A PRIMER OF OILWELL DRILLING

A Basic Text of Oil and Gas Drilling

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(Revised)

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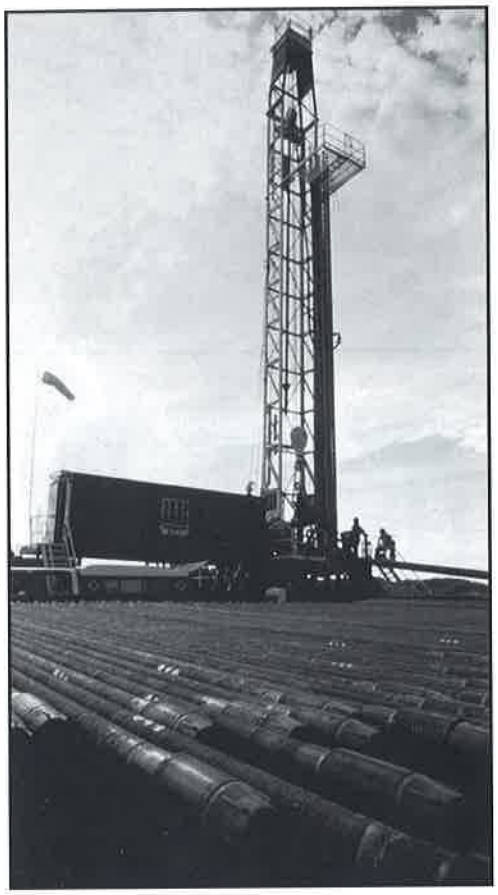

Figure 165. A completion rig running tubing into a well

PERFORATING

The operator is not through, however. Since the production string and the cement seal off the producing zone, the operator has to provide a way for oil and gas to get from the formation and into the well. Usually, the operator hires the services of a completion rig, which is a relatively small portable rig whose crews perform the final operations required to bring the well into production (fig. 165).

One important task is to *perforate* the well. A special gun shoots several relatively small holes in the casing. It makes them in the side of the casing opposite the producing zone. These holes, or *perforations*, pierce the casing or liner and the cement around the casing or liner. The perforations go through the casing and the cement and a short distance into the producing formation. Formation fluids, which include oil and gas, flow through these perforations and into the well.

The most common *perforating gun* uses *shaped charges*, similar to those used in armor-piercing shells. A high-speed, high-pressure jet of gas penetrates the steel casing, the cement, and the formation next to the cement. A perforating specialist installs the charges in the special gun and lowers it—usually on wireline, rather than drill pipe—into the well to the desired depth. The depth can be determined by running a collar locator log, which identifies the depth of each casing collar. By comparing the log with the overall number and length of the casing joints, the operator can accurately determine the depth. Once at the desired depth, the perforating specialist fires the gun to set off the charges (fig. 166). After the gun makes the perforations, the perforating specialist retrieves it.

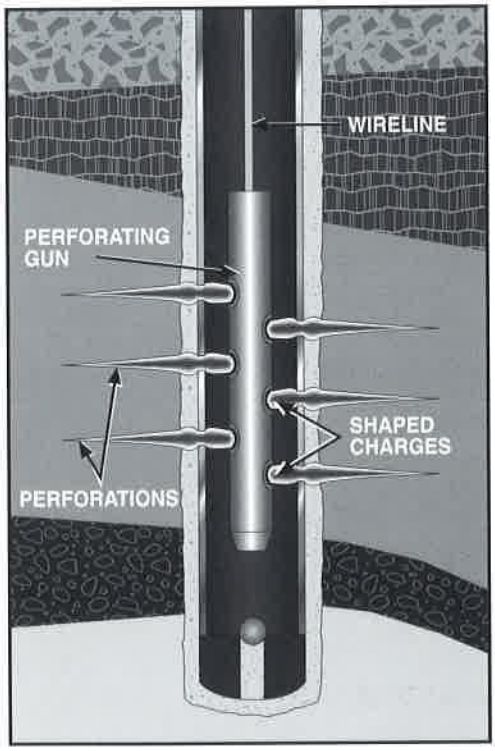

Figure 166. Shaped charges perforate the casing, cement, and formation.

Whether using jointed or coiled tubing, the operator usually produces a well through a tubing string rather than through the casing for several reasons. For one thing, the crew does not cement a tubing string in the well. As a result, when a joint of tubing fails, as it almost inevitably will over the life of a well, the operator can easily replace the failed joint or joints or, in the case of coiled tubing, remove and repair or replace the failed area. Since casing is cemented, it is very difficult to replace.

For another thing, tubing allows the operator to control the well's production by placing special tools and devices in or on the tubing string. These devices allow the operator to produce the well efficiently. In some cases, the operator can produce the well only by utilizing a tubing string. Casing does not provide a place to install any tools or devices that may be required for production. In addition, the operator installs safety valves in the tubing string. These valves automatically stop the flow of fluids from the well if damage occurs at the surface.

Finally, tubing protects the casing from the corrosive and erosive effects of produced fluids. Over the life of a well, reservoir fluids tend to corrode metals with which they are in contact. By producing fluids through the tubing, which the operator can easily replace, the casing, which is not so easy to repair or replace, is preserved.

Crew members usually run tubing into the well with a sealing device called a packer. They install the packer on the tubing string and place it at a depth slightly above the casing perforations. The end of the tubing is left open or is perforated and extends to a point opposite the perforations in the casing. The packer expands and grips the wall of the production casing or liner. When expanded, the packer seals the annular space between the tubing and the casing above the perforations. The produced fluids flow through the perforations and into the tubing string. The packer prevents them from entering the annular space, where they could eventually corrode the casing.