

AL AYEN university
Golloge Pearolun Engineering



DRILLING RIGS AND RIG TYPES

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بحث تخرج مقدم الى كلية الهندسة – قسم النفط جامعة العين وهو جزء
من متطلبات نيل شهادة البكالوريوس في هندسة النفط

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اقرار المشرف

اشهد بان اعداد هذا البحث الموسوم (DRILLING RIGS AND RIG TYPES RIG COMPONENTS) من اعداد الطلاب:

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قد تم تحت اشرافي في كلية الهندسة / قسم النفط / جامعة العين وهو جزء من متطلبات نيل شهادة البكالوريوس

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(اللَّهُ نُورُ السَّمَاوَاتِ وَالْأَرْضِ مَثَلُ نُورِهِ كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ
الْمِصْبَاحُ فِي زُجَاجَةٍ الزُّجَاجَةُ كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ
شَجَرَةٍ مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ
لَمْ تَمْسَسْهُ نَارٌ نَوْراً عَلَى نُورٍ يَهْدِي اللَّهُ لِنُورِهِ مَنْ يَشَاءُ وَيَضْرِبُ
اللَّهُ الْأَمْثَالَ لِلنَّاسِ وَاللَّهُ بِكُلِّ شَيْءٍ عَلِيمٌ)

صدق الله العلي العظيم

سورة النور / الآية (35)

الإهداء

إلى من أفضلها على نفسي، ولمَ لا فلقد ضحّت من أجلي

ولم تدّخر جُهدًا في سبيل إسعادي على الدّوام

(أمّي الحبيبة).

نسير في دروب الحياة، ويبقى من يُسيطر على أذهاننا في كل

مسلك نسلكه

صاحب الوجه الطيب، والأفعال الحسنة.

فلم يبخل عليّ طيلة حياته

(والدي العزيز).

إلى أصدقائي، وجميع من وقفوا بجواري وساعدوني بكل ما

يملكون، وفي أصعدة كثيرة

أُقدّم لكم هذا البحث، وأتمنّى أن يحوز على رضاكم.

شكر وتقدير

كلمات شكر وامتنان وعرفان أتقدم بها إلى عمادة كلية الهندسة وأساتذتها في جامعة العين وأتقدم بالشكر والتقدير إلى اليمين المشرفين على البحث (د. عبد الحسين نعمه العتابي و د. ناجح العلي) لما قدمه لي من رعاية علمية ومتابعة مستمرة فجزاه الله خير الجزاء .

هذا ويسعدني إن أتقدم بالشكر والامتنان إلى الأساتذة الكرام الذين كانوا خير عون في دعم البحث ورفده بكل ما يحتاج إليه .

كلمة شكر يملأها الاعتزاز إلى فريق العمل المساعد متمنيا لهم الموفقية والنجاح .

وأخيرا وليس آخراً يقف الباحث عاجز اللسان عن مشاعر الحب والحنان والتقدير والعرفان

إلى أقرب واعز الناس كانوا إلى جانبي خير جليس لي وتحملوني طوال مدة الدراسة وكانوا

خير عون لي عائلتي أسأل الله لهم الصحة والعافية .

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Abstract

We at Service King are pleased to be able to offer to the oil industry quality products made in the heartland of America. Our mobile rigs are now in the USA and around the world. We have the best skilled laborers and management with over 40 years in the oilfield equipment industry. We offer a wide selection of well service, work over, and drilling rigs with options to accommodate the industry's many varied needs. We manufacture the Carrier, Draw works and Derricks right here in our plants. Other equipment for complete packages to fit your needs is also available. Our sales staff will be happy to answer your questions by phone, email or in person. We also welcome an on-site visit to our location to see first hand these quality products being produced.

Chapter one

A DRILLING RIG

1-3. Introduction

A drilling rig is a machine that creates holes in the earth's subsurface. Drilling rigs can be massive structures housing equipment used to drill water wells, oil wells, or natural gas extraction wells, or they can be small enough to be moved manually by one person and such are called augers. Drilling rigs can sample subsurface mineral deposits, test rock, soil and groundwater physical properties, and also can be used to install sub-surface fabrications, such as underground utilities, instrumentation, tunnels or wells. Drilling rigs can be mobile equipment mounted on trucks, tracks or trailers, or more permanent land or marine- based structures (such as oil platforms, commonly called 'offshore oil rigs' even if they don't contain a drilling rig). The term "rig" therefore generally refers to the complex equipment that is used to penetrate the surface of the Earth's crust.

Small to medium-sized drilling rigs are mobile, such as those used in mineral exploration drilling, blast-hole, water wells and environmental investigations. Larger rigs are capable of drilling through thousands

of metres of the Earth's crust, using large "mud pumps" to circulate drilling mud (slurry) through the drill bit and up the casing annulus, for cooling and removing the "cuttings" while a well is drilled. Hoists in the rig can lift hundreds of tons of pipe. Other equipment can force acid or sand into reservoirs to facilitate extraction of the oil or natural gas. Marine rigs may operate thousands of miles distant from the supply base with infrequent crew rotation or cycle.

Oil well drilling utilises tri-cone roller, carbide embedded, fixed- cutter diamond, or diamond-impregnated drill bits to wear away at the cutting face. This is preferred because there is no need to return intact samples to surface for assay as the objective is to reach a formation containing oil or natural gas. Sizable machinery is used, enabling depths of several kilometres to be penetrated. Rotating hollow drill pipes carry down bentonite and barite infused drilling muds to lubricate, cool, and clean the drilling bit, control downhole pressures, stabilize the wall of the borehole and remove drill cuttings. The mud travels back to the surface around the outside of the drill pipe, called the annulus. Examining rock chips extracted from the mud is known as mud logging. Another form of well logging is electronic and is commonly employed to evaluate the existence of possible oil and gas deposits

in the borehole. This can take place while the well is being drilled, using Measurement While Drilling tools, or after drilling, by lowering measurement tools into the newly drilled hole.



Figure: (1-1) first old rig

1-2: TYPES OF RIGS

Drilling rigs are classified as:

- Land rigs
- Offshore rigs

1-2-1. OFFSHORE RIGS

There are two types of offshore rigs:

Floating rigs:

- Semisubmersible

A semisubmersible is a MODU designed with a platform-type deck that contains drilling equipment and other machinery supported by pontoon-type columns that are submerged into the water.

- Drillships

A drillship is a merchant vessel designed for use in exploratory offshore drilling of new oil and gas wells or for scientific drilling purposes. In most recent years the vessels are used in deepwater and ultra-deepwater applications, equipped with the latest and most advanced dynamic positioning systems.

- **FLOATING RIGS:**



Figure: (1-2) floating rigs

An oil platform, offshore platform, or offshore drilling rig is a large structure with facilities for well drilling to explore, extract, store, and process petroleum and natural gas that lies in rock formations beneath the seabed. Many oil platforms will also contain facilities to accommodate their workforce. Most commonly, oil platforms engage in activities on the continental shelf, though they can also be used in lakes, inshore waters, and inland seas. Depending on the circumstances, the platform may be fixed to the ocean floor, consist of an artificial island, or float. Remote subsea wells may also be connected to a platform by flow lines and by umbilical connections. These sub-sea solutions may consist of one or more subsea wells or of one or more manifold centres for multiple wells.



Figure: (1-3) floating rigs

- **FLOATING RIGS:**

Offshore drilling presents environmental challenges, both from the produced hydrocarbons and the materials used during the drilling operation. Controversies include the ongoing US offshore drilling debate.

There are many different types of facilities from which offshore drilling operations take place. These include bottom-founded drilling rigs (jackup barges and swamp barges), combined drilling and production facilities, either bottom-founded or floating platforms,

and deepwater mobile offshore drilling units (MODU), including semi-submersibles and drillships. These are capable of operating in water depths up to 3,000 metres (9,800 ft).

- **FLOATING RIGS:**



Figure: (1-4) floating rigs

Spars are moored to the seabed like TLPs, but whereas a TLP has vertical tension tethers, a spar has more conventional mooring lines. Spars have to-date been designed in three configurations: the "conventional" one-piece cylindrical hull; the "truss spar", in which the midsection is composed of truss elements connecting the upper buoyant hull (called a hard tank) with the bottom soft tank containing permanent ballast; and the "cell spar", which is built from

multiple vertical cylinders. The spar has more inherent stability than a TLP since it has a large counterweight at the bottom and does not depend on the mooring to hold it upright. It also has the ability, by adjusting the mooring line tensions (using chain-jacks attached to the mooring lines), to move horizontally and to position itself over wells at some distance from the main platform location. The first production spar[when?] was Kerr-McGee's Neptune, anchored in 590 m (1,940 ft) in the Gulf of Mexico; however, spars (such as Brent Spar) were previously used as FSOs. Eni's Devil's Tower located in 1,710 m (5,610 ft) of water in the Gulf of Mexico, was the world's deepest spar until 2010. The world's deepest platform as of 2011 was the Perdido spar in the Gulf of Mexico, floating in 2,438 metres of water. It is operated by Royal Dutch Shell and was built at a cost of \$3 billion.

The first truss spars were Kerr-McGee's Boomvang and Nansen. The first (and, as of 2010, only) cell spar is Kerr-McGee's Red Hawk.

BOTTOM-SUPPORTED RIGS:

Bottom-supported rigs: There are three types:

- Jack-ups

A jackup rig is a barge fitted with long support legs that can be raised or lowered. The jackup is maneuvered (self-propelled or by towing) into location with its legs up and the hull floating on the water. Upon arrival at the work location, the legs are jacked down onto the seafloor.

- Platform

The Platform (Spanish: El hoyo, transl. The Hole) is a 2019 Spanish social science fiction-horror film directed by Galder Gaztelu-Urrutia.

- Barge

a long flat-bottomed boat for carrying freight on canals and rivers, either under its own power or towed by another.



Figure: (1-5) floating rigs

Many of the world's potential reserves of hydrocarbons lie beneath the sea, and the hydrocarbon industry has developed techniques suited to conditions found in the offshore, both to find oil and gas and to successfully produce it.

Modern and advanced drilling techniques and methods have increased Companies' ability to find hydrocarbons and the speed at which their projects are developed.

There are technology advances for exploration and development, better control of environmental impacts, increased efficiency, and improved understanding of the marine environment.

The techniques and equipment for drilling offshore wells (offshore drilling) are very similar to those used for onshore drilling.

The main differences consist in the arrangement of the drilling rig and of the equipment, and in certain particular methods of carrying out the operations, which have to be adapted to the requirements dictated by far more difficult and often extreme environmental conditions.

BOTTOM-SUPPORTED RIGS:



Figure: (1-5) Bottom-Supported rigs

This entails considerably higher costs, to which must also be added considerable investments to provide the facilities and plants for subsequent field development.

An offshore drilling rig has to create the same working conditions as for onshore rigs which can move from one point to another without any difficulty, and they have several additional features to adapt them to the marine environment, including:

Heliport

- a large deck area that is placed high and to the side of offshore rigs;
- It is an important feature since helicopters are often the primary means of transportation.

Living quarters

- usually comprise bedrooms, a dining hall, a recreation room, office space, and an infirmary.

Cranes

- used to move equipment and material from work boats onto the rig and to shift the loads around on the rig.

Risers

- used to extend the wellhead from the mudline to the surface.

BOTTOM-SUPPORTED RIGS:

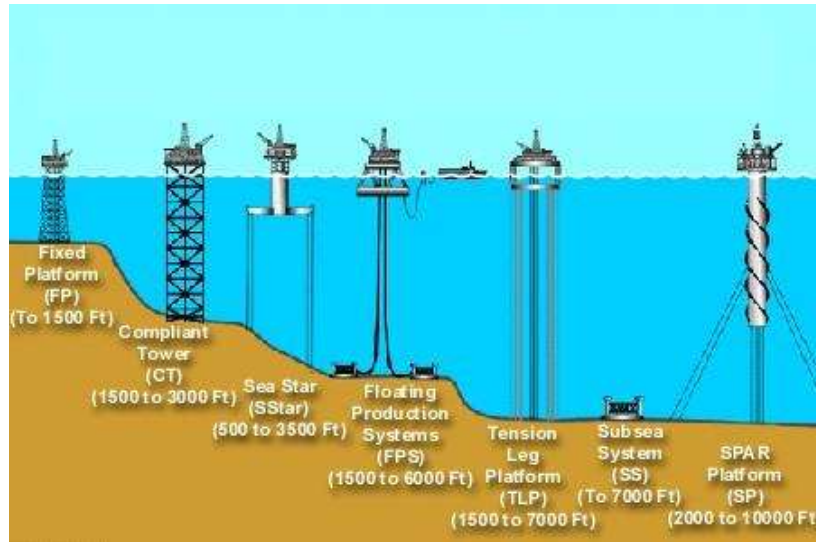


Figure: (1-6) Bottom-Supported rigs

These conditions increase the complexity of the offshore rigs, and justify their higher daily rate compared with an onshore drilling rig of the same capacity.

From an operational point of view, offshore drilling may be subdivided into two main categories, depending on the water depth.

Bottom supported drilling rigs

- The safety equipment, i.e. ordinary Blow-Out Preventers (BOPs) located permanently above sea level and accessible from the supporting structure;

- drilling operations are identical to those carried out in onshore drilling.

Floating drilling rigs

- The wellhead and the subsea BOPs are placed on the seabed, and are not therefore directly accessible from the supporting structure.
- Drilling operations differ from onshore ones, as the rig floats, subjected to the action of the wind, currents and waves, which cause it to make small horizontal and vertical movements.
- The use of floating rigs is necessary for exploratory drilling in water depths of more than 100 m (this refers solely to exploratory drilling operations, and not to the subsequent development drilling).

Chapter Two

RIG COMPONENTS

The major components that need to be selected and sized for the purpose of rig sizing are:

1. Hoisting System
2. Rotating System
3. Circulating System
4. Tubular Goods
5. Well control system
6. Derrick Capacity And Substructure
7. Power Requirements for the above

2-1 HOISTING SYSTEM

○ The main objective of this system is to provide lifting and dropping force towards drill string and any components around rig floor.

- Drawworks
- Crown Block
- Dead Line Anchor

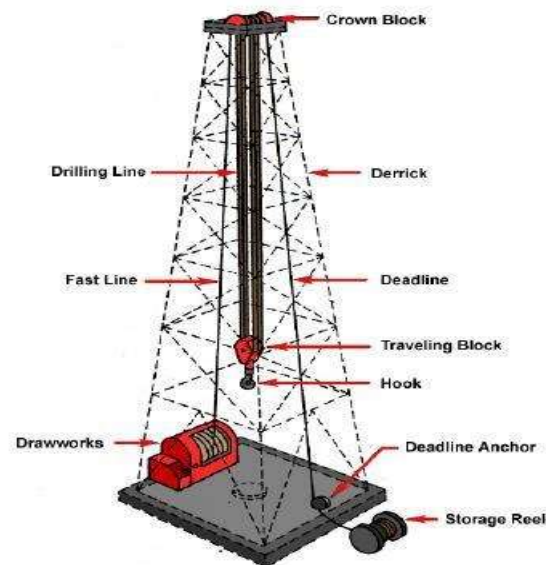
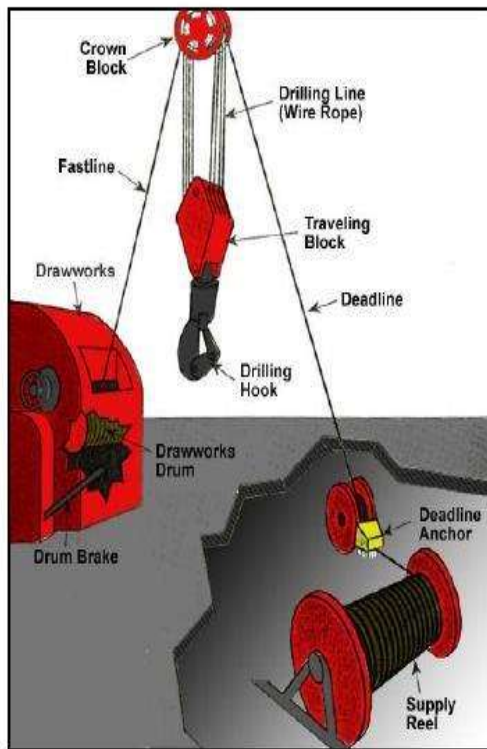


Figure: (2-1) Hoisting System

- Travelling Block
- The Hook
- Drilling Line

HOISTING SYSTEM



A Windlass hoists water from a well

Figure: (2-2) Hoisting System

Hoisting System is the system used on a drilling rig to perform all lifting activities on the rig. ... The major components of a Hoisting System are derrick, block & tackle system, drawworks and miscellaneous hoisting equipment like elevators, hooks and weight indicator.

2-2 CROWN BLOCK

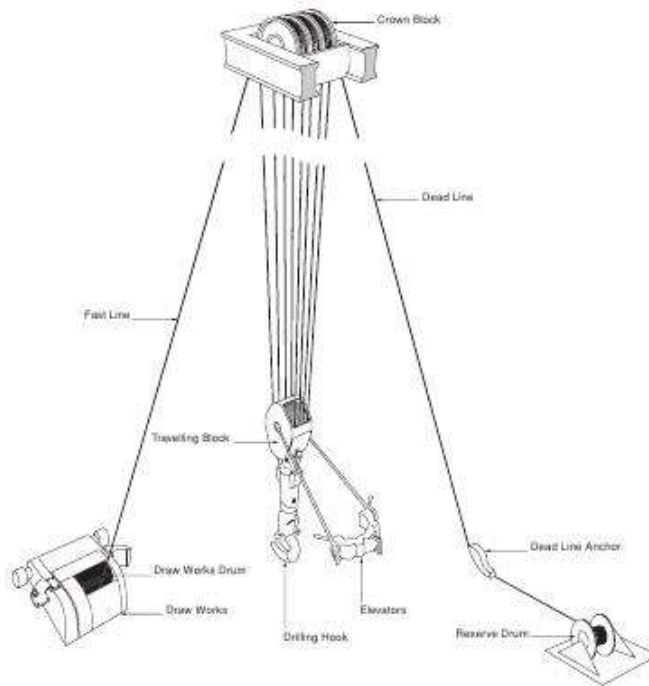


Figure: (2-3) Crown Block

A crown block is the stationary section of a block and tackle that contains a set of pulleys or sheaves through which the drill line (wire rope) is threaded or reeved and is opposite and above the traveling block.

The combination of the traveling block, crown block and wire rope drill line gives the ability to lift weights in the hundreds of thousands of pounds. On larger drilling rigs, when raising and lowering the derrick, line tensions over a million pounds are not unusual.

2-3 TRAVELING BLOCK

- Traveling Block - The block and tackle which is rigged with the crown block by multiples of drilling line strung between the crown block and the traveling block.

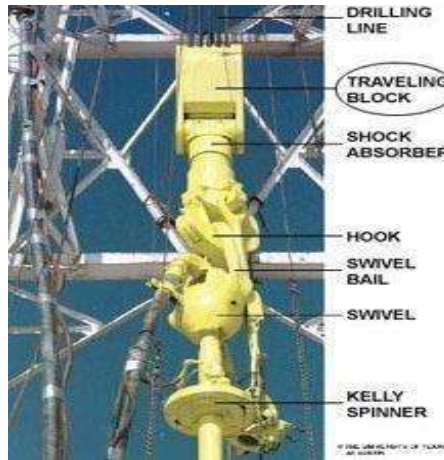


Figure: (2-3) TRAVELING BLOCK

A traveling block is the freely moving section of a block and tackle that contains a set of pulleys or sheaves through which the drill line (wire rope) is threaded or reeved and is opposite (and under) the crown block (the stationary section).

The combination of the traveling block, crown block and wire rope drill line gives the ability to lift weights in the hundreds of thousands of pounds. On larger drilling rigs, when raising and lowering the derrick, line tensions over a million pounds are not unusual.

DRAWWORK



Figure: (2-4) TRAVELING BLOCK

A drawworks is the primary hoisting machinery component of a rotary drilling rig. Its main function is to provide a means of raising and lowering the traveling block. The wire-rope drill line winds on the drawworks drum and over the crown block to the traveling block, allowing the drill string to be moved up and down as the drum turns. The segment of drill line from the drawworks to the crown block is called the "fast line". The drill line then enters the first sheave of the crown block and makes typically 6 to 12 passes between the crown block and traveling block pulleys for mechanical advantage. The line then exits

the last sheave on the crown block and is fastened to a derrick leg on the other side of the rig floor. This section of drill line is called the "dead line."

A modern drawworks consists of five main parts: the drum, the power source, the reduction gear, the brake, and the auxiliary brake. The apparatus can be powered by AC or DC, or the drawworks may be connected directly to internal combustion engines using metal chain-like belts. The number of gears could be one, two or three speed combinations. The main brake, usually operated manually by a long handle, may be a friction band brake, a disc brake or a modified clutch. It serves as a parking brake when no motion is desired. The auxiliary brake is connected to the drum, and absorbs the energy released as heavy loads are lowered. This brake may use eddy current rotors or water-turbine-like apparatus to convert the kinetic energy of the moving load to heat and dissipate it.

Power catheads (winches) located on each side provide the means of actuating the tongs used to couple and uncouple threaded pipe members. Outboard catheads can be used manually with ropes for various small hoisting jobs around the rig.

The drawworks often has a pulley drive arrangement on the front side to provide turning power to the rotary

table, although on many rigs the rotary table is independently powered.

The drawworks is used to hoist or lower several hundred thousand pounds of weight and comes in AC, DC or mechanical power units. Horsepower ratings for drawworks can also have a wide range, often ranging from 1000 HP to over 3000 HP.

HOISTING SYSTEM

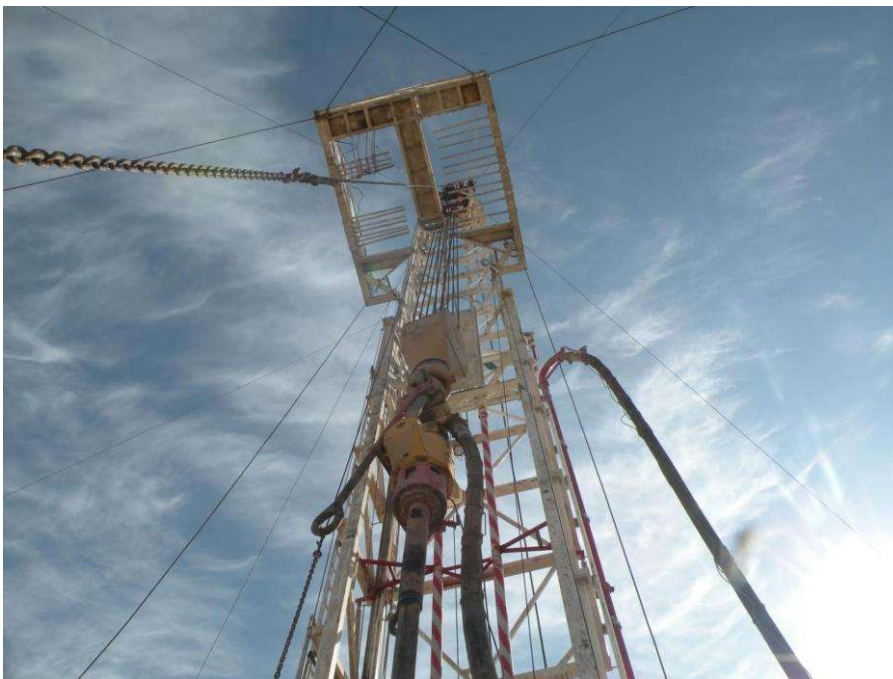


Figure: (2-5) HOISTING SYSTEM

Hoisting System is the system used on a drilling rig to perform all lifting activities on the rig. ... The major components of a Hoisting System are derrick, block &

tackle system, drawworks and miscellaneous hoisting equipment like elevators, hooks and weight indicator.

DEAD LINE ANCHOR



Figure: (2-6) DEAD LINE ANCHOR

The Cameron deadline anchor is used to tie down the drill line and measure the load suspended from the top drive (i.e., hook load). The wire drum attached to the anchor is designed to rotate during a slip-and-cut procedure. The reliability of our deadline anchor is important to a vessel's operational safety.

The reliability of our deadline anchor is important to a vessel's operational safety. Engineered and manufactured to meet the demands and rigors of tough offshore installations, the deadline anchor complies with all relevant standards, reduces wear on the deadline, and facilitates safe drilling line procedures.

THE HOOK

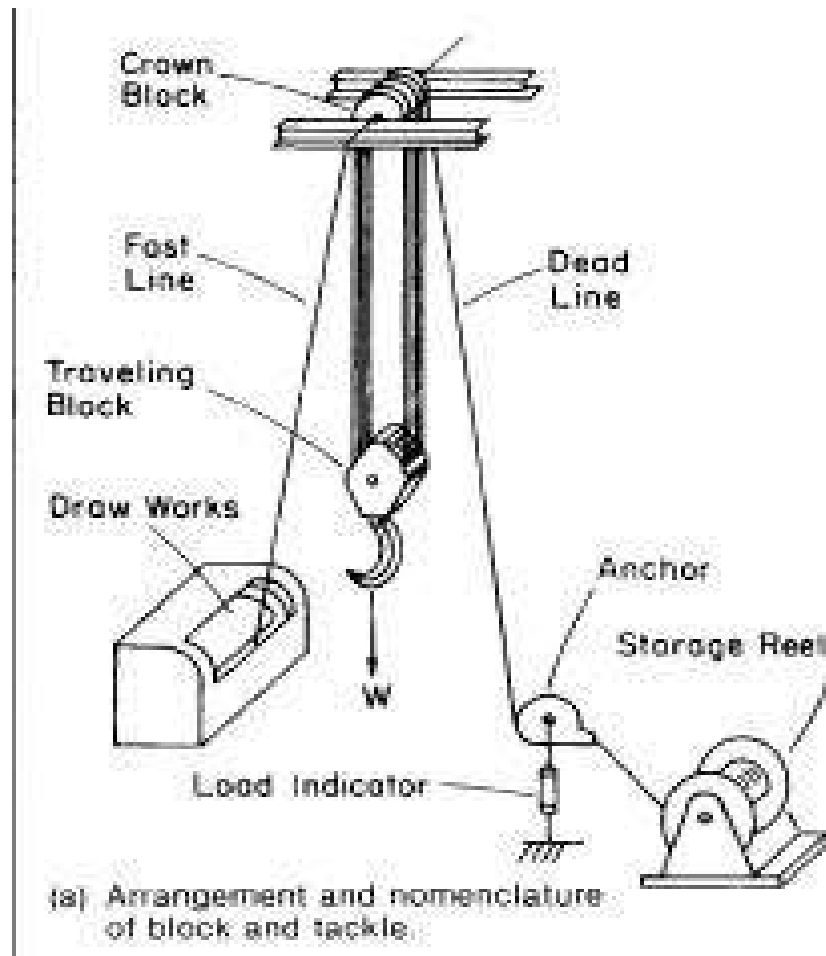


Figure: (2-7) THE HOOK

The Hook, or The Hookman, is an urban legend about a killer with a pirate-like hook for a hand attacking a couple in a parked car. In many versions of the story, the killer is typically portrayed as a faceless, silhouetted old man wearing a raincoat and rain hat that conceals most of his features, especially his face.

The story is thought to date from at least the mid-1950s, and gained significant attention when it was reprinted in the advice column Dear Abby in 1960. It has since become a morality archetype in popular culture, and has been referenced in various horror films.

Chapter Three ROTATING SYSTEM

3-1. Introduction

The main objectives of this system is to create rotation force towards drill bit at the bottom hole and provide helps when tightening and loosing pipe connection.

1. Rotary table
2. Top Drive (this is equivalent to the Kelly and rotary table,
i.e. either top drive or Kelly/rotary table)
3. Kelly
4. Swivel
5. Rotary hose

ROTARY TABLE



Figure: (3-1) a – b rotary table

A rotary table is a precision work positioning device used in metalworking. It enables the operator to drill or cut work at exact intervals around a fixed (usually horizontal or vertical) axis. Some rotary tables allow the use of index plates for indexing operations, and some can also be fitted with dividing plates that enable regular work positioning at divisions for which indexing plates are not available. A rotary fixture used in this fashion is more appropriately called a dividing head (indexing head).

THE KELLY/TOP DRIVE

The Kelly/ top drive provide the rotation required for rock breakage (drilling). The Kelly is the rotating link between the rotary table and the drill string.

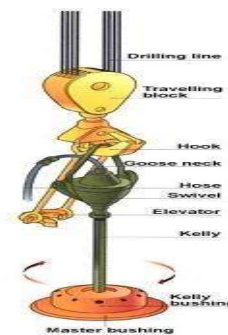


Figure: (3-2) THE KELLY

SWIVEL

- Swivel That part of the drill sting which connects the rotary hose to the drill string and allows circulation and rotation at the same time.



Figure: (3-3) SWIVEL

3-2. TOP DRIVE

The top drive is basically a combined rotary table and Kelly. It is powered by a separate motor and transmits rotation to the drill string directly without the need for a rotary table.

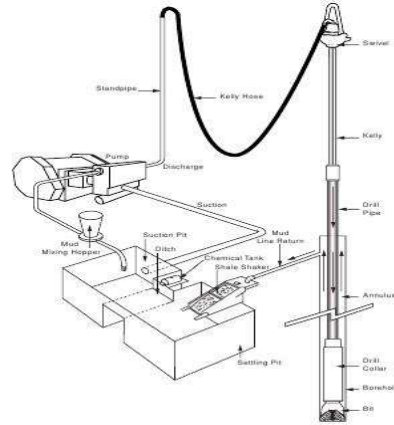


Figure: (3-4) TOP DRIVE

3-3. CIRCULATING SYSTEM

The main objective of circulation system is to pump fluid through the whole active fluid system. The complete circuitous path that the drilling fluid travels starting at the:

- main rig pumps
- surface piping
- standpipe
- kelly hose (rotary)
- kelly
- drillpipe
- drill collars
- bit nozzles

- openhole and casing strings
- flowline
- mud-cleaning equipment
- mud tanks
- positive displacement main rig pumps

3-4. Functions of Drilling Fluids:

- Lift-up cuttings
- To cover the underground pressure
- To restrain the well bore
- To create mud cake and prevent filtrate loss
- To lubricate drill bit and drill string
- Down hole information gathering media and well logging
- To transfer hydraulic force to downhole motor

3-5. principal components

The principal components of the rig circulating system include:

- 1) Mud pumps
- 2) Mud pits
- 3) Mud mixing equipment
- 4) Solids control equipment

MUD PUMPS



Figure: (3-5) MUD PUMPS

MUD PUMPS

- Mud pumps are used for circulating the drilling fluid down the drill pipe and out of the annulus. These are high-pressure and high-volume pumps. They can be double-acting duplex pumps or single-acting triplex pumps.
- A. The double-acting duplex pump has four pumping actions per pump cycle.

- B. The single-acting triplex pump has three pumping actions per pump cycle.

- **MUD PISTON - LINER**

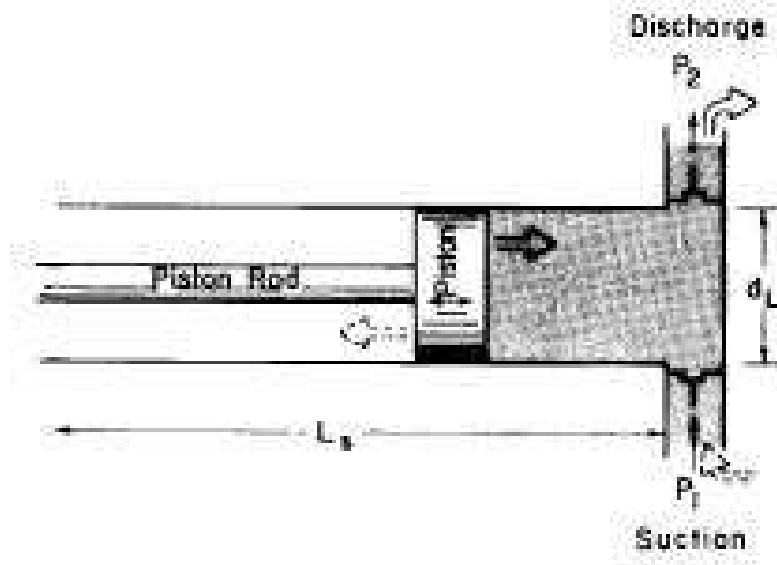


Figure: (3-5) MUD PISTON - LINER

Superior Quality as per API Standard; Strict Quality control during productions. Any 3rd Party Inspection available; Customized Production available. China second oilfield. strategic partnerships. assigned suppliers. member of CCOIC & CCPIT. API, GOST certified.

Offers Ceramic, Chrome Iron Sleeved, Hardened Steel Liners For All Mud Pump Manufactures. API Standard Mud Pump Liner Manufacturers, Using Only The

Highest-grade Materials. Order! 21 years experience.
OEM service. interchangeable.

- **FLOW LINE AND SOLIDS CONTROL EQUIPMENT**

Figure: (3-6) FLOW LINE AND SOLIDS



CONTROL EQUIPMEN

Solids Control Equipment is used for maintain the drilling mud properties, Normally we call it 4 phases solids control equipment, including the first phase solids control control with the shale shaker for solids up of 100 microns, and secondary solids control desander for solids up 50 microns, and the thrid solids control desilter unit to

remove solids above 20 microns, the fourth solids control decanting centrifuge to separate solids of 2-7 microns. GN Solids Control have all products available for you one stop Solids Control and Waste management Solutions.

MUD PITS AND SOLIDS CONTROL EQUIPMENT



Figure: (3-7) MUD PITS AND SOLIDS CONTROL EQUIPMENT

Customizable Solids control System with Competitive Price, 28+ Years Experience! Specialized In Solids control Equipment for 28+ Years with API & ISO

Certified. Customizable System. Drill Waste Manage
Expert. Solid Control Leader.

- **MUD MIXING HOPPER**



Figure: (3-8) MUD MIXING HOPPER

Mud Mixing Hopper with Mud Mixing Tank & Centrifugal Pump in Drilling Mud System. Quote ! Drilling Mud Mixing Hopper & Jet Mud Mixer Manufacturer in China, Good Price! Quote ! Serviced 50+ Countries. Competitive Price. CE/ ISO/ IADC Certificate.

- **WASTE PIT**



Figure: (3-9) WASTE PIT

Both liquid and solid wastes are stored at well sites in reserve or storage pits. Operators may leave solid wastes behind at well sites by burying storage pits. ... Buried pits in effect amount to thousands of small landfills that are never tested or overseen.

Chapter Four

TUBULAR GOODS

4-1. The components

of the drill string are:

1. Drill pipe
2. Drill collars

4-2. Accessories including:

- Heavy-walled drill pipe
- Stabilizers
- Reamers
- Directional control equipment

• DRILL PIPE



Figure: (4-1) DRILL PIPE

- A drill pipe is a seamless steel pipe that composes around 95% of the length of a drill string. For clarity, a drill string is what is used to actually drill into the ground to extract resources. The drill pipe is hollow, which allows drilling fluid to flow freely throughout the pipe and the pumping process to be completed successfully.

- **DRILL COLLARS**

- It function to furnish the compressive load on bit.
- Keeps the drill pipes remain in tension.



Figure: (4-2) MUD PUMPS

Strict Quality Control during production; Good mechanical property; 3rd Party Inspection. Competitive Prices and Quick Delivery; Long Service Life; Customized Production available. strategic

partnerships. global oil & gas industry. assigned suppliers. API, GOST certified.

- **STABILIZERS**

Choose the best and most optimum voltage stabilizer for AC, LCD, LED, Refrigerator, TV, washing machine, music system and other home appliances.



Figure: (4-3) TOP DRIVE

4-3. PRESSURE CONTROL EQUIPMENT

Pressure Control Equipment. Hunting's extensive product portfolio includes wireline valves, stuffing boxes, grease heads, lubricators and tool catchers.



Figure: (4-4) PRESSURE CONTROL EQUIPMENT

4-3-2. PRESSURE CONTROL EQUIPMENT

1. Diverter if required, usually for offshore operations during the drilling of top or surface hole. Make sure the diverter discharge line is 12” or above.
2. Annular preventer
3. Ram preventers (determine minimum size of rams required to suit the drillstring)
4. Blind or Shear rams
5. Choke manifold
6. HCR valves
7. Choke and Kill lines
8. Accumulator and BOP Control System (Koomey Unit)

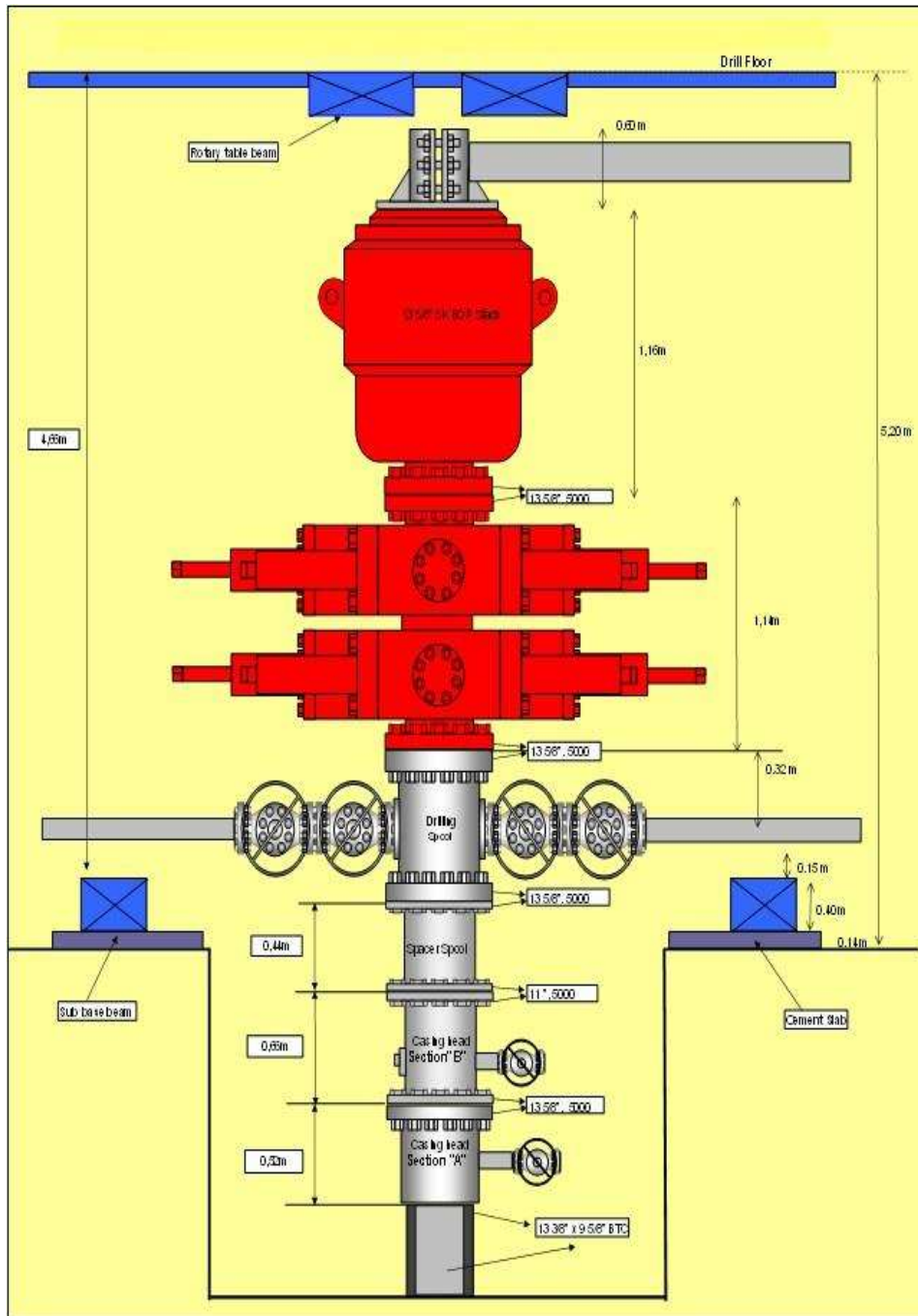


Figure: (4-5) TOP DRIVE

From the wellhead connector to the manifold system, we offer complete systems for containing wellbore pressure and diverting formation fluids and gases. Our focus is on the safety of drilling operations, so we design, engineer, and test technologies that meet and often exceed regulatory requirements.

Recognized for excellence in manufacturing, every piece of Cameron pressure control equipment integrates highly tested material and superior engineering—along with a century of experience and the reliability that comes with it. We were the first to engineer large-bore drilling BOPs rated 20,000+ psi for deepwater drilling and the first to manufacture rams that can shear the hardbanding on tool joints.

Leveraging our global manufacturing, sales, and service network, we work with oil and gas industry experts spanning many markets and applications to create the flow control technologies that energize the world. Our facility uses the latest inspection and manufacturing technology—such as automated and computer-aided machines—and top-tier materials to complete each BOP with the highest degree of accuracy.

- **CHOKE LINE**

JINGBO Since 1986, 30 Years experience in Oil & Gas Hose, Your reliable Partner. Factory direct sales, High quality and low price, contact us now. Skype: drilling.hose66. Hi Bella is here. Types: Drilling Hose, Choke Hose, Bop Hose, Hammer Union.



Figure: (4-6) CHOKE LINE

- **DRILL PIPE BLOWOUT PREVENTER**

Drill pipes are manufactured in a variety of sizes and materials, meaning there is a perfect drill pipe for your project. Similar to the API length ranges, there are also groupings of API classes, based on the size and material of the drill pipe. The API classes measure yield strength, tensile strength, the drill-pipe body and the tool joint.

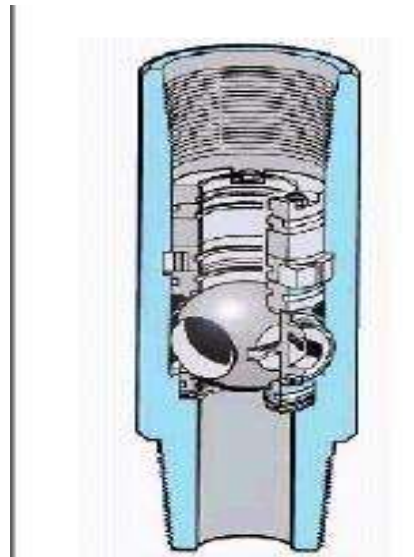


Figure: (4-7) DRILL PIPE BLOWOUT PREVENTER

API classes are given based on inspection, and these inspections are especially important after the drill pipes have been used. Ultrasonic testing and a wide-range of other tools are used to give these measurement ranges.

4-4. RIG FLOOR EQUIPMENT AND INSTRUMENTS

This is a large list and includes:

1. Tongs
2. Iron Roughneck
3. Slips
4. Bit breakers
5. Lift Nipples
6. Mud bucket
7. Elevators
8. Safety clamps

- **TONGS**

- Tongs-Large wrench-like devices that are used to tighten up and break out tool joints or connections. The tongs are connected to the breakout and make up catheads. Hydraulic tongs are generally used to make up casing and tubing, deriving power from a hydraulic unit.



Figure: (4-8) Tongs

- **SLIPS**

- Slips-Latch around the drill pipe and seat in the rotary bushing in the rotary table. The slips support and transmit the weight of the drill string to the rotary table while making a connection or tripping pipe.



Figure: (4-9) Slips

- **ELEVATORS**

- Elevators-The elevators are used for latching on to the **tool joint or lift sub of the drill pipe or drill collars.** This enables the lifting and lowering of the drill string while making a trip. The elevators are connected to the hoisting system(traveling block) by means of bails.

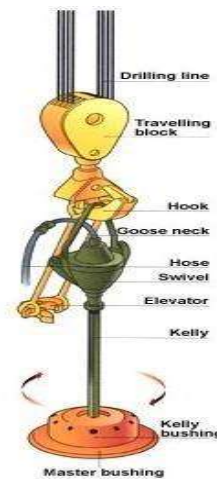


Figure: (4-10) Elevators

- **RAT HOLE**

- Rat Hole-The steel casing extending below the rig floor where the **Kelly and swivel** are stored while tripping



Figure: (4-11) RAT HOLE

- Mouse Hole-A section of steel casing that extends below the rig floor where **drill pipe** is placed to be made up in the drill string or to the Kelly. It is further used in laying down drill pipe.

Chapter Five

MONKEY BOARD

5-1. Monkey board

Monkey board -(Stabbing board) The platform on which the derrick man works when tripping pipe.



Figure: (5-1) Monkey board

There is no better, Instagram-worthy view in New Orleans. From atop our rooftop bar you can see the lights and excitement of the city below. Grab a hand crafted cocktail or frozen drink and relax with friends while you experience 360 reasons why Monkey Board is at the top of NOLA nightlife - outdoor dining at its best.

5-2. INSTRUMENTS

There are several instruments on the rig floor including:

- Standpipe pressure gauge
- Weight indicator
- Pump speed
- Pit level indicator
- Gas detectors

INSTRUMENTS

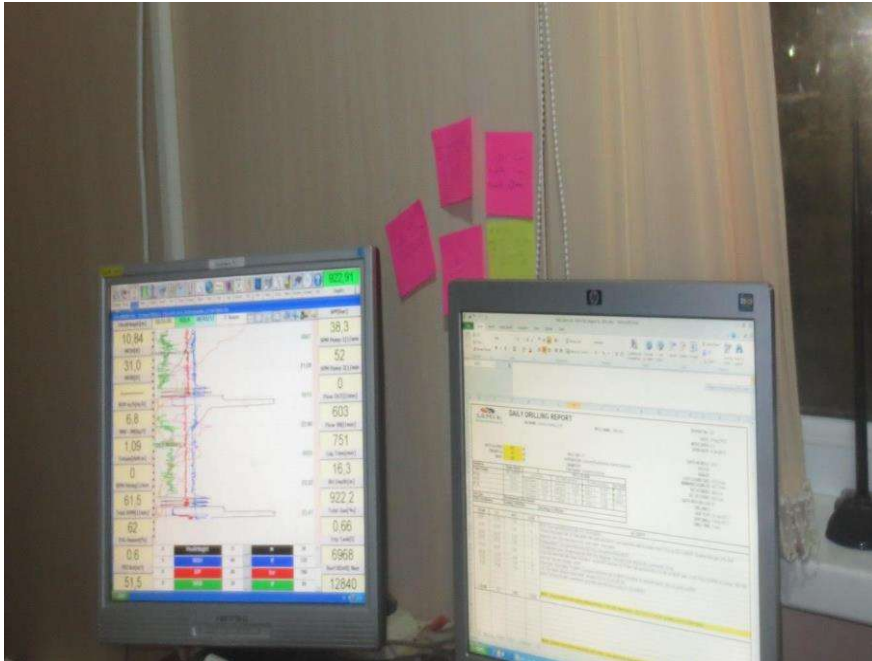


Figure: (5-2) INSTRUMENTS

Donate used instruments or funds Share a life of passion and music. Share instruments or funds Give passionate kids music lessons. Music Lessons. Instrument Donations. Donate Music. Brands: Gibson, Fender, Pro Tools, Yamaha, Drum Workshop, Guitar Center.

INSTRUMENTS



Figure: (5-3) INSTRUMENTS

Pakachoag Connect offers a number of online learning choices with Pakachoag Music School. Pakachoag offers private lessons in a wide variety of instruments

and music styles. Payment Plans Available. High quality instruction. 30+ Years Experience.



Figure: (5-4) INSTRUMENTS

- **POWER SYSTEM**

The prime movers in a rotary drilling rig are those pieces of equipment that provide the power to the entire rig.

Recently, while diesel engines still compose the majority of power sources on rotary rigs, other types of engines are also in use.

5-3. POWER SYSTEM

Some rotary rigs may use electricity directly from power lines. Most rotary rigs these days require 1,000 to 3,000 horsepower, while shallow drilling rigs may require as little as 500 horsepower.

The energy from these prime movers is used to power the rotary equipment, the hoisting equipment, and the

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