Well Drilling Engineering

Hoisting System

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Land Rig (*Onshore*)

- Cantilever mast – most common arrangement
- Portable mast – usually mounted on trucks that incorporate the hoisting machinery, engines and derrick as a single unit.

portable drilling rigs

Onshore

Main component parts of a Rotary Rig are:

1. Hoisting system.
2. Rotary system.
3. Tubular and tubular Handling Equipment.
4. Fluid circulating system.
5. Power system.
6. Well control system BOP's
7. Well Monitoring system.

1. Hoisting System

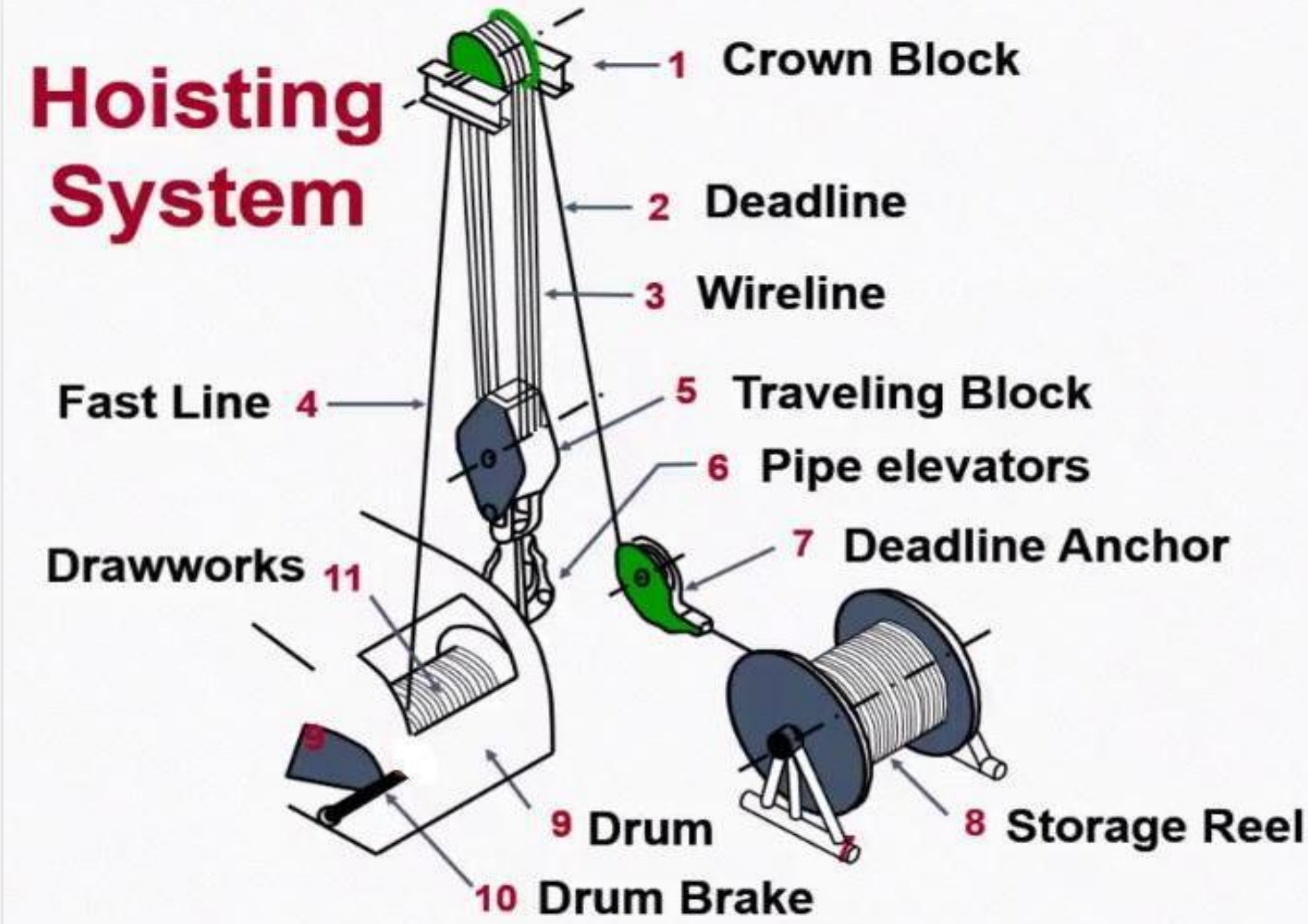
Function

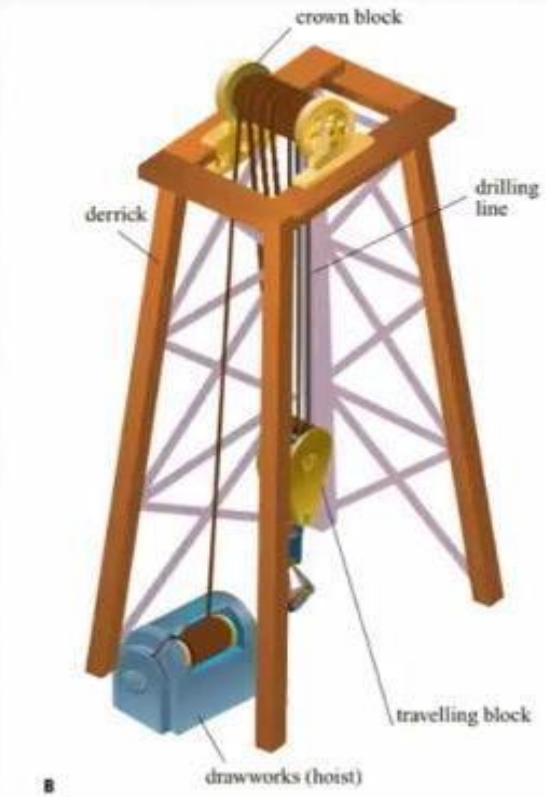
The hoisting system is the set of equipment necessary to lower or raise drill strings, casing string and other subsurface equipment into or out of hole.

Principal Components:

I. Derrick and substructure
II. Crown block
III. Travelling block
IV. Draw works
V. Drilling line

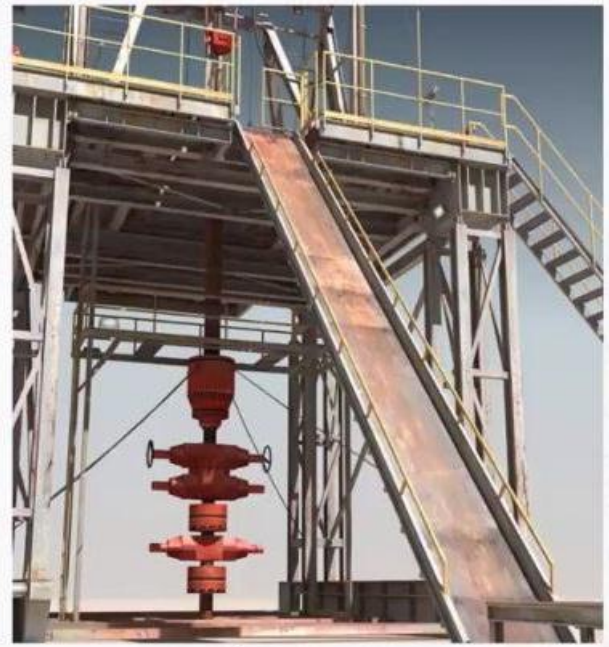
Hoisting System





1. Substructure

- The substructure is the supporting base for the derrick, the draw works and the rotary table, and constitutes the working floor for operations, or drilling floor, being elevated with respect to ground level. The substructure is a reticular structure of steel beams, that can easily be dismantled, and rests on concrete foundations or on a base of wooden planks around the cellar.
- Its height varies from a few meters up to 10 m in the largest rigs



2. Derrick

- The derrick is an open-framework structure of steel beams, whose function is to hold the ensemble of sheaves at its top, known as the crown block, on which all of the items of equipment operated in the well or on the drilling floor are suspended.

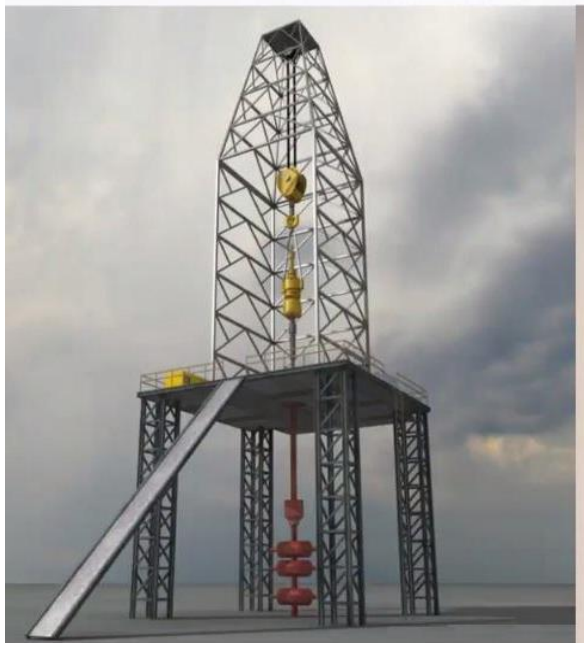
- the height of the derrick must be such as to permit the vertical movement of the travelling block for a distance greater than the equivalent of one stand. For example, to handle a stand of 3 drill pipes (about 27 m long) the derrick has to be about 40 m high. The derrick is designed to resist the loads tripped in and out of the well in the operating phases, which induce both static and dynamic stresses.

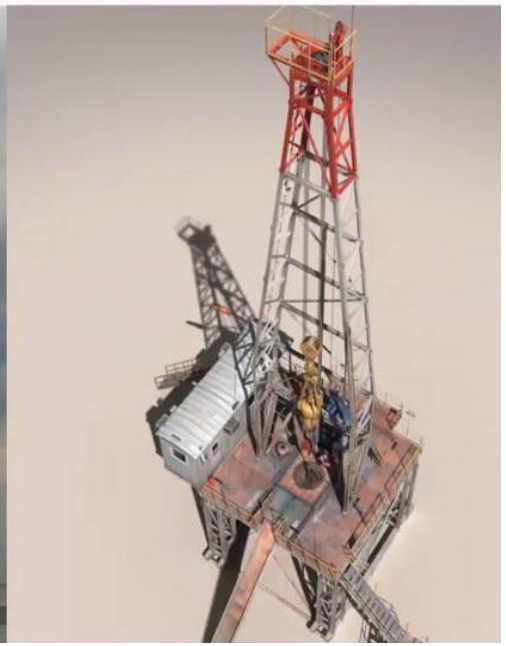
- Every derrick has a rated load capacity, defined by API (American Petroleum Institute) standards, which establish the maximum hook load

Derrick

1 Conventional derrick

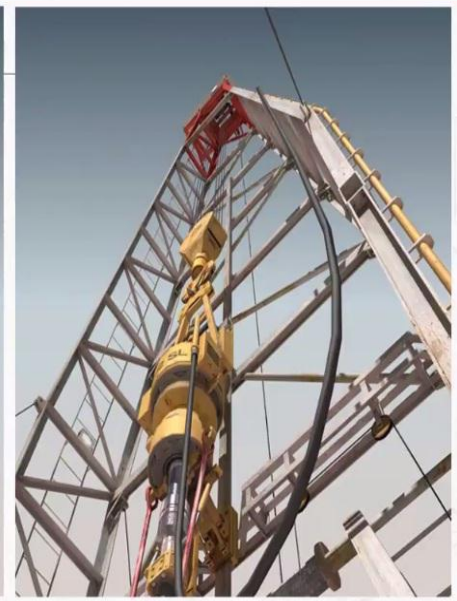
2 Mast





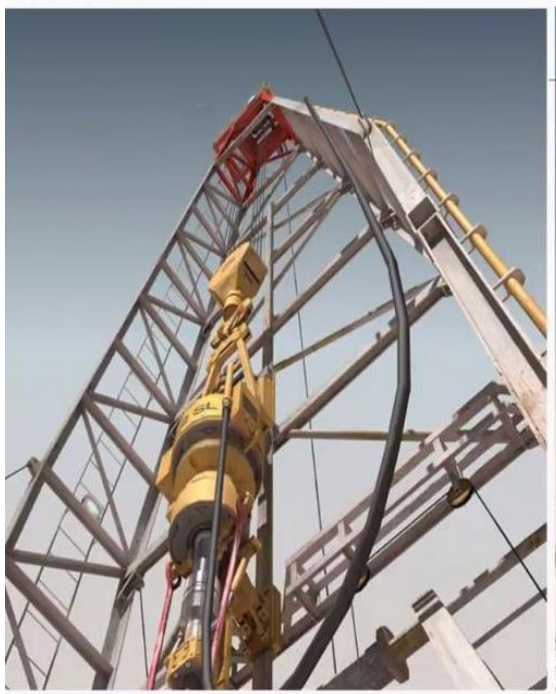
3. Crown block

- An assembly of sheaves mounted on beams at the top of the derrick/mast and over which the drilling line is reeved.
- The crown block bears the load applied at the hook and its function is to reduce the wire rope tension required to pull the tubular material used to drill the well. It at the top of the rig consists of a set of sheaves (usually from 3 to 7) supported by a framework of steel beams.



4. travelling block

- consists of another set of sheaves (one fewer than for the crown block), mounted on an axis connected to the hook.
- The number of sheaves in the crown and travelling block is chosen on the basis of the rated capacity of the tower and the rate of pulling, which is inversely proportional to the number of lines of wire rope connecting the travelling block and the crown block



5. Hook

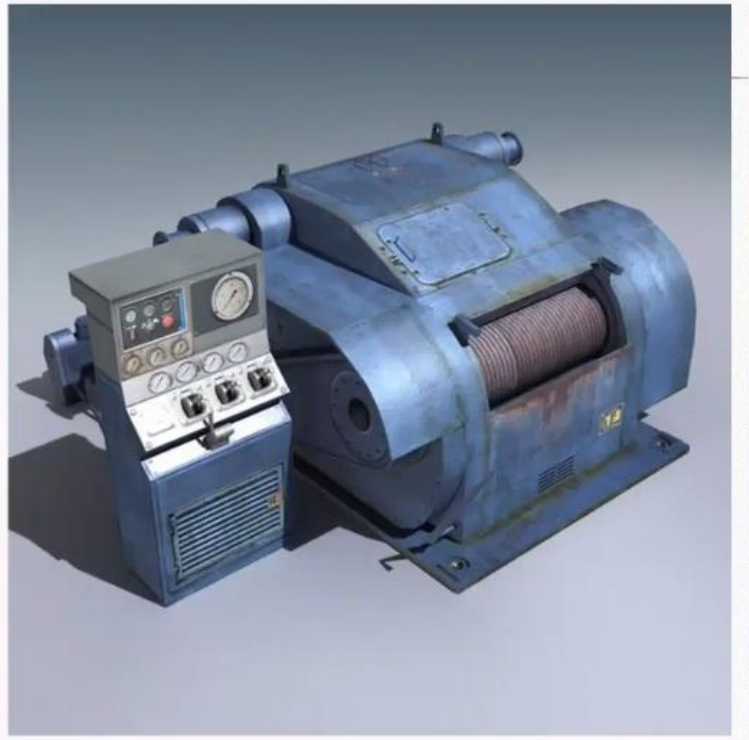
- The high-capacity J-shaped equipment used to hang various other equipment, particularly the swivel and Kelly, the elevator bails or top drive units. The hook is attached to the bottom of the traveling block and provides a way to pick up heavy loads with the traveling block. The hook is either locked (the normal condition) or free to rotate, so that it may be mated or decoupled with items positioned around the rig floor, not limited to a single direction.

6. Draw works

- The drawworks is the machine that transmits the power to operate the equipment in the well. The basic components of the drawworks are an engine, one or more drums containing a steel cable, and the brakes

- The main brake is a strongly-built, band brake, used to stop the drill string as it is being lowered, or to release it slowly during drilling.

- Normally a hydraulic brake and an electromagnetic brake are used, although these cannot stop the hoisting drum completely and they cannot be used alone.

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Learning Objectives

Hoisting system:

- **Identify the names of each of the component parts of the hoisting system and state its purpose.**