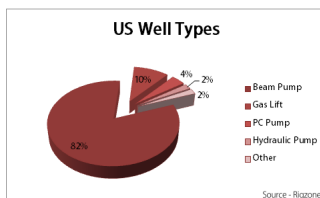


## All About Artificial Lift

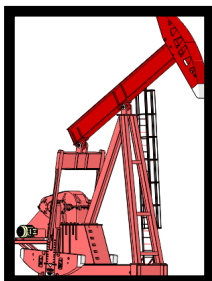


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Remember the old opening credits of the **Beverly Hillbillies** TV show, when **Buddy Epsen's** character shoots, "and up from the ground came a-bubblin' crude." The days of oil and gas naturally rising to the surface are largely gone.

In the US, 96 percent of oil and gas wells require **artificial lift** when they are established. Worldwide only about 5% of today's wells have enough natural lift to be profitable. **Artificial lift** refers to the process by which internal pressure of an oil reservoir is raised in order to drive oil to the surface. This system increases the productivity of the well.

Even in wells that have sufficient pressure at the onset to force oil to the surface, **artificial lift** is generally employed as natural lift pressures decrease over time. Using artificial lift increases natural flow rates and helps make wells more productive.



The most common form of artificial lift used is **beam pumping**. Beam pumping employs equipment on the surface and below to increase pressure and pump oil to the surface. The system is made up of a sucker rod string and a sucker rod pump. Beam pumps are familiar jack pumps seen in oil fields.

Connected to the beam pump are a string of sucker rods, which plunge down into the wellbore. The sucker rods are connected to the sucker rod pump, which is installed as a part of the tubing string near the bottom of the well. Beam pumps work similarly to pistons inside a cylinder. The sucker rod pump lifts the oil from the reservoir through the well to the surface. This usually occurs about 20 times a minute.

Other artificial lift operations use **hydraulic pumping** systems to extract oil and gas. These operations use a downhole hydraulic pump, rather than sucker rods. The production is forced against the pistons, causing pressure and the pistons to lift the fluids to the surface. Similar to the physics applied in waterwheels powering old-fashion gristmills, the natural energy within the well is put to work to raise the production to the surface.

For very sandy, heavy oil conditions, hydraulic pump jacks that pump the entire string do not use sucker rods allows for pumping fluid with a lot of debris.

**Progressive cavity (PC) pumps** are also commonly employed for artificial lift. A PCP system is made up of a stator and a rotor. The rotor is rotated using either a top side motor or a downhole motor. The rotation created sequential cavities and the produced fluids are pushed to surface. The PCP is a flexible system with a wide range of applications. PC pumps offer outstanding resistance to abrasives and solids but they are restricted to setting depths and temperatures. Some components of the produced fluids like aromatics can also deteriorate the stator's elastomer.

**Electric submersible pumps (ESP)**, also known as a centrifugal pump, use a screw-type impeller downhole to transfer the fluid from the well. These systems are very high producing, with some systems lifting more than 25,000 barrels of fluid per day.

Another method of artificial lift is the **gas lift** method. This system uses injected gas that is forced into the well to establish pressure. Typically the gas injected is recycled gas produced from the well itself. Due to its minimal surface requirements, gas lift is frequently used in offshore wells.

Along with the pump system, **artificial lift systems** require a number of additional tools, depending on the circumstances.

**Torque anchors** are used to prevent tubing back-off during PC Pumping operations. These tools help to ensure that the pump does not become unscrewed and fall into the well. Many torque anchors feature specialized design features like centralizers and bypass allowances.

**Tubing rotators** are a valuable addition to artificial lift systems, providing a method low-maintenance way to assure that sucker rods do no wear against the same location in the tubing. Rotators help to extend tubing and tool life for PC Pumping and beam pumping operations, and ensure that the artificial lift system works for longer runs without costly servicing. There are a variety of drive systems for tubing rotators, including manual, mechanical and electrical systems.

**Gas separators** provide methods for allowing gas to separate out of solution and migrate up the tubing annulus. This helps to avoid gas locking of a downhole pump. Gas separators have also been shown to increase a well's productive capacity.

*Tags - what is artificial lift, what is a torque anchor, what is a tubing rotator, what is a gas separator, PC pump, pump jack, progressive cavity pump, gas lift, artificial lift, ALS, beam pumping*

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