OPTIMIZING AND MONITORING A HEAVY OIL RESERVOIR USING PROGRESSIVE CAVITIES PUMPS AND REAL TIME INFORMATION IN DOBOKUBI FIELD, FAJA PETROLIFERA DEL ORINICO, AYACUCHO DIVISION – VENEZUELA

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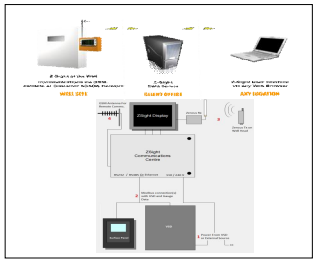
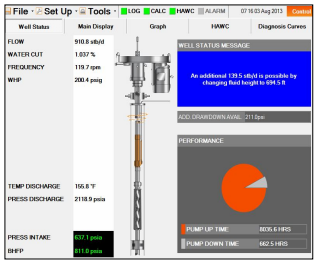
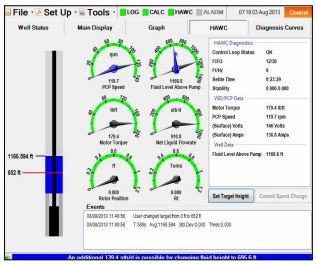
Screen of Well Status, Using a Color Code on a Map



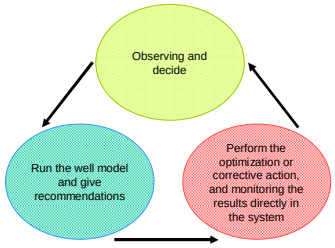
System Hardware Configuration



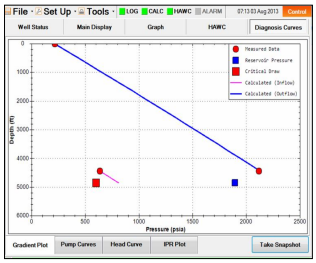
Screen of well status (MFD-19) showing initial flow calculations and the automatic well optimization recommendations



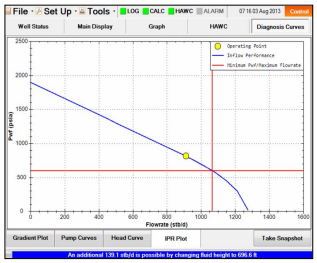
The optimization screen of well MFD-19, showing the optimization target and alarms in dials assuring the optimization will be inside the PCP limits



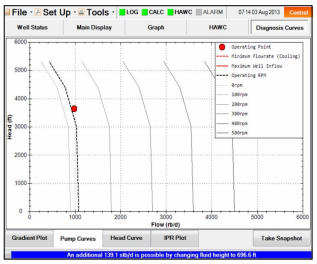
The three steps, applying by this intelligent process



The automatic well modeling of well MFD-19 keeps the calculations correlated with the real measured points taken by the down-hole sensor, for quick problem identification



Screen with the real time nodal analysis construction (Well MFD-19), showing to the engineers users the real well potential for production optimization



Pump Curve vs. PCP Operating Point (well MFD-19)

INTRODUCTION

Progressive cavity pump (PCP) is the artificial lift system commonly used in the Faja Petrolifera del Orinoco (FPO). As a matter of fact, approximately 65% of the wells there have this system implemented.

Now a days, an effective diagnostic for optimization and timely appliance of corrective actions in artificially lifted oil wells is increasingly required by oil companies. Many reasons supporting it, when an oil field is operated with this philosophy it is possible to increase the asset run-life of the artificial lift system, optimize and maintain reservoir productivity, and maximize field production. Nevertheless, the procedure to obtain calculated data in order to optimize and diagnose a PCP well can be complex, expensive, ineffective and tedious when manual process are applied in compare with a fully automated system.

To maximize field production, PCP run-life, reservoir productivity and minimize operations expenses according to the FPO operational conditions, an intelligent system was designed.

THE SYSTEM COMPONENTS

Hardware: it is compound by an intelligent processor with a touch screen panel, a communication device, a wireless transmitter pressure, a temperature sensor located at the production tubing on the well head, a GSM transmitter and antenna to receive the signal from the wireless sensor.

Software: it includes a mathematical algorithms in order to calculate, in real-time, the PCP´s diagnostic parameters.

Calibration: The system is calibrated by uploading an initial well modeling. To calculate data for well diagnosis, it must have a validated operational parameters in comparison with the reality.

Operations: It can perform the entire optimization and monitoring process in all the wells belong to an oil production field with three automated steps . Operational conditions and working anomalies that may require physical changes over a PCP well for its optimization can be predicted with this system. Thus, the time of the process can be reduced as the minimum to maximize cost effectiveness of field operations.

CASE OF STUDY

The system was implemented for a period of 30 days in the well MFD-19, Dobokubi field, in the FPO.

- Test Started: July 15th 2013 /Test Finished: August 15th 2013.
- Monitoring rate: every minute for each well
- Main purpose of test: to get additional oil production by optimizing the PSP system. Calculating total production, water cut, sumergence level and GOR. Error less than 5% against real values measured.

RESULTS

Total production: 910,8 bpd.
Net production: 901,4 bpd.
Water cut 1,37%
Pump efficiency 90,1%.
Test with multiphase device indicated a deviation error of 4,2%.

CONCLUSION

- The system can reduce as maximum as possible, the time of well simulation for diagnose an operational issue or increase production in a well, maximizing field production and decreasing operational expenses.
- The system can be used to reduce the cost associated to the usage of mobile testing units in a high rate of periodicity for opportune well diagnosis.
- Due to its capacity of process high quantity of data every minute (of each well and of the entire field), it can be used to improved reservoir studies in order to increment the reservoir oil recovery factor.
- Due to its fully automatic processing, an alarm can be identified as soon as it happens, reducing as maximum the response time for corrective actions, increasing PCP run-life, improve reservoir productivity, and reduce as maximum the work-over rigs operations and its related cost.
- Due to its capacity of remote control, the system can reduce deferred production related to manually operations process.