The Benefits of Offshore Gas Lift Automation and Optimization

A case study on offshore gas lifted oil wells located in the Java Sea, Indonesia

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Realize Production Potential

Improving Offshore Oil Production

A major international exploration and production (E&P) company in Indonesia looked to Zedi to optimize production on 11 oil wells located on 3 offshore platforms in the Java Sea. Zedi developed and implemented a Production Monitoring and Optimization System (PMOS) solution to remotely monitor and analyze real-time production data while controlling gas lift processes for their offshore oil program. The investment in technology and skills developed were justified through a 17.8% production improvement equating to an increase of 694.8 barrels of oil per day (BOPD). The PMOS solution was designed to optimize production on three oil wells located on an offshore platform in the Java Sea. The PMOS solution aided in their objective of meeting production targets, increasing operational efficiency and reducing safety risks. High reliability, availability of equipment, and system performance of Zedi's solution contributed to this production objective.

Using Zedi technology, the E&P company realized the benefits of timely data, optimized gas lift, stabilized production, reduced operational costs, improved well test results and minimized safety hazards. On each offshore platform at the wellhead, an automated closed loop control system monitors vital production data such as pressures, temperatures and flow rates. Remote alarming gives operators the ability to immediately respond to any malfunctions or faults detected on the offshore platform. Data collected on location is transmitted through Zedi's secure network, which utilizes satellite communication services and a managed IT and network infrastructure. Real-time data is viewed remotely by the end-user, anywhere and anytime with the Zedi Access SCADA system. Analysis of this data through consolidation, trends and reporting empowers the end user with improved operational decisions when adjusting production remotely through gas lift control for optimal performance.

The operator has the ability to remotely control gas lift through a choke valve located at the wells casing line. Real-time data combined with gas lift control allows for the optimization of oil production on the offshore platform. The diagram below is an overview of the PMOS solution:

Figure 1: High Level PMOS Solution Diagram

Benefits Realized by the Producer

The benefits of implementing a PMOS solution can be characterized into two categories. They are:

Technical Benefits

- Visibility of real-time production data anytime, anywhere resulting in reduced trips to the EC offshore platform.
- Improved gas flow and emulsion measurement accuracy, improving well test production through precise and consistent data.
- Remote automated control of gas lift valves improving production optimization processes and minimizing manual intervention.
- Instantaneous alarming on production parameters, allowing for steady production and reduced unplanned maintenance. Alarms notify operations of a set point breach, ensuring that proper measures can be executed in a safe and timely manner.
- Reliable and secure communication through public satellite service versus radio networks with high and often hidden lifecycle management costs.
- SCADA system locally hosted in country by Zedi with data securely and readily available. The system meets in-country regulations for data residency and eliminates the need for an expensive internal SCADA support infrastructure.

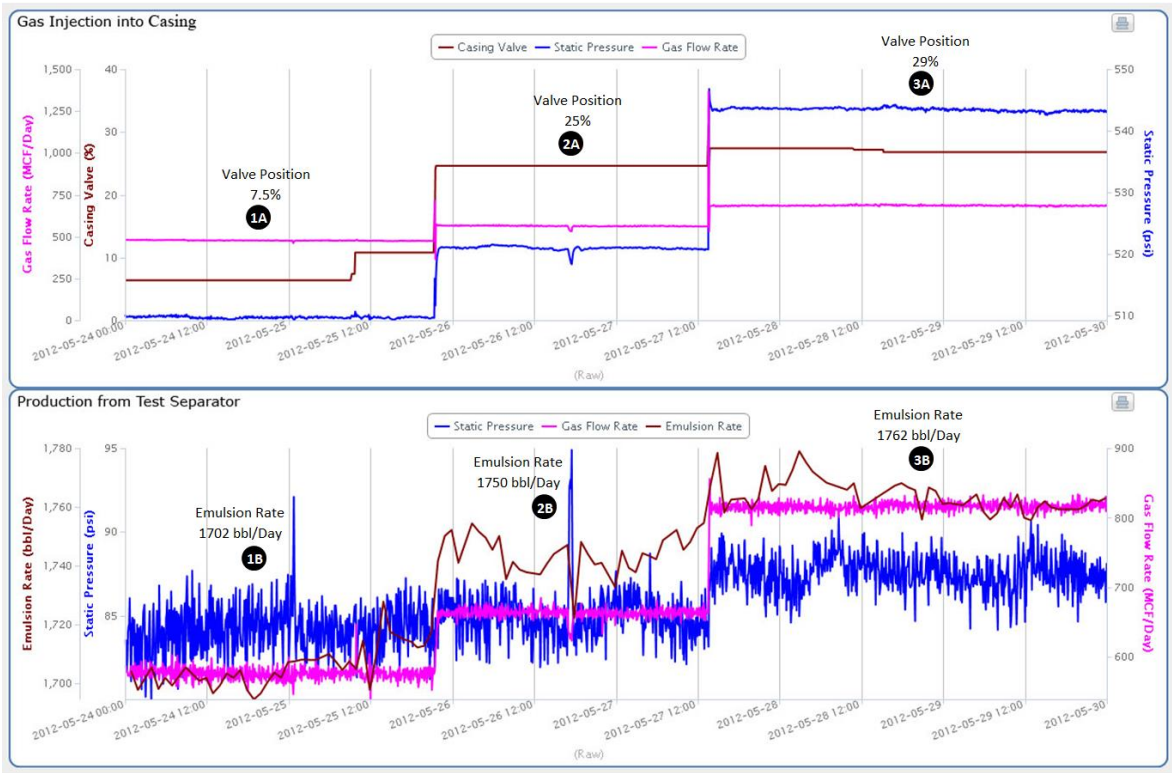
Business Benefits

- Increase in annual earnings through improved reliability of production, increased production, as well as reduced operating costs.
- 17.8% production gain (694.8 BOPD) through automated stabilization of oil recovery process and optimal gas lift remote control.
- Reduced operational and safety risks through remote monitoring and control.
- Availability of accurate, instantaneous and high resolution data for analysis.
- Team collaboration and consistency using a single production data source for well optimization.
- Empowering operators with an enhanced technology skillset for managing their wells.
- Increased revenue accounting confidence.

Optimized Production

Figure 2 below was produced using Zedi Report Center in the PMOS solution to optimize oil production on the offshore platform. The graphs represent data from a gas lift well (top graph) and the resulting production at the test separator (bottom graph). The top graph shows step increases in the casing valve position (brown), gas lift flow rate (pink) and static pressure (blue) by controlling the choke valve position on the gas lift well. The PMOS solution gives the user the ability to remotely control this process by entering gas flow rate (automatic mode) and casing valve position (manual mode) set points via the Zedi Access web-based HMI. The second graph shows the resulting static pressure (blue), gas flow rate (pink) and emulsion rate (brown) at the test separator as the gas lift well gas flow rate and static pressure increases.

Figure 2: Impact of Remotely Controlled Gas Lift Flow Rate on Emulsion Rate



1A Gas lift well initial step for baseline data: Casing Valve Position (7.5%), Gas Flow Rate (490 mcf/Day) and Static Pressure (511 psi)

1B Test separator production result of initial step: Emulsion Flow Rate (1702 bbl/Day), Gas Flow Rate (590 mcf/Day) and Static Pressure (81 psi)

2A Gas lift well 2nd step with gas lift increase: Casing Valve Position (25%), Gas Flow Rate (610 mcf/Day) and Static Pressure (530 psi)

2B Test separator production result of 2nd step: Emulsion Flow Rate (1750 bbl/Day), Gas Flow Rate (680 mcf/Day) and Static Pressure (85 psi)

3A Gas lift well 3rd step with gas lift increase: Casing Valve Position (29%), Gas Flow Rate (730 mcf/Day) and Static Pressure (543 psi)

3B Test separator production result of 3rd step: Emulsion Flow Rate (1762 bbl/Day), Gas Flow Rate (815 mcf/Day) and Static Pressure (88 psi)

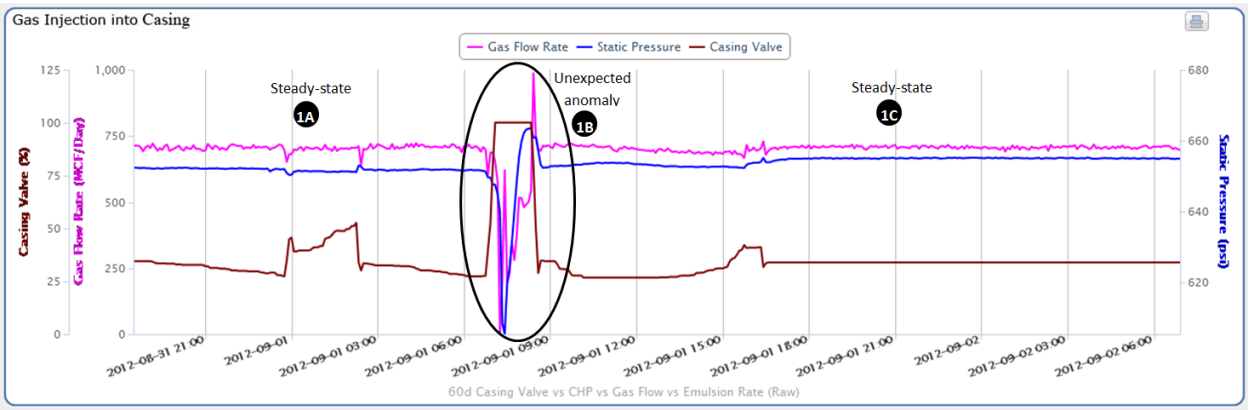
Note: All values are approximations.

Analyzing the graphical data, one will find that there is a direct correlation between the increase in gas lift flow rate and static pressure at the gas lift well and the resulting static pressure, gas flow rate and emulsion rate at the test separator. When optimizing production, this data can be used to find an optimal gas lift flow rate to produce a desired amount of emulsion. Using the Zedi PMOS solution, a user can easily generate a report or trend, make informed production decisions and then immediately implement them through remote control via the Zedi Access web-based HMI.

Steady-State Production

Figure 3 below was produced using Zedi Report Center in the PMOS solution. It is an example of automated of gas lift, leading to steady-state production. The graphs represent data from a gas lift well running under normal operating conditions after the optimal gas lift flow rate has been determined. The graph shows casing valve position (brown), gas lift flow rate (pink) and static pressure (blue) while the system is running in automatic mode with a flow rate set point of approximately 740 mcf/Day entered in the Zedi Access web-based HMI. The circled area on graph (1B) shows an unexpected anomaly in the production process in which there was a sudden decrease in static pressure, resulting in the reduction of gas lift flow rate. In this case, it fell to 0 mcf/Day. With the system running in automatic mode, this anomaly was immediately realized and the valve position opened to 100% to increase the gas lift flow rate in an attempt to rectify the issue. Once gas lift flow rate and static pressure began to increase, the valve position adjusted accordingly until steady-state gas lift was reached once again.

Figure 3: Automated Gas Lift



1A Steady-state gas lift
1B Unexpected anomaly in production process
1C Recovered steady-state gas lift

The advantage of this functionality is that subsequent to an unexpected event during production or during well start-up, the optimal gas lift flow rate will be reached quickly. Without automation, recovery will take significantly longer, which can lead to a loss in production. By implementing a PMOS solution with automated gas lift flow rate, the end-user will realize optimized steady-state production.

Production Monitoring and Optimization System

A look at important measurement locations on the offshore platform before and after the PMOS solution was implemented:

Before After

Figure 4: Gas Lift Well Monitoring and Control

Before After

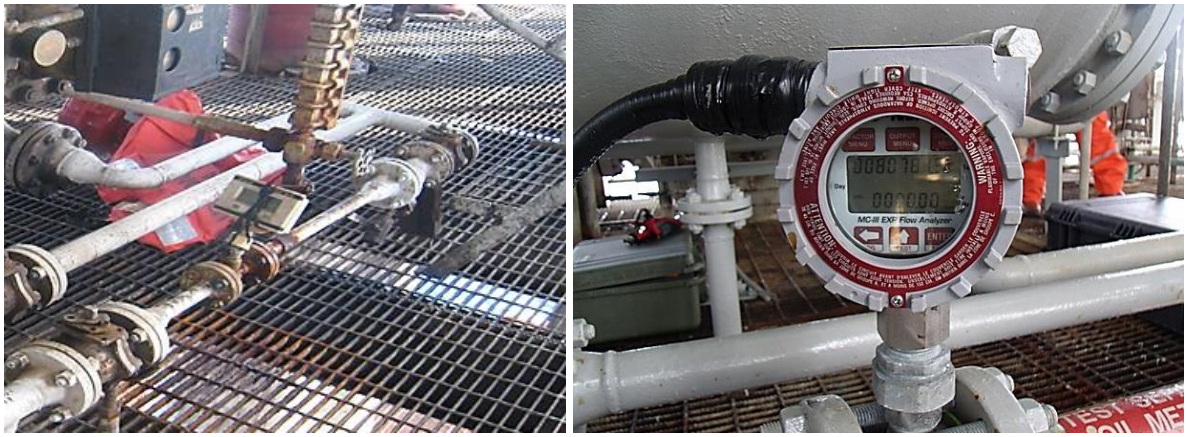


Figure 5: Production Emulsion Measurement

Before After

Figure 6: Production Gas Measurement

Results of Gas Lift Automation and Optimization

	Production Increase (bbl)
Day	694.8
Week	4863.6
Month	20,844.0
Year	**253,602.0**

* Production increase from 3 offshore platforms with 11 producing oil wells.

Summary

The implementation of the PMOS solution on an offshore platform empowered the end user to meet their production objectives. High reliability and availability of remote production data contributed to this realization. Using Zedi technology, the E&P company realized numerous technical and business benefits.

The PMOS solution allowed the producer to optimize their well testing process through remote control of gas lift and production analysis through easily accessibly reports and trends on Zedi Access. Combining this with the new skillset learned by the producer, well test results were improved through remote production optimization.

Implementing a closed-loop control system with automated gas lift, the producer gained confidence in their production processes maintaining steady-state performance. Even in the event of an unexpected anomaly such as a sudden decrease in gas lift flow rate, the system will react instantaneously and automatically adjust valve positions until steady-state production is reached once again.

This case study exemplifies how cutting-edge technology, know-how and learning a new skillset can be a lucrative investment for producers and allow for realization of production goals. The PMOS solution using Zedi Technology allowed the producer to view real-time data, optimize gas lift, increase operational efficiency, learn new skills, reduce safety risks and ultimately increase oil production on their offshore platform.