

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

RIG COMPONENTS

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Oil & Gas Industry



Upstream
Exploration & Production



Midstream
Gas processing plant



Downstream
Petroleum Product Distribution

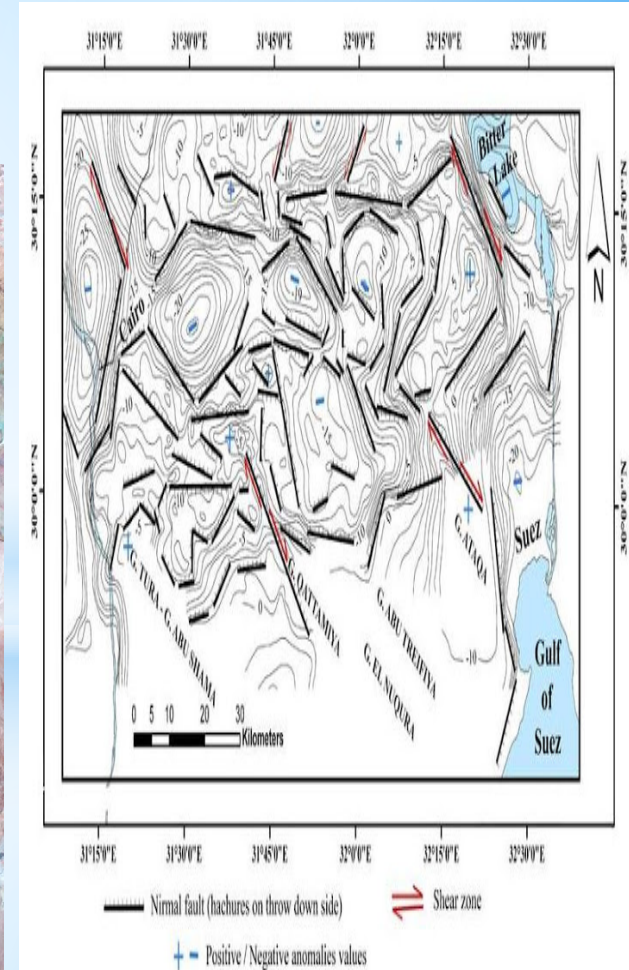
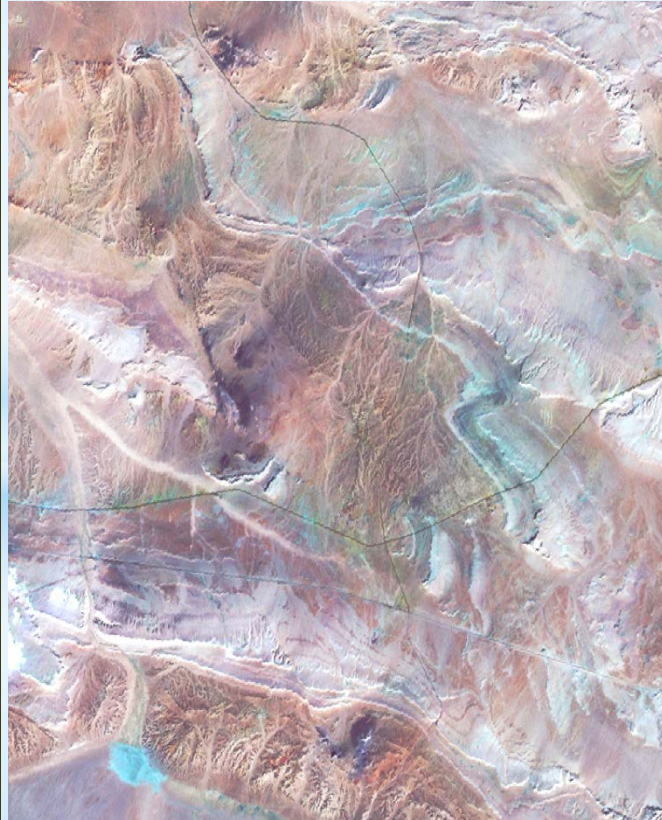
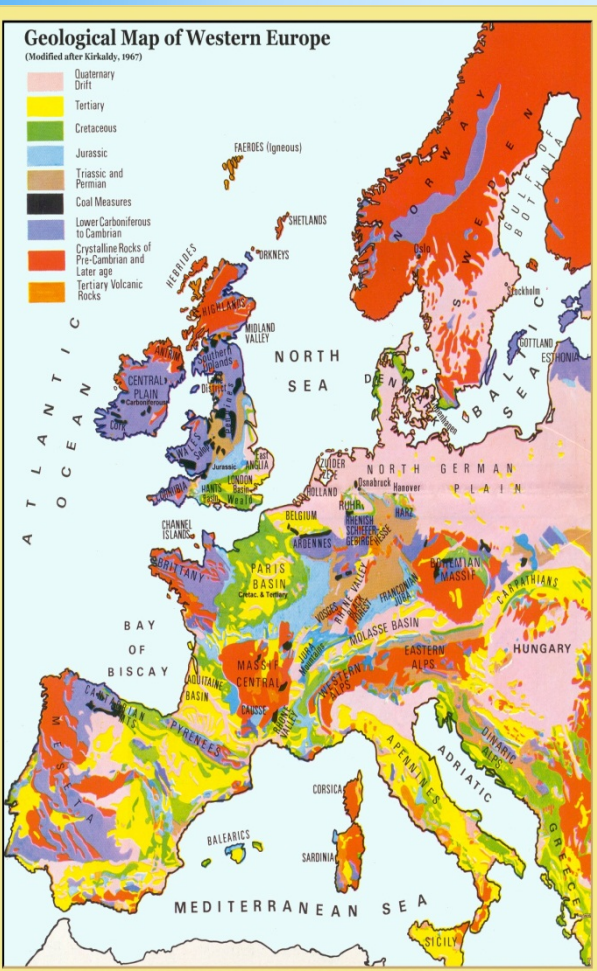
Upstream Petroleum Life Cycle

Exploration surveying

Regional Tectonic
setting

Magnetic, Gravity
& Seismic

Satellite images &
Field trips
(Geological Maps)



Upstream Petroleum Life Cycle

Exploration drilling (Wild Cat wells)

The process of drilling for oil or natural gas in an unproven area, that has no concrete historic production records and has been unexplored as a site for potential oil and gas output.

Upstream Petroleum Life Cycle

Exploration drilling (Exploration wells)

The appraisal stage aims:

1. To evaluate the **size and nature** of the **reservoir**,
2. To determine the **number** of confirming or **appraisal wells** required,
3. To determine if any further **seismic** work is **necessary**.

Upstream Petroleum Life Cycle

Production & Development

- The **number of wells** required to exploit the hydrocarbon reservoir varies with the **size of the reservoir** and its **geology**.
- Large** oilfields can require a **hundred** or more wells to be drilled, whereas **smaller** fields may only require **ten** or so.
- Most **commercial** oil and gas **wells** are initially **free flowing**.

The rate of flow depends on:

1. The **properties** of the reservoir rock (**porosity & permeability**).
2. The underground **pressures**.
3. The **viscosity** of the **oil**.
4. & the **oil/gas ratio**.

Injection wells:

When the **oil cannot** reach the **surface** unaided, some form of **additional lift** is required, such as **injection** of **gas, water or steam** to maintain reservoir pressures which require the drilling of additional wells called **injection wells**.

[vedios\OilDrillingAnimation.gif](#)

Well Planning

Lease data

- Operator company.
- Name of the Well.
- Type of Well.
- Location of drill site.
- Expected total depth of the well.

Drilling data

- Expected formation pressures.
- Drilling Parameters.
- Mud program.
- Casing program.
- Cementing program.
- Bits & Hydraulics program.
- Expected drilling problems (Sloughing, Swelling, Salt beds, Fractures, high angle beds) .
- Well completion program.

Geological Data

- Primary and Secondary Objectives.
- Types , thicknesses and depths of formations to be drilled.
- Casing Points.
- Correlation and Detection of Marker Horizons with offset well.
- Selection of Logging Run Intervals.

Logging data

Mud Logging .

- Crew Size .
- Types of samples and depth intervals.
- Gas system.
- Pressurized unit
- Sensors

• H₂S detector

Electric logging

- Big, regular or Slim hole tools.
- Temperature requirements.
- Fresh, Salt or oil mud tools.
- Type of logs and depth intervals of each tool.
- RFT .
- Backup tools.
- Repeat and overlap sections.
- Scales.
- Maximum logging speed.
- Display format.

Coring

- Conventional coring or sidewall coring
- Depth and type of formation
- Core handling procedure.

Well Planning

Data distribution

- Drilling records
- Mud logs
- Electric logs
- Cutting (Wet and dry) and / or core
- Fluid samples
- Pressure charts
- Laboratory analyses
 - Cuttings description
 - Cores description
 - Biostratigraphy
 - Geochemical
 - Fluid properties
- Number of copies of each type of data

Note:

A data package should be prepared for use on the wellsite containing all of the data needed for correlation and evaluation. This includes **maps, offset well logs, the well prognosis**, and any **other data** that the geologist believes may be useful. Only **copies** (not the originals) of these data should be taken to the field.

The RIG



TYPES OF RIGS

On shore/ Land rig

Jack up

Semi- submersible

Drill Ship

Tension Leg

Platform

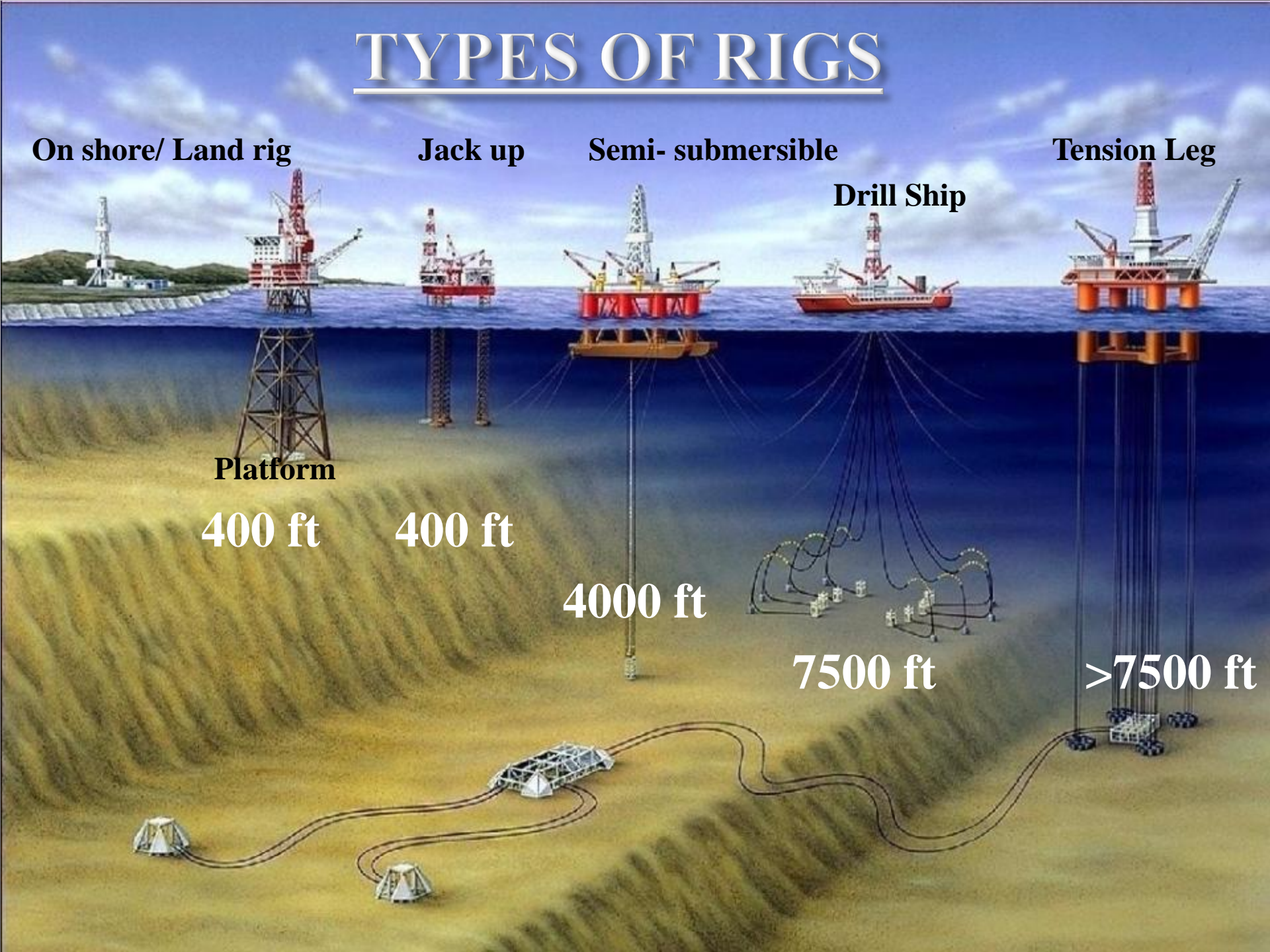
400 ft

400 ft

4000 ft

7500 ft

>7500 ft



Land/On Shore Rigs

- Land rigs **vary** considerably in **size, lifting capacity, power generation, ability to circulate fluids... Etc.**
- **Before rig equipment is brought in, the land must be cleared and graded.**
- **Access roads, where possible, must be prepared.**
- **If access roads cannot be made (jungle locations), the helicopters can airlift everything to the drill site from a base location.**
- Land rigs are generally either **wheel mounted portables** or a **component system** which must be moved by **trucks and cranes.**



Land/On Shore Rigs

Types of land rigs:

1. Drilling Rigs.
2. Work over Rigs.

Land Rigs

DUTY	DEPTH	
	feet	meters
Light	3000 - 5000	1000 - 1500
Medium	4000 - 10,000	1200 - 3000
Heavy	12,000 - 16,000	3500 - 5000
Ultraheavy	18,000 - 25,000	5500 - 7500

Crown block



Mud to



Simplified diagram
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THE RIG COMPONENTS

- 1. Power System.**
- 2. Hoisting System.**
- 3. Rotating System.**
- 4. Blowout Prevention System**
- 5. Circulating system.**

THE RIG COMPONENTS

1. Power System:



THE RIG COMPONENTS

Hoisting system



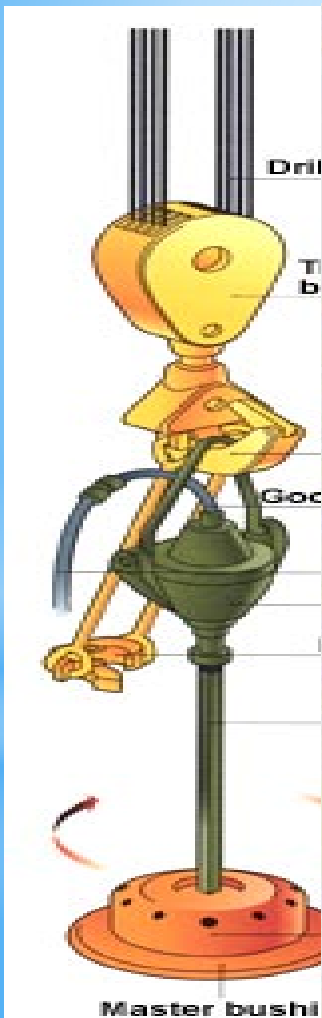
Support
Drawworks



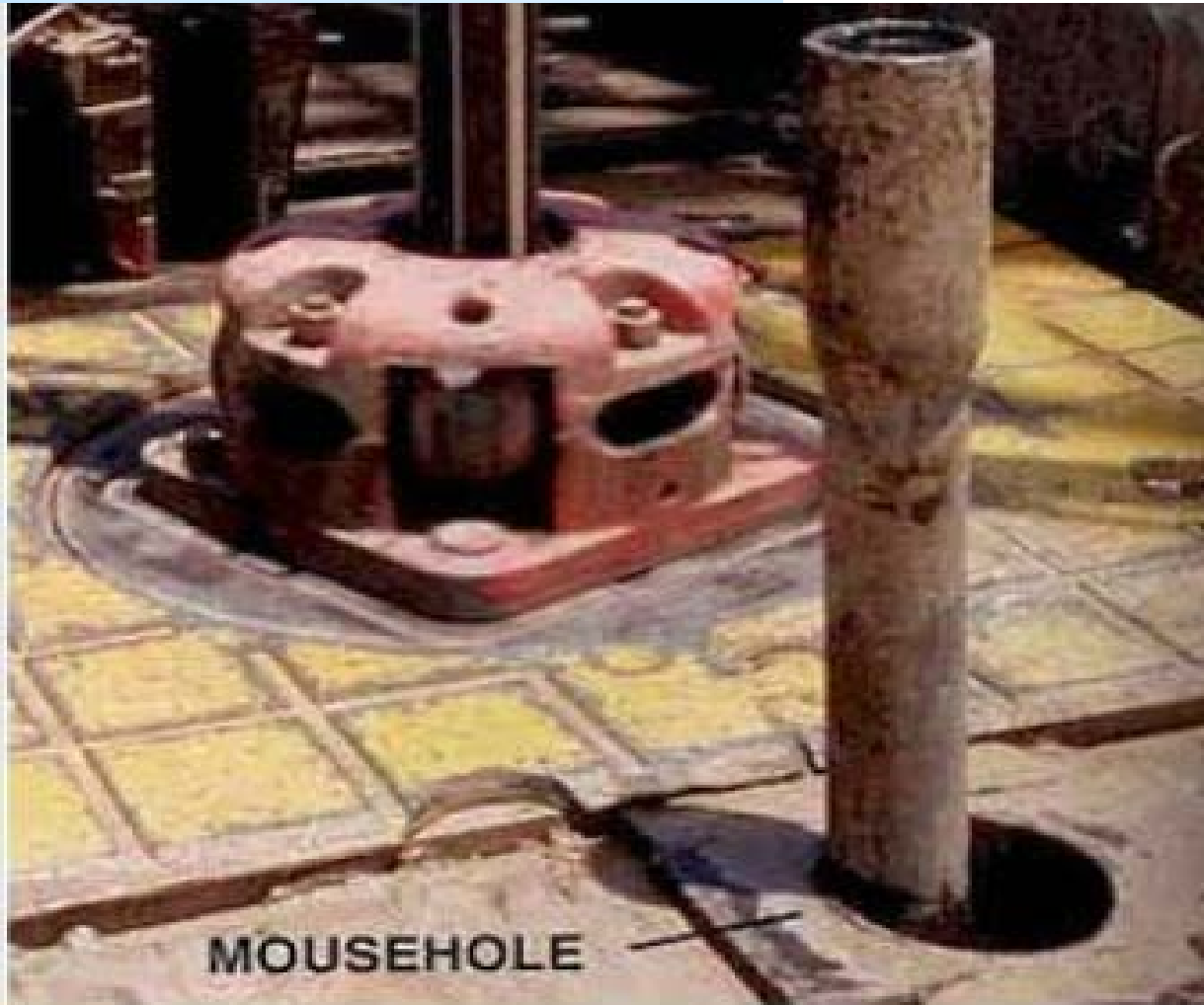
THE RIG COMPONENTS

Rotary system

Conventional Kelly system

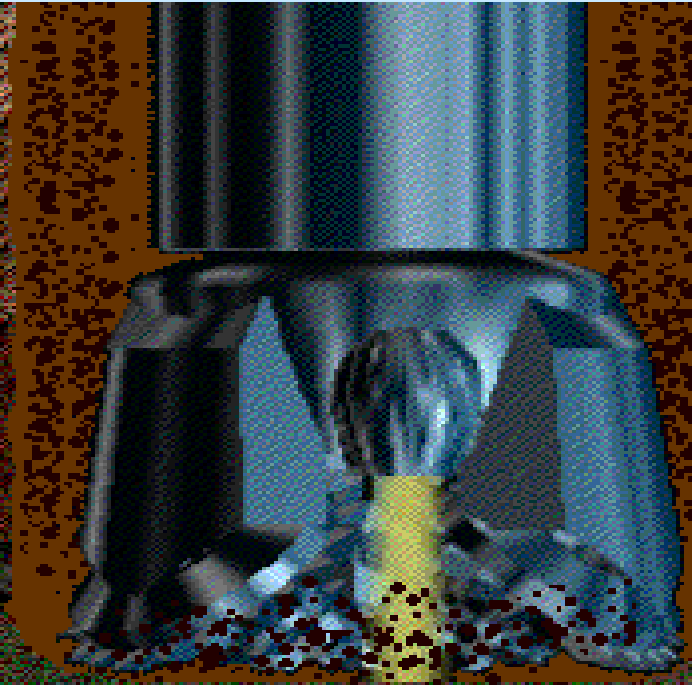


Top Drive System



Drilling mud

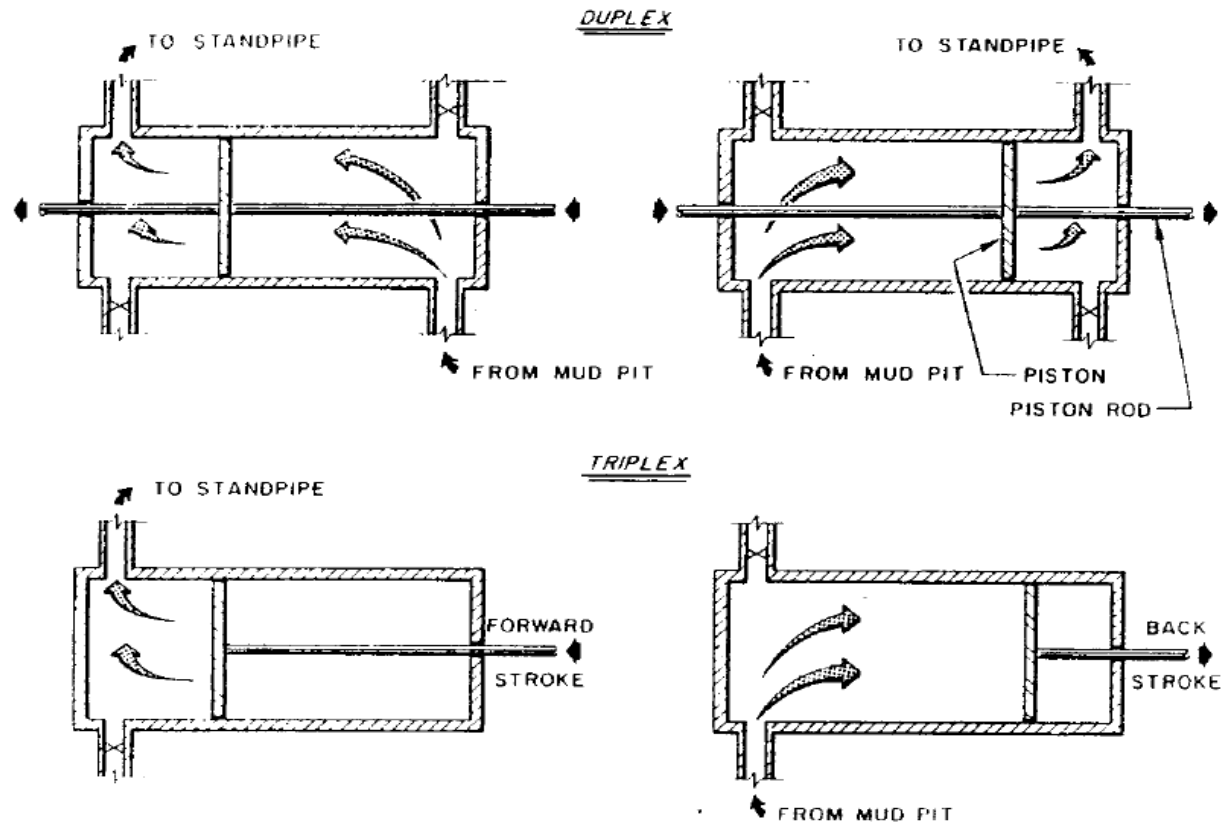
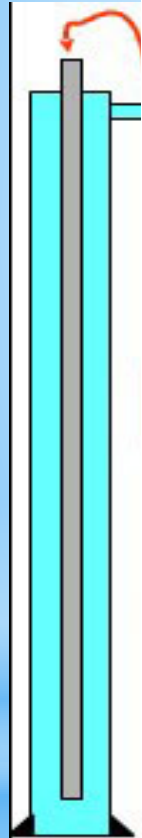
Overview



Functions of Drilling Mud:

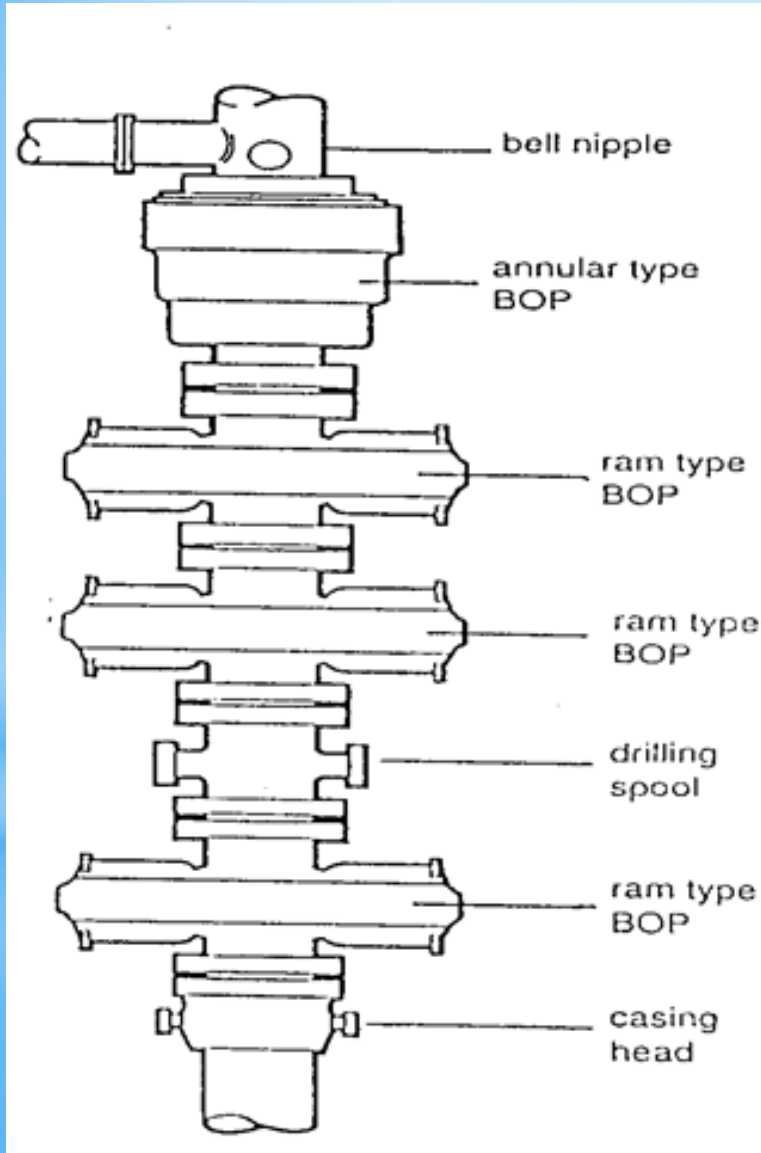
- Cleaning the Hole
- Cooling and Lubricating Drill String
- Lifting Cuttings to the Surface
- Carrying Information About Formations
- Stabilizing Wellbore
- Controlling Formation Pressure
- Suspending Cuttings

Mud System



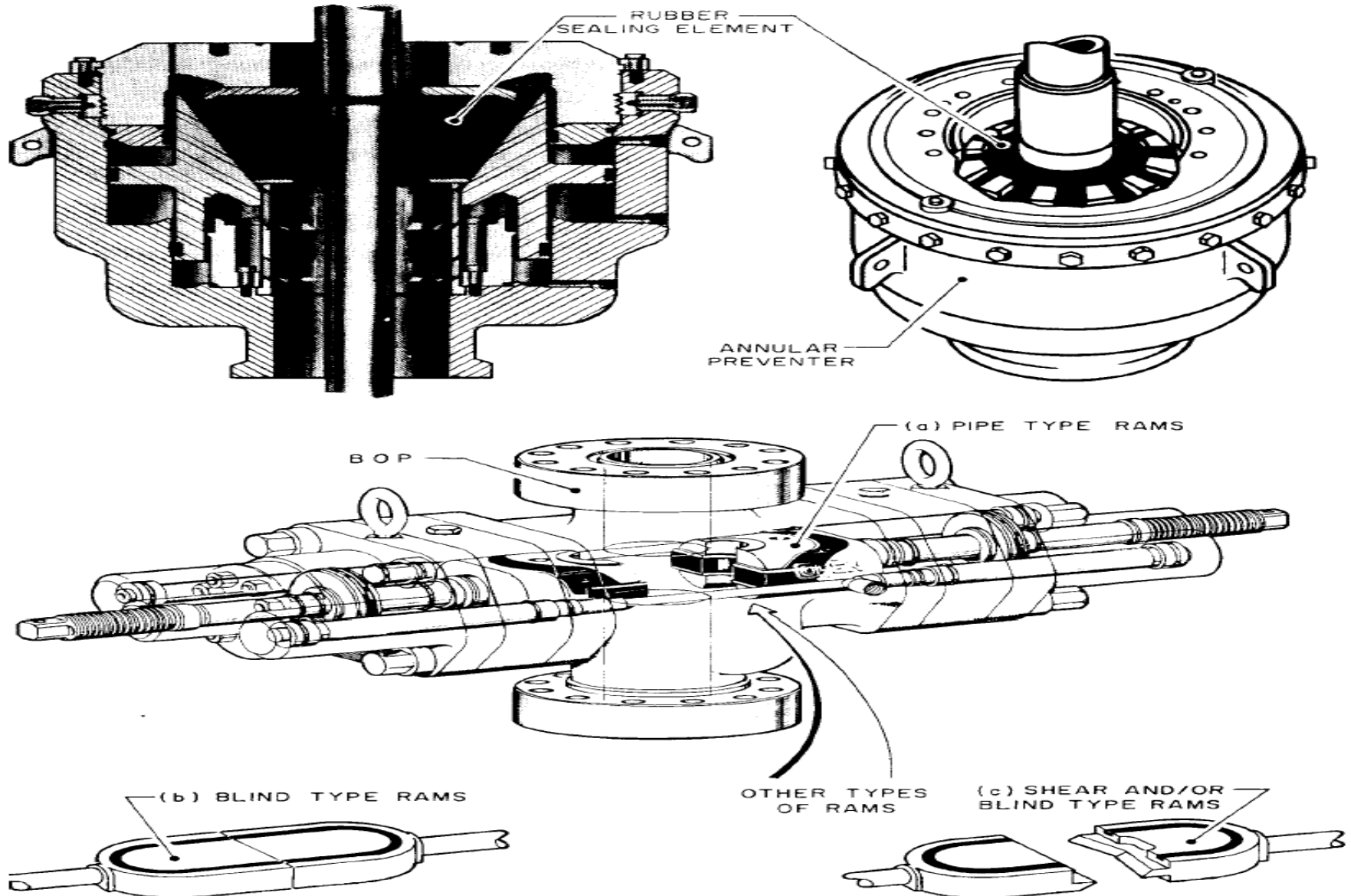
THE RIG COMPONENTS

Blow Out Preventing



THE RIG COMPONENTS

Blow Out Preventing

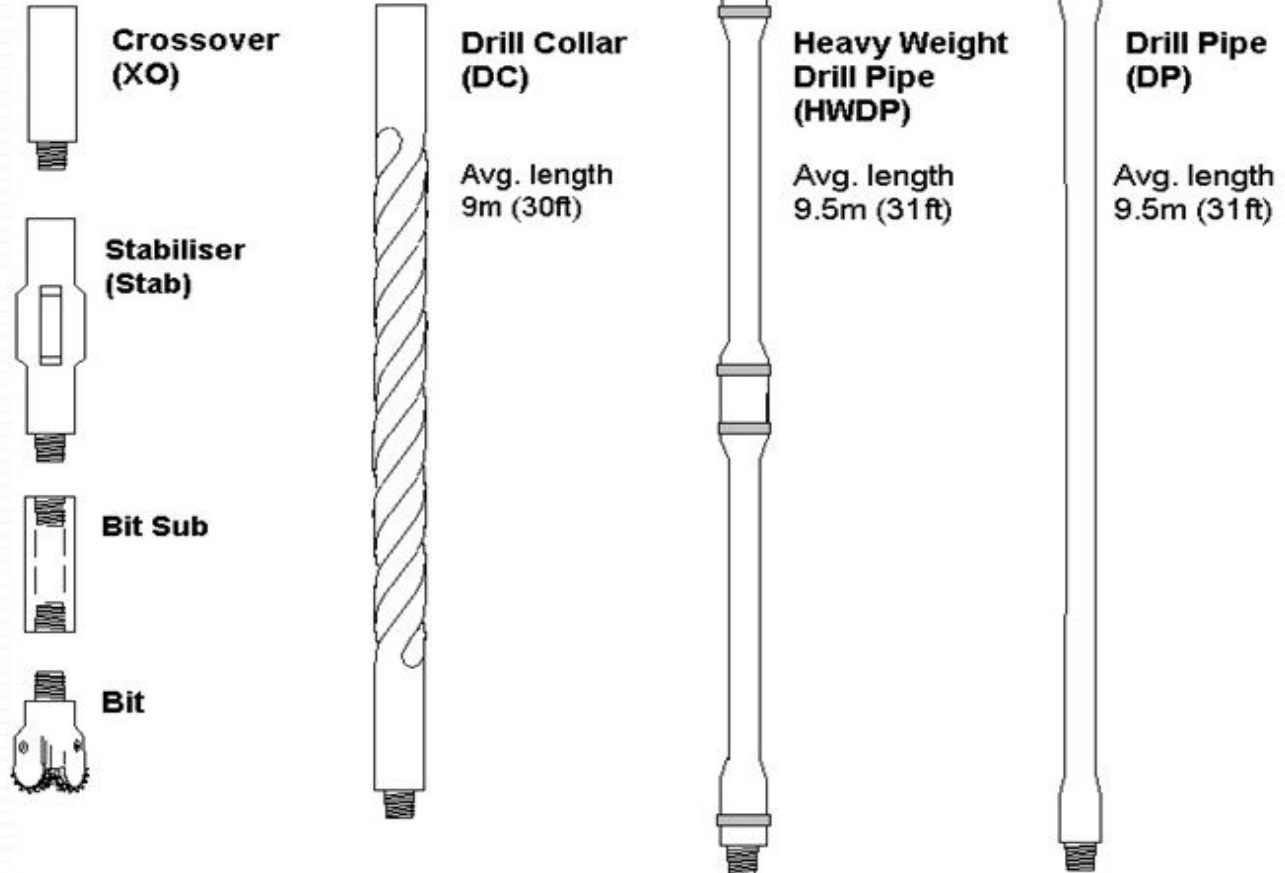


THE RIG COMPONENTS

Drill String

This term includes **all** the **components** used **to drill** below the Kelly or top drive; and it can **include** the following components: -

1. Drill Pipe & Tool Joints.
2. Heavy weight drill pipe (HWDP).
3. Drill Collars.
4. Rotary Bits.



THE RIG COMPONENTS

1. Drill Pipe & Tool Joints.

- The drill pipe lengths (**joints**) are **hollow** seamless **tubes**.
- The **tool joints** (connections) are **separate components** and are **attached** to the **pipe** at both ends to **complete the** manufacture of one joint.
- The **drill pipe** joints are approximately **30 ft** in lengths.



THE RIG COMPONENTS

2.Heavy weight drill pipe (HWDP).

- This is the same as a drill pipe but with a smaller inner diameter and longer tool joints.
- Because of its wall thickness, its weight is greater than the drill pipe.
- It serves as a transition section between the drill pipe section up and the lower drill collars section.

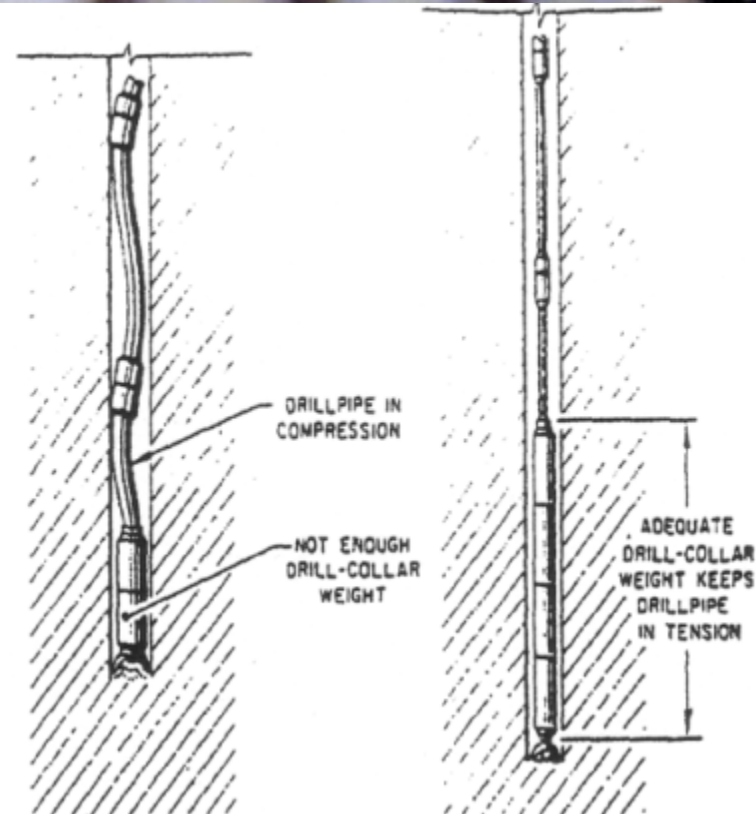
THE RIG COMPONENTS

3. Drill Collars.

- These are similar to drill pipe, but with spiral shape & have large outside diameters and small inside diameters. They, also, are approximately 30 feet long.

* Drill collars have several important functions:

1. Provide weight to the bit when drilling
2. Maintain weight to hold the drill pipe in tension.
3. The spiral grooves are to minimize the surface of contact between hole and pipe reducing the risk of getting stuck.
4. Prevent the pendulum effect to cause the bit to drill a nearly vertical hole.



THE RIG COMPONENTS

4. Rotary Bits.

- Drag bit:
- Three cones bit (tri cone bit):
- Diamond bit:



Rig Personnel

❖ Company representative:

- ☐ Company man
- ☐ Geologist

❖ Rig Crew:

- ☐ Tool Pusher.
- ☐ Night Pusher.
- ☐ Driller.
- ☐ Assistant Driller.
- ☐ Derrick Man.
- ☐ Floor man.
- ☐ Roustabout.
- ☐ Rig Mechanic.
- ☐ Rig Electrician
- ☐ Rig Welder.
- ☐ Camp Boss.
- ☐ Driver.



❖ Service Crew (Permanent):

- ☐ Mud Loggers.
- ☐ Mud engineers.

❖ Service Crew (By Job):

- ☐ Cementing.
- ☐ Casing
- ☐ Fishing
- ☐ Wire line logging
- ☐ Testing

❖ Catering crew:

- ☐ Chef.
- ☐ Waiter.
- ☐ Room boy.
- ☐ Confectioner.
- ☐ Laundry.