Extracting Oil Using Automated Systems to Such Efficiency that even Stripper Wells as well as Productive Wells can Produce Oil Cost Effectively”

Using New and Improved Artificial-Lift Systems in Mature Fields

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Vann Pumping Systems
Improved Artificial-Lift Systems

OUR CHALLENGE

• To increase the productive basin life

HOW TO ACHIEVE IT

• To continue improving existing artificial-lift experiences and methods
• Application and optimization of advanced techniques

ARTIFICIAL-LIF EXPERIENCES - IMPROVED ARTIFICIAL-LIFT SYSTEMS

• Computerized Hydraulic Lifting Systems
• New applications for wire line services
MEXICO – Regional Context

OBJECTIVE:

- Reactivation of mature/abandoned oilfields
- Implement EOR/IOR techniques
- Maximum economic benefit of the conventional resources

AREAS:

TAMPICO – MISANTLA
CHICONTEPEC
POZA RICA
The mature oilfield is located in Veracruz. The field was discovered in 1930. It covers approximately 120 km² (7 big areas) and produces an oil of 31 °API. The mature field produces from the Tamabra Reservoir found at a depth of approximately 2,300 meters. The distance between existing wells averages about 400 m (40-acre spacing).

TAMAULIPAS-CONSTITUCIONES
The mature oilfield is located in Tamaulipas. The field was discovered in 1951. It covers approximately 60 km² and produces an oil of 18 °API. The mature field produces from the Cretaceous and Jurassic Reservoir found at a depth of 1,980 meters.

<table>
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<th>REGION</th>
<th>PROJECT</th>
<th>Water Injection</th>
<th>Injection Fluid</th>
<th>Rock Formation</th>
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<tr>
<td>North</td>
<td>Poza Rica</td>
<td>March-1951</td>
<td>Water</td>
<td>Carbonates</td>
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Artificial-Lift System

Typical Oilfield

Finishing of Primary stage (natural declination) and beginning of secondary recovery projects (waterflooding)

Complex fluid: corrosive, heavy oil, gas, sand, carbonates and scale

Multilayer reservoir

Multiphase fluids (Oil + Gas + Water)

High Pulling Index

Surface Pumping Units failures

High water cut
This new pumping method is designed as an alternative to conventional “rod and pump jack methods” utilized in oil well production today

- In place of pump jacks, an electronic and hydraulic operated system is used.
- Instead of rods to convey the up and down stroke of the downhole pump, cable can be used.
- Automatized Pumping System (PLC)
Advantages

- Longer Strokes (204”)
- No work over unit needed
- Automatic equipment to optimize the operation (Programmable Logic Controller PLC)
- The equipment is designed to operate safely
- Quiet operation and no visible moving parts
- Environmentally pleasing
- Stroke Length and SPM (Strokes per Minute) can be regulated without interrupting the operation
- Completely enclosed superficial equipment
- Provides continuous polished rod lubrication
- Maintenance Costs Reduction
- Total Lifting Cost Reduction
- Reduce Electric Power Consumption
Using cable instead of rods to convey the up and down movement has been patented, and it offers many advantages:

- Reduce overweight
- Reduce cost per feet
- Cable is always in tension
- Reduce tubing wear
- Reduce labor, maintenance, surveillance and operating costs
- Continuous cable optimize the installation process
- Fewer and Longer SPM (Strokes per Minute)
Lifting Cost Considerations

- Energy (25 - 40%)
- Surface maintenance (15 - 25%)
- Subsurface maintenance (25 - 35%)
- Others (20 - 35%)
Operation and Cost-efficient

- 100% Hydraulic-Electric Operation
- High Efficiency Equipment
- Variable Speed Systems
- Custom Equipment according to special requirements

Conventional Pump Jack: 22,500 kWh/month
Hydraulic Pumping Unit: 7,500 kWh/month
Artificial-Lift System

Automatized Operation

Continuous Operation

Solid state electronics are utilized and can be calibrated to sense well functions such as fluid level. Keeping the fluid level at the proper depth maximizes production allowing to pump 24 hours per day.

- Lowering the economic limit
- Increasing run time
- Increase a well’s profit margin
- Decrease well downtime
- Recover more oil reserves
Controlling Fluid Level

Controlling the fluid level in the annulus above the pump has turned out to be a very important factor to achieve the desired efficiency of the production and recovery of oil.

The system is programmed to operate the downhole production pump at a production rate equal to the flow rate of the produced oil flowing into the well bore from the casing perforations.

A condition that achieves maximum production of oil from an oil well.
RESULTS MARGINAL WELLS
With High Water Cut

Marginal oil wells are usually uneconomical because labor and pumping costs are close to the revenue from the hydrocarbon sales.

Many of the unprofitable wells can be operated profitable by judiciously diagnosing the operating history of the well and carrying out any future operation of the well in accordance with improved pumping systems.

Well: MECATEPEC-13 (Poza Rica, MEX)
RESULTS
Annual Pulling Index

Active Oil Wells: 40 wells
Initially 75% were shut-in
Oil Production: 1,000 BOPD
65% no power supply
Pulling Job/Well/Year: 0.2
Longer strokes/fewer strokes
RESULTS
Environmentally Friendly
Pumping Intermittently by placing the unit on a timer is the usual method for reducing pumping frequency in marginal wells. However, there are some disadvantages associated to this method:

- Creation of backpressure on the producing formation
- Intermittent pumping changes the frequency but not the pumping speed
- Starting the pumping unit from a dead stop requires more power
- Downtime allows the solids to settle
There is a need for regulating pump rates to deliver the maximum amount of oil to the surface.

- Continuous measurement of fluid level
- Regulate Pumping speed
- NO downtime or need for clocks
- Reduce Failure Frequency
- Production Optimization
- Based on built in algorithms customized by client
CONCLUSIONS

We must break a historical paradigm that prescribes that recovery methods should follow a chronological order.

Oil field development plans could include any necessary lift/recovery method, at any given stage, and in any given order, to maximize recovery efficiency.
CONCLUSIONS

- Increase in exploration and drilling costs on developing new reserves

- Focus our efforts on improving and developing new techniques of oil recovery to extend the productive life of wells.

We believe that these methods and logic used to evaluate these wells will be of great assistance in increasing production and making mature wells economical again. We believe that these methods have as much potential as many other new techniques that have introduced a paradigm shift from the conventional methods to another method of pumping oil wells.
Artificial-Lift System

...Thanks

Questions