.

Maintenance Supervisor – Supervise and control the maintenance and repair of mechanical, electrical, electronics, subsea, and information technology equipment on the rig.

Chief Electrician – Responsible for the installation, maintenance and repair of all electrical equipment onboard the rig.

Chief Mechanic – Maintain and repair mechanical, pneumatic and hydraulic equipment onboard the rig.

Motor Operator – Monitor performance, lubricate, and maintain the engines and other mechanical equipment.

Welder – Carry out welding, cutting, burning and associated activities as directed.

Barge Supervisor – Ensure that all marine aspects of the rig’s operations are carried out in accordance to statutory and regulatory controls and guidelines and supervise the operation of the marine department to ensure the safe and efficient running of the rig.

Ballast Control Operator – Operate the ballast control system so as to maintain the rig’s position, draft and trim with respect to well location.

Dynamic Positioning Operator - Operate the automated and fixed station keeping system of the rig.

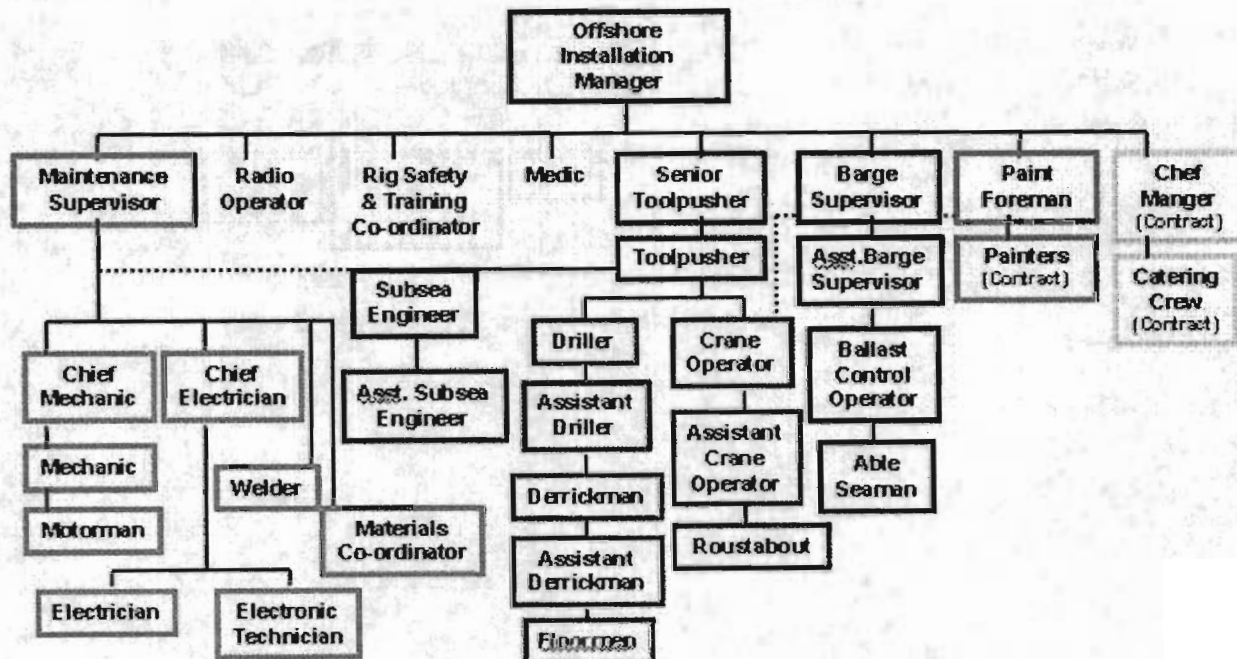
Supsea Supervisor – Maintain and repair all subsea systems and associated surface equipment, riser tensioning system, and drill string compensation systems onboard the rig.

Materials Coordinator – Coordinate the rig's materials requisitions, organize and control the warehouse, and maintain the warehouse inventory levels within established guidelines.

Medic – Provide medical care and primary first aid care in emergency cases, to all personnel onboard the rig and provide clerical/administrative support as required.

Radio Operator – Operate rig communication equipment and answers phones and perform Carry out cargo handling duties, general cleaning, maintenance, and other manual labor as assigned/directed clerical duties such as filing and typing as directed.

Rig Safety Training Coordinator – Coordinates and administers the company's management systems on board. Assists, recommends and advises the OIM, Department Supervisor's and Crews on HS&E and Training matters.



Typical offshore floating rig crew.

Note: not all rigs have these positions.

In addition to the personnel supplied by the drilling contractor, many service companies are required to drill a well.

These include:

Directional Drilling Company – provides special down-hole equipment and well planning to perform directional drilling

Well Logging Company – conducts well monitoring procedures

Mud Company – specializes in the supply and maintenance of the drilling fluid

Cementing Company – specializes in the cementing operations, primarily casing cementing

Casing Company – specializes in running of casing

ROV Company – specializes in operating the “Remotely Operated Vehicle” also referred to as the “Sub”. They carry out specialised diving operations for well surveillance, back-up operation of the SubSea BOP and regular inspections of the SubSea Riser, BOP and well head. The ROV provides the eyes at the sea bed for the Company Man, OIM, Toolpusher, SubSea Supervisor and many others during typical and critical drilling operations.

Catering Company – specializes in the operations of the unit's Galley, food service, laundry, and the cleaning of the accommodations and administrative spaces.

Life on the Rig

Crews on drilling rigs work on a rotation basis. They work for so many weeks "on" the rig and have so many weeks "off" for recuperation. Each time on the rig is generally known as a "trip".

There are many rotation schedules including:

2 weeks on – 2 weeks off

3 weeks on – 3 weeks off

4 weeks on – 4 weeks - off also known as "month and month"

5 weeks on – 5 weeks off

Some areas even work 2 weeks on – 4 weeks off

During their time on the rig, the drilling crews work "shift" patterns or "tours", pronounced "towers" to cover the 24 hour period. The majority of crews will work a 12 hour shift "on" or at work followed by 12 hours "off" to rest. There are normally 2 crews working on the rig although some land operations use 3 crews who work an 8 hour tour.

The most common shift for drilling crews is from 12 o'clock to 12 o'clock. They will split their trip between a day shift and night shift. So, a crew working 2 weeks on and 2 weeks off would normally work the first week on days from midday to midnight and the second week on nights from midnight to midday. This may vary greatly from one operation to another and rig to rig.

The shift schedule will depend on various issues but includes the logistics of getting to and coming off of the rig. For that reason, it may be necessary to work at nights on arrival to the rig followed by a period working days.

Crews will normally perform a short shift on their arrival to the rig, a short shift on their last day and a short shift or "short change" in the middle. This allows change over of crews to take place.

For example, a crew coming on to the rig may start work at 4 pm until midnight. They then work a 12 hour shift for 1 week. On the change over day they would finish work at midnight and resume work at 8 am. They would work until 4 pm when the new crew coming on the rig starts their first shift. The crew that finishes at 4 pm then resume work again at midnight to spend a period working the night shift.

Other members of the rig crew generally work a fixed shift schedule of either days or nights. These may be 12 o'clock to 12 o'clock or more commonly 6 o'clock to 6 o'clock.

Some crew positions work flexible hours to suit the operation. Therefore, they are "on call" 24 hours per day but company policies will ensure that they do not work unnecessarily long hours and always have sufficient rest time.

Meal breaks also play a part in how a rig crew work their shift patterns. Crews are divided so that there are not too many starting or finishing work at the same time.

Meal break periods are generally as follows:

Breakfast 5 am to 7 am

Lunch 11 am to 1 pm

Dinner 5 pm to 7 pm

Evening 11 pm to 1 am (also known as "Midnights")

Crew members are normally allowed 30 minutes for their meal break during the 12 hour shift. They all have to eat between 5 pm and 7 pm during the dinner period and some personnel have to be relieved by someone else to take their break.

Because the rig is working 24 hours per day and some crews are starting work at midnight the meals do not always follow the normal expectations. Not everyone enjoys having steak and chips or roast chicken for breakfast so a variety of food is available to cover all meal periods.

During working hours there are generally 2 additional rest periods or "coffee breaks". Normally this is limited to a 15 minute break in the first half of the shift and a 15 minute break in the second half of the shift. Supervisors may grant additional quick breaks depending on the operations taking place.

As half of a persons time on the rig is spent not working then there are facilities for relaxation. Each person is assigned a bed space in one of the cabins. This may have to be shared with other personnel but there is commonly only one person off duty at any one time.

Toilets and shower facilities are provided which may be "ensuite" next to the cabin or may be "communal". The rig supplies soap and towels for personnel to wash but any additional personal items such as tooth paste, deodorant or shampoo have to be supplied by the individual.

Some rigs have an onboard shop or "bond" which sells items such as cigarettes and they may also provide some toiletry items such as shampoo. This operation is commonly known as the "Ship's Store".

In addition to the sleeping areas there are additional recreation facilities available. The facilities available will depend on the age and type of rig. Every rig will have at least one room dedicated as a "recreation room" with a television and video / DVD player for watching films or satellite TV.

Some of the newer rigs are better equipped and may have a dedicated cinema, reading room or gymnasium. Some rigs even have saunas and sun beds.