

**MATERIALS AND CHEMICAL REAGENTS
FOR OIL AND GAS PRODUCTION**

**LECTURE 4: Methods of wells operation and
materials used in these processes**

Lecture 4. Part 2.

Disadvantages of gaslift:

- low efficiency of gaslift system – 9 – 16 %:
- high cost spendings on building of compressor station and gas pipelines;
- availability of great amounts of natural gas;
- high energy costs for gas compression.

Scheme of any gaslift must provide 2 channels: for gas pumping and for lifting of gas-liquid mixture – tubes can be placed either in parallel or concentrically.

Depending on the number of pipes in well lift can be: single-row, double-row.

Depending on the direction of gas pumping lift can be: circular or central. Starting pressure for central gaslift system is less then for the circular gaslift (7.6 times smaller for single-row).

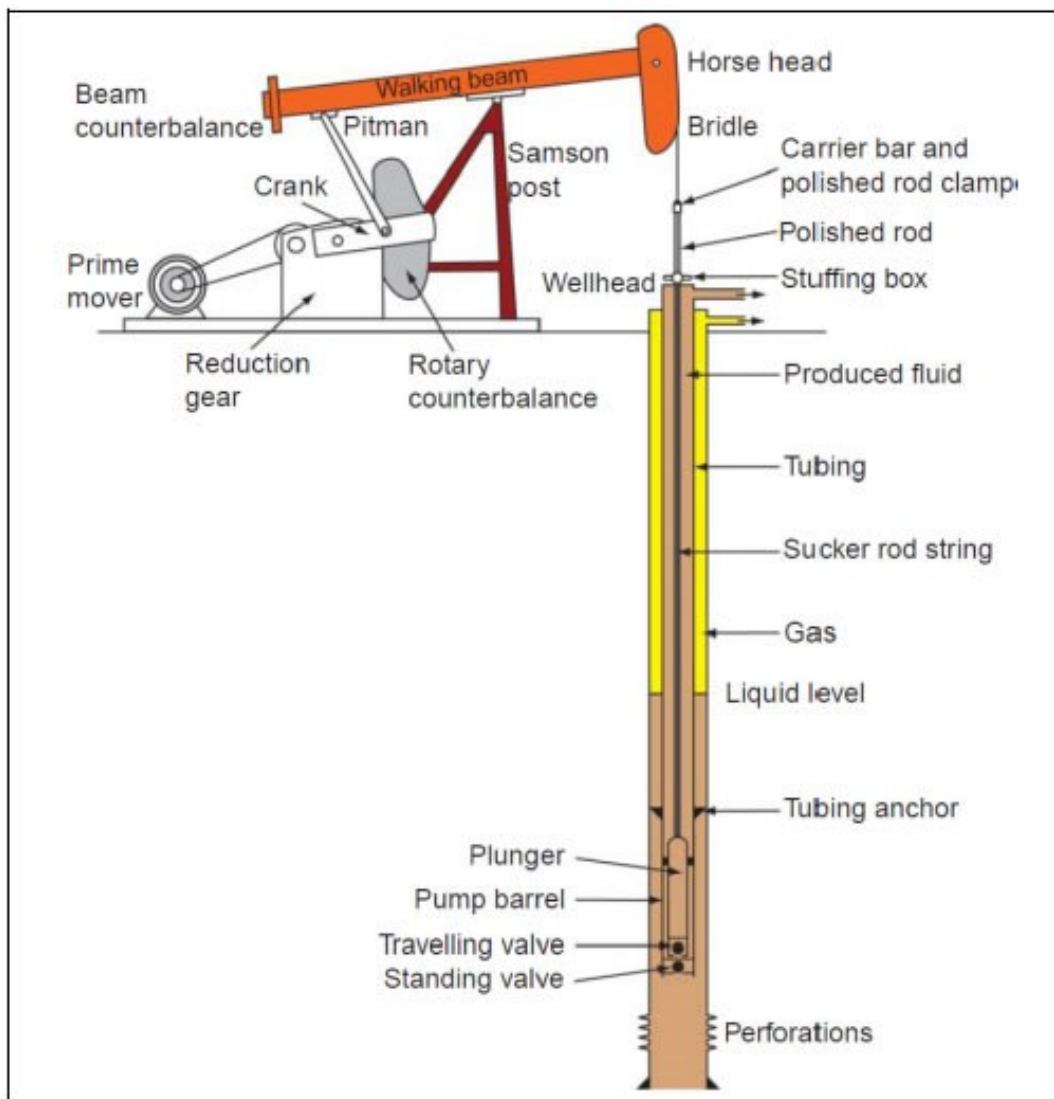
In practice majority of gaslift wells are using circular system because:

- better lifting is supplied with smaller cross-sections;**
- sand is destroying coupling joints and even causing pipe's raptures;**
- in case of production of paraffin oil, removing of paraffin deposits from circular space is complicated.**

Gaslift wells are equipped exactly the same as flowing wells, as soon as Christmas tree allows supplying of gas into the annular space.

Pumping methods of oil wells operation

1. Sucker-rod pumps



1) Surface equipment - beam pumping unit

2) Wellhead equipment

3) Subsurface equipment - rods, tubing, sucker-rod pump, different preventers.

Beam pumping unit consists of: electric motor, reduction gear, crank mechanism, walking beam with counterbalance. This unit is used to transfer the

rotary movement from the motor to reciprocating rods.

Wellhead equipment is used to seal the annulus and tubing, offtake the produced fluid and hang the tubing. It includes casing-head stuffing box, cross and stop cock. Type of stuffing box is chosen depending on magnitude of gas showings and depth of dynamic level in the well.

Rods are used to transfer reciprocating movement to the plunger. Rods are manufactured from alloy steels with diameters 13, 16, 19, 22, 25 mm and length 8 m. To control the length of rods strings shortened rods are used (1, 1.2, 1.5, 2 and 3 m), which are connected with couplings.

Rods have thickened ends with square cross-sections for gripping by tongs. Hollow (tubular) rods are also available. A special rod is the

wellhead rod that connects the column of rods with the cable hanger. Its surface is polished.

Rod pumps can be divided into: rod liner pumps and tubing sucker-rod pumps. Rod liner pump is lowered inside the tubing and is fixed with a special previously lowered lock holder. This type of pump is used in wells with low flow rates and big depth. Cylinder of tubing sucker-rod pump is screwed with tubing and lowered together inside the wellbore. This type of pump is used in wells with high flow rates and small depth and long overhaul life (to replace a pump is necessary to pull out all rods and tubing).

Plungers are made of steel pipes with the length 1.2 m. Surface of plungers and barrels is polished. Depending on the present of solid additives in

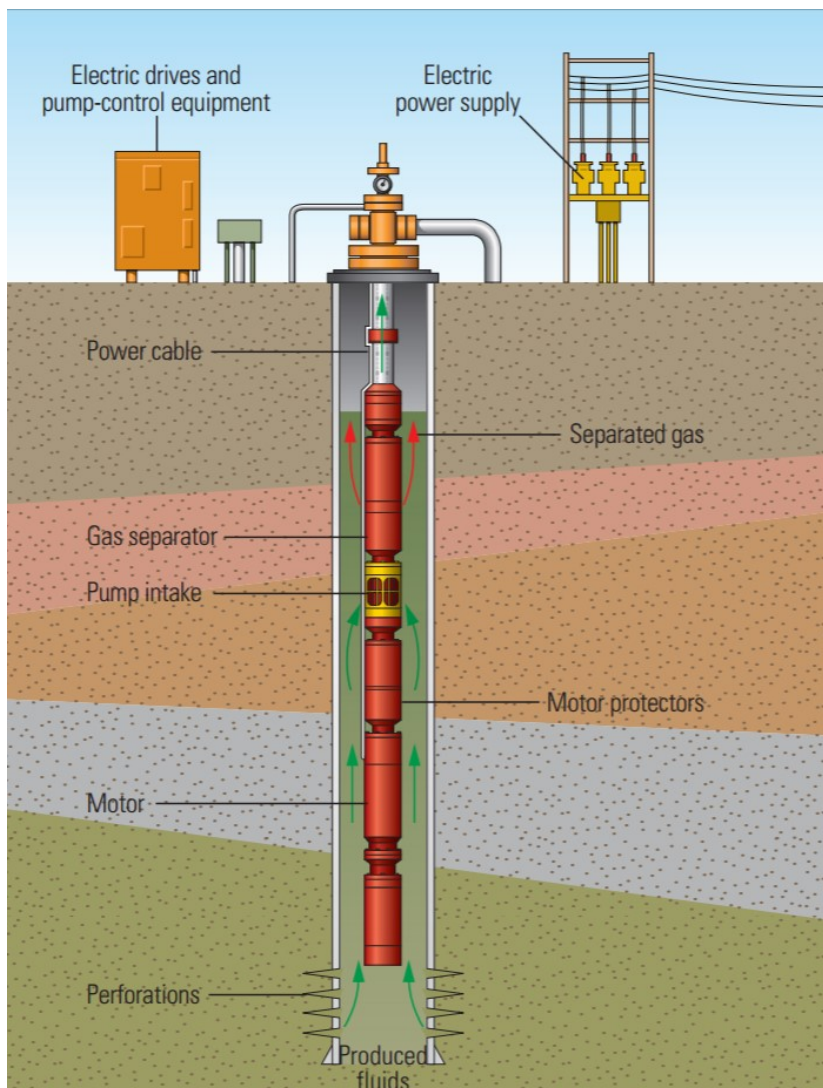
production fluid, plungers can be smooth, with a circular groove and with fanged rubber gasket. Positive allowance between the barrel and the plunger can be within ranges 0.045 – 0.17 mm.

Rod pump is chosen based on the composition of oil (presence of sand, gas, water), its properties, flow rate of the well and depth of pump's installation. Tubing diameter is chosen depending on the type and nominal diameter of sucker-rod pump.

Type of pump	Nominal diameter, mm	Stroke length, m
Rod liner pump	28 – 55	1.2 – 3
Tubing sucker-rod pump	29 – 93	0.6 – 4.5

2. Electric submersible pumps (operation of oil wells by electric submersible pumps)

Lecture 4. Part 2.



- 1) Wellhead equipment
- 2) Submerged system
- 3) Electric equipment
- 4) Tubing

Submerged system consists of centrifugal pump, electric motor and seal section. Check valve

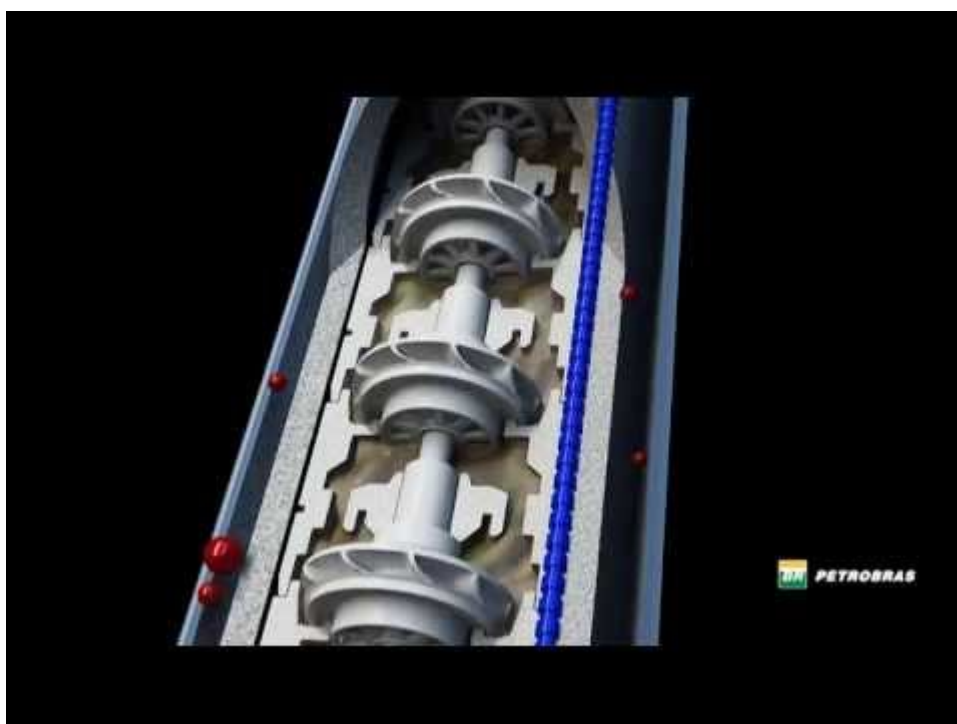
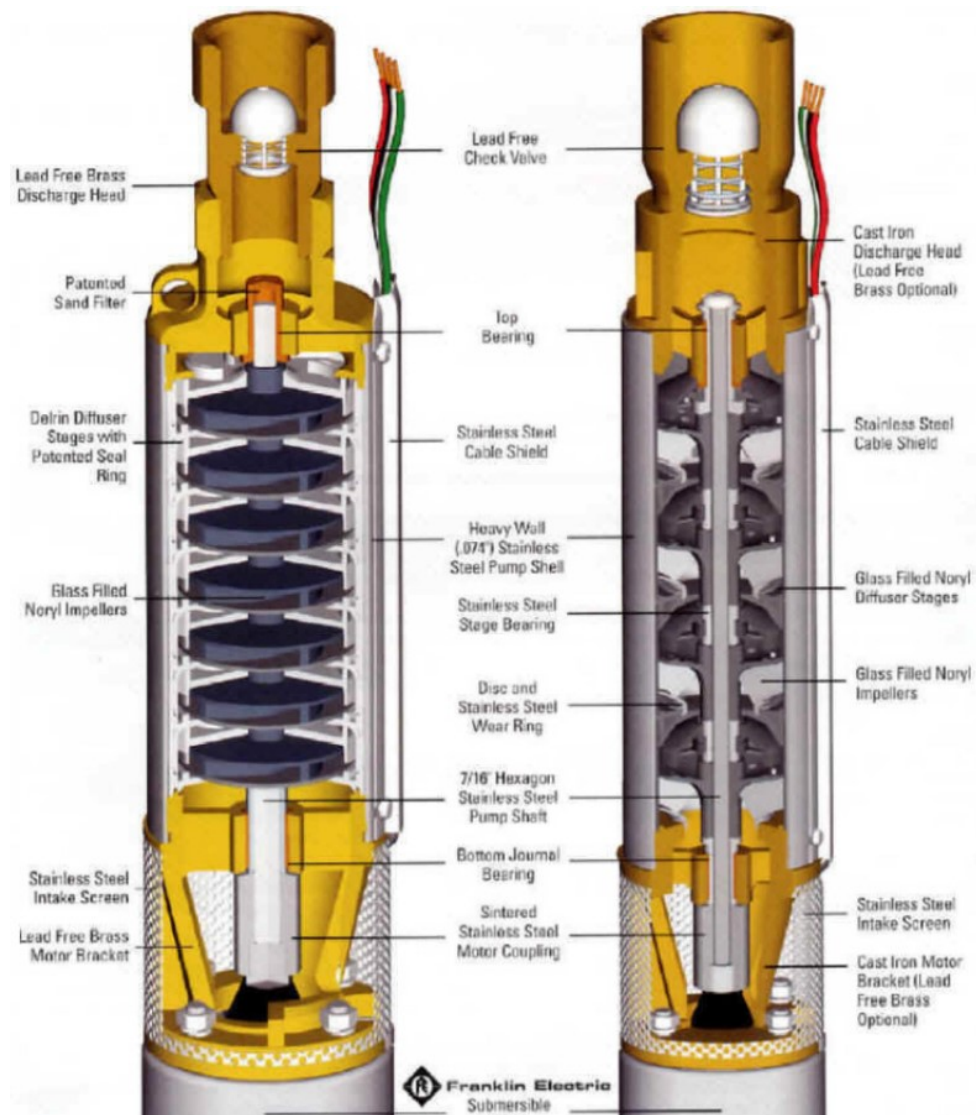
and outlet valve and placed above the pump to simplify its operation.

Pump is submerged under the dynamic level from 25 to 300 m and even to 600 m in rare cases (depending on the gas rate in liquid).

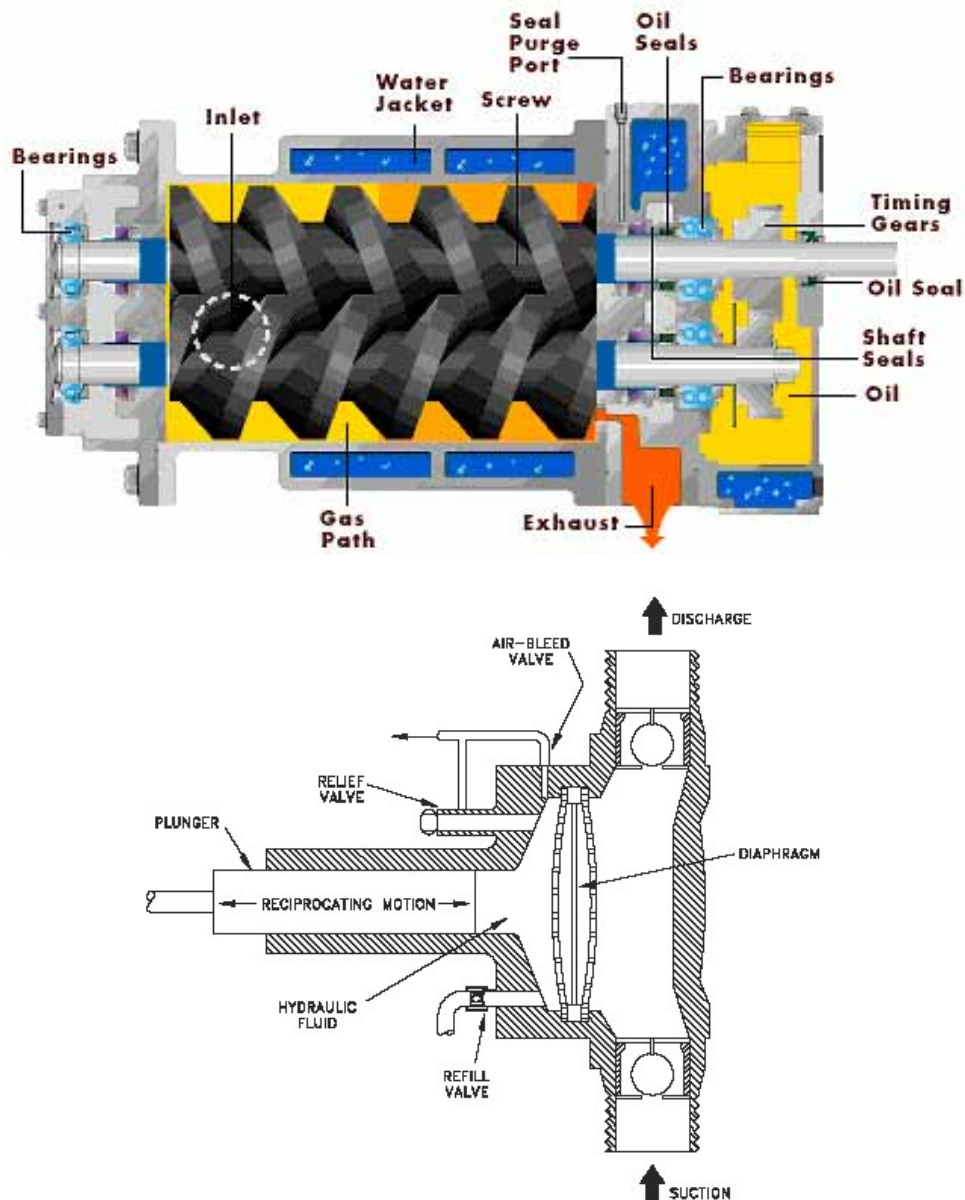
Electric pump is a submerged, centrifugal, sectional, multistage pump (in total in one pump can be 127 – 413 working wheels).

Wellhead equipment include: control station, discharge shut-off valve of manifold type, compensator, cross with cone cap, rubber seal.

Lecture 4. Part 2.



Lecture 4. Part 2.



Other methods of mechanical operation:

1. Screw pumps – are almost the same as electric pumps but it uses screw instead of working wheels.
2. Hydraulic pulsers – are pumps, driven by hydraulic engines, which get their operation liquid from the surface.
3. Diaphragm pulsers.
4. Mud-pulse pumps.