Modified Free-Wheeling

PLUNGER LIFT

“ MODIFIED FREEWHEELING”

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ABSTRACT

Plunger lift Technology has been with us for decades, no one knows for sure who first developed the idea, but we have seen the technology evolve from a rough guessing game to a near absolute science. The introduction of the electronic controller has brought the technology further than any other single development. This paper will cover one of the many areas, where electronics have allowed us to refine the technology.

INTRODUCTION

Plungers have been run in high rate gas wells, which produce some fluids making successive trips and allowed to travel freely. The modified freewheeling process adds a motor valve, an electronic controller and plunger arrival sensor, to momentarily shut in the well. By shutting the well in for 10 to 20 seconds you allow the plunger to fall out of the lubricator at a higher flow rate and remove fluids from the well bore, which helps to increase draw down. Using the standard freewheeling application the plunger would not drop until 250 MCFD had been reached, because the plunger-opening rod restricts the bypass. By implementing the use of the motor valve and electronic controller we can control momentary shut in to allow for a faster fallout of the plunger, and displays of valuable information for pumper assessment, such as plunger trip counts and times.

In areas of East Texas freewheeling plunger installations have been extremely effective in the removal of produced fluids from wells. In several cases eliminating the need for less cost effective methods of fluid removal, such as gas lift or pumping installations Experience has indicated the free running plunger applies to a large percentage of wells having fluid problems,

and that operating expenses are extremely lower than any other method of fluid removal presently available. Though not a cure-all for all wells, this type plunger installation appears to be the single most efficient method of fluid removal developed to date.

A flow rate of at least 250 MCFD is required to “freewheel” a plunger. Chokes can be used at surface to prevent the fluid slug from overrunning the separator should fluid production be high. The plunger will also control paraffin and scale deposition.

EQUIPMENT

Figure “1” illustrates a basic modified freewheeling plunger installation. The essential components needed are a lubricator to receive the plunger at surface, a valve opening rod within the lubricator a motor valve, electronic controller, a plunger arrival sensor a free running blade, (Figure “2”) or brush type plunger, the tubing string to the level of the casing perforations, a bottom hole bumper spring, and a tubing stop, collar stop, or three cup hold down in the seating nipple. Either a blade or brush type plunger is recommend, without an integral opening rod. Plungers with integral opening rods generally will not fall against higher gas flow rates making freewheeling impossible. Use of a blade type plunger creates a superior seal between the plunger and the walls of the tubing. This creates a more efficient lift of fluids with each run. A brush plunger uses a brush seal to create the seal between the plunger and the tubing walls. The brush plunger exudes minimal wear on the tubing making it useful with tubing that is in bad condition or is under drift diameter in spots, Plungers can be turned down as much as 0.040 in. if necessary.

OPERATION

A typical cycle of operation is as follows (the well is producing to the sales line through the tubing), the free plunger is dropped from the lubricator by opening the master valve and is allowed to fall until it contacts the bottom hole bumper spring,

closing the bypass valve in the plunger. With the bypass valve closed this allows the gas to lift the plunger up the tubing, carrying any fluids above it to the surface.

Upon fluid and plunger arrival at surface the fluid passes down the flow line, the plunger enters the lubricator making contact with the bypass valve opening rod, opening the large bypass valve in the plunger, allowing gas to

flow through the plunger. The plunger upon arrival also trips the electronic sensor attached to the lubricator causing the electronic controller to record the plunger trip, the plunger trip time, and close the motor valve for 10 to 20 seconds, allowing the plunger to fall out of the lubricator and begin the "freewheeling" cycle. The electronic controller then opens the motor valve, the plunger begins its trip back to bottom and the cycle repeats, as the cycles continue, all fluids that enter the tubing string along with the flow of gas are lifted to the surface and are not allowed to pull the well down or log it off.

The time required to complete a cycle in this operation will vary depending on varying well conditions such as rate of gas and liquid flow, the gradient of each, the depth of the well, and surface pressures.

MAINTENANCE

The plunger should be pulled monthly and checked for wear. The brush type plunger does not wear appreciably as compared to the blade type; however, the blade type offers greater lifting efficiency due to the superior seal. Drip pots should be checked more often to keep supply gas dry.

Free wheeling plunger installations have eliminated the need to blow wells to the atmosphere to keep them unloaded. Each installation will require some attention to set the flow cycles and proper operating pressures. Field personnel may need additional training on this particular type operation

SUMMARY

A plunger free-travels in the tubing to keep fluids automatically unloaded. Normally, the well must be shut-in to allow the plunger to fall, but the use of a large bypass valve and no integral valve-opening rod allows the plunger to fall against the flow. As noted for 2 in. tubing, the gas flow rate should be at least 250 MCFD. Although no upper limit has been placed on the rate, the plunger will not fall out of the lubricator at higher rates. In such cases a shut-in at arrival may be used to momentarily shut-in the well. Once the plunger begins descending it will normally reach bottom even against some of the higher rates because of the large bypass valve unique to this type plunger.

Trained personnel should be used to evaluate gas charts and analyze surface and subsurface factors to identify the appropriate candidates. By carefully selecting the wells, this method can be very successful in keeping wells automatically unloaded; thus enabling the well to maintain a consistently higher rate of production.

REFERENCES

Brown. K. E. and K. C. McBride. The Technology of Artificial Lift Methods, Vol. 2b. Tulsa OK: Penn Well Books, 1977