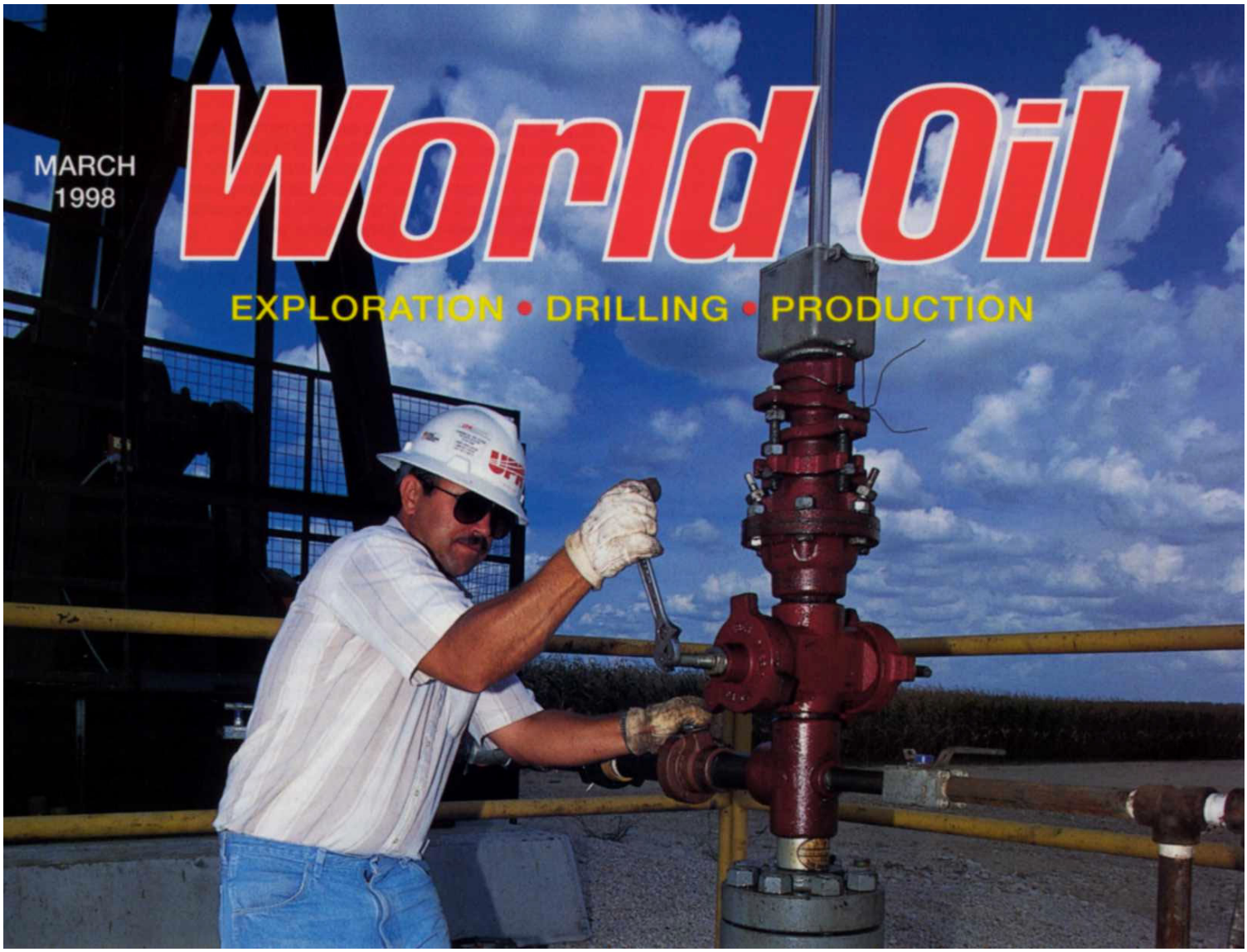

What's new in artificial lift

Part 1 - Sucker rod pumping, progressing cavity pumping, automation/control. Twenty-four innovations for improved field operations

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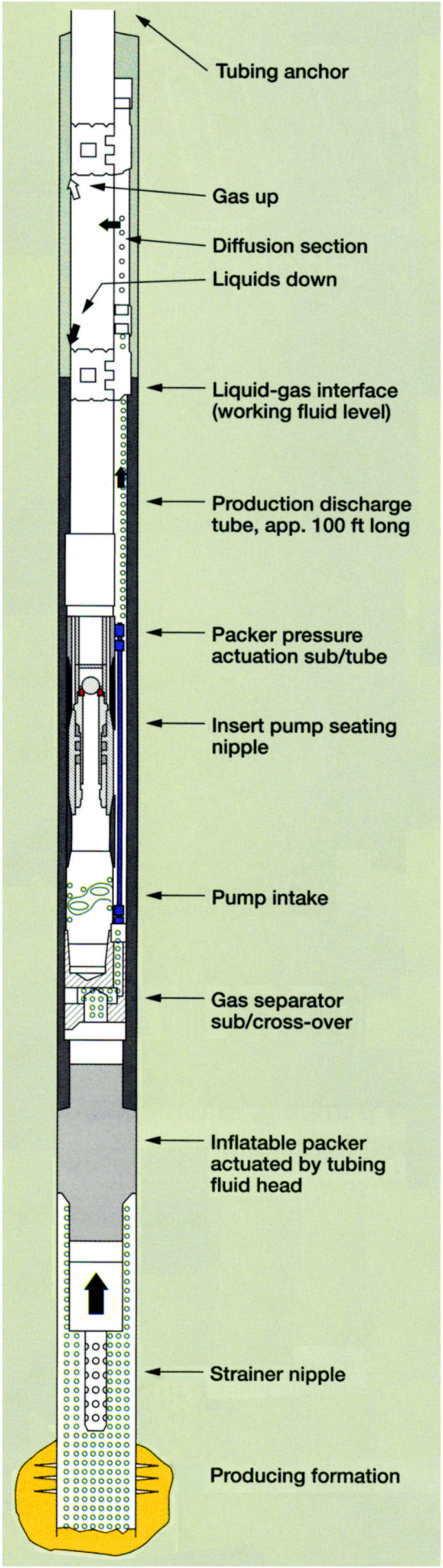
The overall subject of artificially lifting producing oil wells, vs. relying on the wells' abilities to flow, is covered in this article and a second part to appear next month. This article covers sucker rod pumping and progressing cavity pumping (PCP), plus several advances in remote control and automation of pumping systems. Part 2 will introduce innovations in electrical submersible pumping (ESP).

In the major category of sucker rod pumping, 15 recently applied tools/techniques include: 1) six devices for improving horse head to wellhead operations such as safety, maintenance and load measurement; 2) four new devices for the downhole pump system itself; 3) two systems for monitoring/controlling speed and power; 4) an improved annular gas separation scheme; 5) an annular production logging method; and 6) a new coiled rod/tubing service unit. Five PCP improvements include: two offerings for wireline retrievable pumps above submersible electric motors; two wellhead designs for running/handling PCPs and ESPs; and software for controlling an ESPCP. For automation/control, four industry systems for pumping well monitoring and control are featured. Essentially universal systems, they offer options for controlling rod and PCP systems, as well as plunger lift.



GAS SEPARATOR TO INCREASE ROD PUMPING PRODUCTIVITY

Fig. 2. Maximizer 4300 annular gas separator operates above a special inflatable packer to direct raw production into annular lift tube from which it drops back into larger annular reservoir, with pump intake at the bottom. Inflation/deflation tube to packer element connects to inside of tubing above insert pump holddown (or above tubing pump, if used) and goes through gas separator sub into packer. Tubing anchor prevents movement and packer wear.

Gas separation concept. Gas separation for beam pumping installations has included: set- ting the pump below the perforations (where possible), using various types of, "poor-boy" systems, a decentralized modification of the poor-boy sys- tem, a packer type of gas separator and other methods. The packer type separator system is known to provide good separation, but most operators do not like seating (and un-seating) packers, as trash and sand can accumulate on top of the packer, complicating its retrieval.

Stren Co., Houston, has developed a packer-type annular gas separator called the Maximizer Series 4300, Fig. 2. The system uses an inflatable packer that will allow the operator to easily unseat the packer by simply unseating the pump. This allows pressure to be released from the elastomeric packer element, fluids can then wash over the top of the packer to remove any trash accumulations. When the pump is seated and pumping is commenced, as the tubing fills, that fluid is ported into the packer and pressures up the element to seal the packer.

Separation occurs in the tubing-casing annulus because production is directed through the packer, through a cross-over into a riser tube about 100-ft long and up the annulus. The tube discharges into the open annulus and produced fluid falls back down to fill the liquid reservoir from which the pump draws, with its intake located just above the packer. Rising gas bubbles in the large annular space are not carried downward through the slower-moving liquid. Thus they can break out and be produced as free gas through the annulus.

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