The Lease Pumper's Handbook

Chapter 17
Well Servicing and Workover

Section E

WELL WORKOVER

E-1. Well Workover Operations.

When a well has a problem more serious than changing out a pump, repairing a hole in the tubing, fishing a parted rod, or other basic well service need, it is referred to as *well workover*. This section highlights a few of the well problems and necessary workover procedures that may be encountered.

Killing flowing wells and blowout preventers. In most cases when a flowing well is to be worked over, the well must be *killed* before service can begin. This is usually done with a transport truck similar to the truck that hauls oil or water. Wells can be killed with oil, formation water, or treated water. Water is used when it will not damage the formation. After the kill fluid has been injected and until the injected fluid exerts more downward pressure than bottom hole pressure, the well will sometimes go on vacuum. Water is injected until the desired amount has reached bottom. At some point, all fluid movement stops. The well is dead and can be worked on.

With flowing wells, the injected fluid slowly dissipates into the formation, and the well begins to flow again after a period of time. This means the volume of kill fluid injected is proportional to the work being performed. The pumper must not only begin the work, but must always be prepared to close the well back in if it begins to come back to life or flow.

Figure 1. Specialized equipment for well workover, including a water tank, hydraulic power for rotating head, mud pump, and mud pit.

If a blowout preventer or *BOP* is to be installed, the crew needs to be prepared for a quick transfer in removing the Christmas tree and the BOP installation.

If water is injected as a killing fluid, potassium chloride may need to be mixed with the water to prevent formation hydration. This is especially true if any shale is present in the reservoir. Enough water is injected to kill the well for the needed time before it may disperse in the formation and allow the well to begin flowing again. Swabbing will remove the load water to speed up the process.

Blowout preventers. A typical blowout preventer used for workover will usually consist of two sections. The upper section

contains rams that fit around the pipe if it should become necessary to close them. The lower section contains blind rams that can be closed if necessary whenever the pipe is out of the hole. This will permit control of the well if it should begin to flow while the pipe is in the hole or if it is out or on the bank.

E-2. Stuck Pipe.

Stuck pipe can be caused from several problems, such as salt bridges, scale deposits, and sand accumulating in the bottom of the hole. The pumper does not usually know that the tubing is stuck until tension is pulled on the tubing and it cannot be moved.

Salt bridges. Salt bridges can occur on a pumping well whenever it pumps many cycles a day and the water being produced is extremely salty.

While the well is off between pumping cycles, the salt water rises in the casing, and when pumping, water is pumped down to a level near the tubing perforations. Each time this is done, a thin layer of salt may adhere to tubing and casing walls. Since this occurs thousands of times, these thin layers build up until salt bridges the area between the tubing and the casing. If this area bridges completely, gas cannot be released to the tank battery, and the pressure near the well bore increases to formation pressure. Oil production will fall dramatically and eventually cease.

To solve this problem, fresh water may be dropped down the casing annulus at scheduled intervals to dissolve the salt, reduce the buildup, and prevent bridging.

Scale deposits. Scale is carried into the annular space dissolved in water. It is deposited on the walls of the casing and tubing much in the same way as salt. As pressure and temperature are lowered on the water, the suspended scale breaks out. This scale can bridge the tubing in the hole as well as stick the pump and reduce the size of the tubing to make it too small to be removed. The tubing may need to be pulled out of the hole, laid on a rack, and reamed or drilled out.

With flowing wells a special coating on the tubing can reduce scale buildup. With pumping wells it may become necessary to circulate a scale-reducing chemical down the annulus. This may be done periodically through batch treatment or pumped into the annular space daily.

Sand control. Sand can be periodically bailed from the well or the well may be gravel packed. Screened perforated joints may also be installed to filter out the sand. If sand is a problem, a maintenance program will need to be developed to meet the needs of the lease.

E-3. Drilling with Tubing.

On some leases, it may be necessary to drill out scale in the bottom of the hole periodically. The tubing in the well can be utilized as drill pipe by the use of a rotating head and a power swivel. Some operators perform this service to their wells as needed to restore production.

E-4. Stripping Wells.

Stripping a well is a process of pulling the rods and tubing simultaneously. This begins by breaking the rod string out by setting the string down, engaging the pump clutch or notches, and turning the rods to the left. After many rounds of turning, the rods will break at some point. Rod tongs or a wheel

may be used for this purpose. The part of the rod string that breaks loose is removed. Tubing is pulled until the rods are reached, and the procedure repeated until all of the rods and tubing has been stripped out or removed.

All downhole pumps have a clutch or engaging notch built into them for this purpose. With most pumps, there is a clutch on the bottom only, so the rod string must be lowered until this off-set notch assembly engages. The rods to the left can be turned to break them out. Other pumps have a clutch assembly on both the bottom and top, so the rod string may be lifted to engage it and break the rods loose. The location can be determined in a few minutes by raising or lowering the rod string and turning it until it engages.

Problems are encountered by losing oil through spilling it on the ground, lighter oils *heading* (flowing up out of the tubing) and flowing, and even blowing out and covering the rig and location with oil, causing environmental damage and a major equipment clean-up. Special equipment and procedures such as swabbing can be used to prevent this contamination.

Safety joints can be installed in the rod and tubing string to unlatch and pull most of the string easily. This procedure presents special problems such as the tubing safety device turning loose while trying to unlatch the rod safety device.

When stripping a well, some lease pumpers attempt to turn the rod and casing string by using a rod wrench with an extension or ***cheater***. This is a dangerous practice and should not be attempted.

E-5. Fishing Tubing.

When fishing a loose string of tubing in the hole, there may be problems latching onto the broken part that is in the hole. To determine the problem, an impression block is run. It may be necessary to design and make a special fishing tool for catching the fish.

Running impression blocks. When an impression block is run, the type of block to be used must be selected. Rental blocks are usually made of a soft lead, but a softer material may be needed to get a deeper impression. This are made of tar.

Hard impression blocks. When running a lead impression, the tool is lowered into the hole by running it onto the tubing string. The amount of pressure applied and the manner of obtaining the impression depends on the weight of the tubing string being lowered. The lighter the string, the faster it is lowered to strike the fish to obtain the impression. After examining the impression, a decision is made as to the best method of fishing.

The soft impression block. A soft impression block is usually a shop-made tool. A hole is drilled in the neck of a swage, then roofing tar is poured into it with a short crown. After lowering it into the hole on three or four joints of tubing, the sand line is attached. It can be run to bottom quickly, and very little pressure is necessary to receive a deep impression.

Fishing tools. There are many types of fishing tools that can be rented for fishing. A spear works well for a jagged opening, and an overshot with a milling surface can be used to catch a round fish. When the fish is too far to one side, a shop-formed offset finger can be made to wrap around the fish by turning the pipe. The local tool rental company also has fishing specialists available to supervise special fishing jobs.

E-6. Fracing/Hydraulic Fracturing Wells.

There is an abundance of new technology available for use when stimulating wells through a fracturing process. This requires applying enough hydraulic pressure to the rock formation to split the rock, then pumping sand into the fracture, propping the fracture open to allow oil and gas to flow to the well bore.

Several fluids are used to carry the treatment to the formation when fracing wells. The easily available fluids are lease water, fresh treated water, and crude oil. Several petroleum-based fluids are also used.

Sand frac is a common procedure using natural and manufactured agents. The formation is fractured and spread open, and several sizes of a special sand are pumped in as a propping agent. Rock salt, which is water soluble, and moth balls, which are oil soluble, may be added to block receptive passages during the fracing process to extend the fracture deeper into the formation and improve the final results.

With acid fracing, an acid is pumped into the hole under high pressure to open the rock and etch rock away to permanently open the formation. A time neutralizer is added to make the acid safe to produce back after the job has been completed.

Other special fracs may be performed such as an explosive heat frac. The explosion will back flush the formation toward the reservoir. The heat is especially effective in shallow, low bottom hole temperature wells where tars, paraffins, and other firm petroleum products plug the formation and cut off production. A water blanket is added above the charge to add weight and force the heat into the formation.

E-7. Pulling and Running Tubing Under Pressure.

By using two sets of blowout preventers with a space nipple in between, a well can be worked over without killing the well. It is also possible to work over a well while it is producing.

Figure 2. A well workover rig with a double blowout stack so that workover can be performed while the well is still under pressure and even while it is producing oil and gas.