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Compressor Change Out as a Solution to Unlock Production Enhancement Opportunities and Prolong Production

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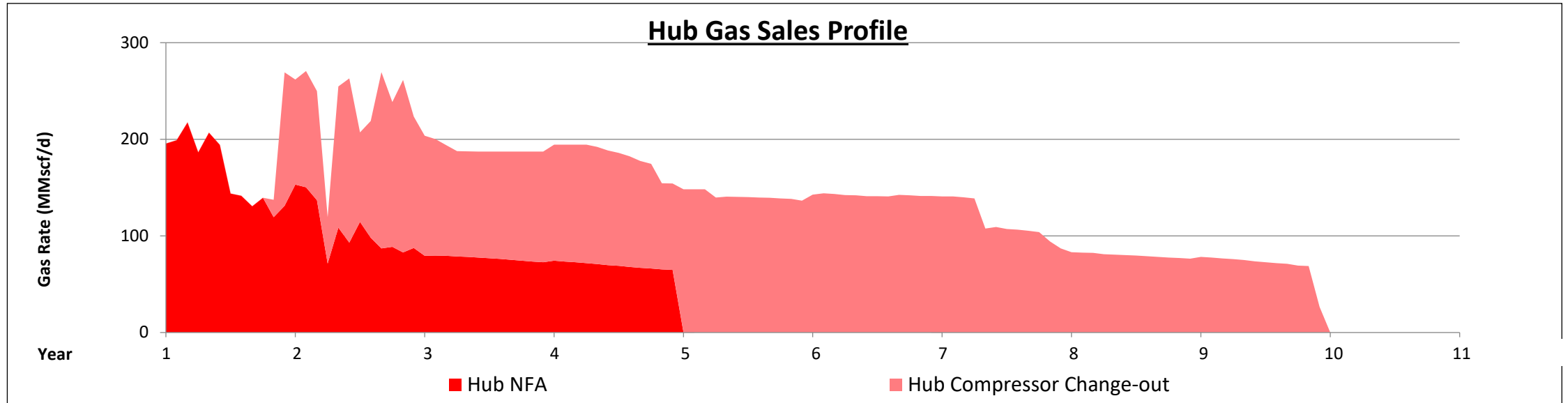
Outline

- Introduction
- Production Enhancement opportunity and realization
 - Heightened well mechanical issue
 - Idle well reactivation
 - Well liquid unloading
- Overall Compressor Change Out (CCO) stage 1 well performance
- Conclusion

Introduction

- Gas Field A (FA) , Field B (FB) and Field C (FC) are producing from carbonate reservoirs
- Hub predicted to reach Turn Down Rate (TDR) of 60MMscf/d and cease flow in five years
- To unlock additional reserves and extend field life, Compressor Change Out (CCO) was selected as a solution. CCO enable field life extension above TDR until 2030 by converting current compressor from single stage to dual stage to lower suction pressure in three stages
- During the feasibility study, two primary options were considered: a new booster compressor module and the reconfiguration of the existing compressor
- Ultimately, the decision was made to implement a CCO via a three-stage reduction in suction pressure, modifying the existing compressor system from single stage to dual stage.
- Compressor re-wheeling was ruled out due to the multiple mechanical risks identified during the risk assessment, rendering it an impractical solution

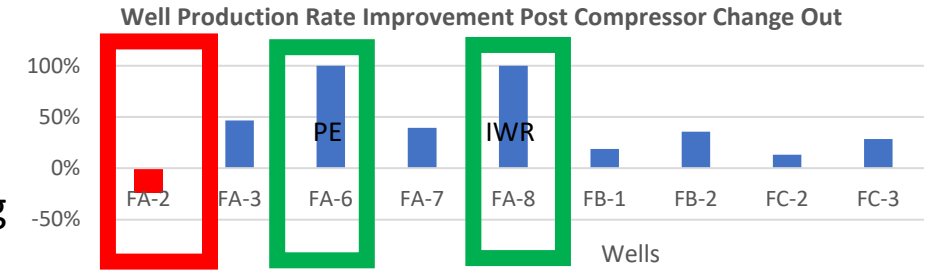
Simulation Result



- Integrated Network Model was used to simulate the lowered suction pressure.
- Calibration includes utilizing Pressure Build Up (PBU) surveys, Static Gradient Surveys (SGS) and Wet Gas Meters (WGM) readings.
- This resulted in +/- 3 MMboe between Forecasted and actual production.
- **To monitor CCO and take the opportunity to further optimize and maximize hub production focusing on Field A**
 - 3 notable events:
 - ❖ Heightened well mechanical issue
 - ❖ Idle Well Reactivation
 - ❖ Well Liquid Unloading

Heightened Mechanical Issue: Zooming into Well FA-2

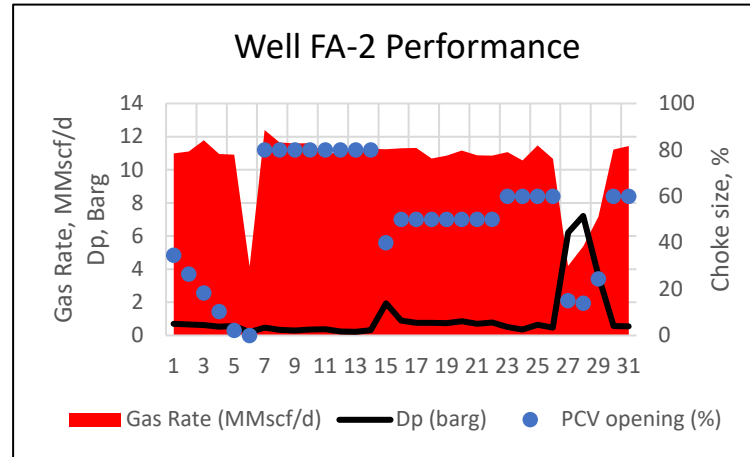
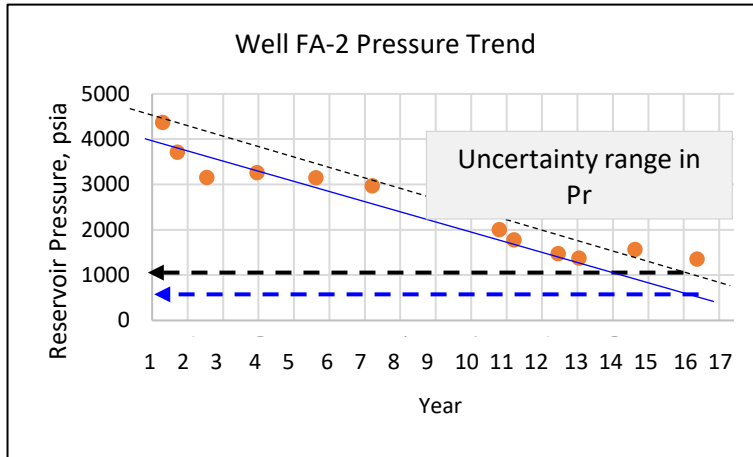
- Well FA-2 had no gain post CCO stage 1. In fact, it was rapidly declining
- Suspected Issue:



(1) Depleted Reservoir

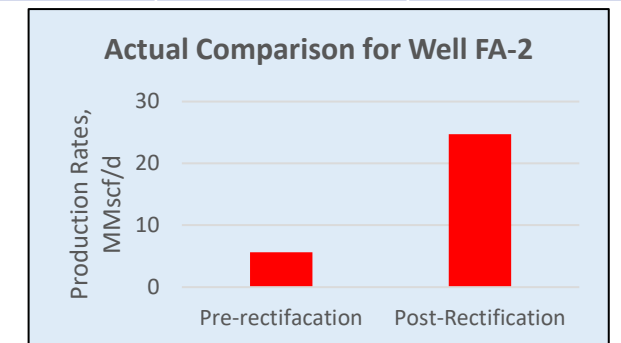
(2) Faulty PCV

(3) Interference with neighboring wells

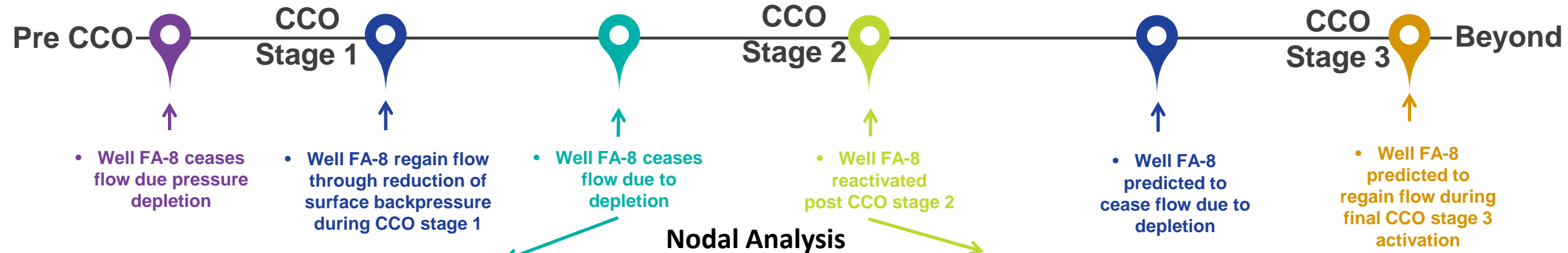


Zone	Well	Gas Rate, MMscf/d
Lower Reservoir	FA-6	36
	FA-7	36
	FA-2	8

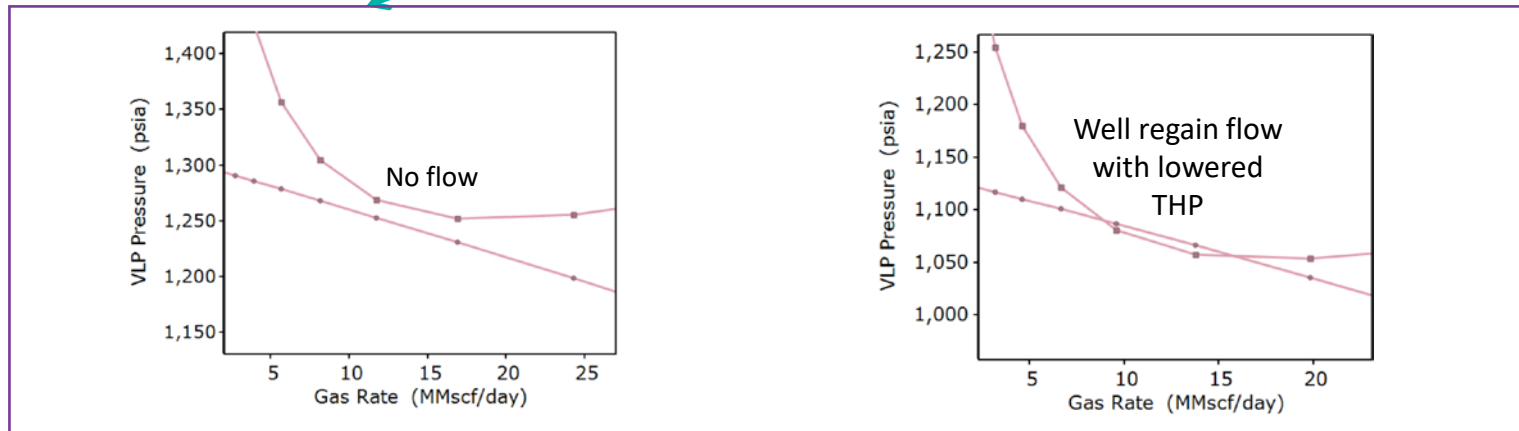
- Way forward: To conduct well intervention and SGS.
- Result: Tubing Retrievable Safety Valve (TRSV) flapper was discovered to be partially opened and well was restored to Technical Potential (TP)



Idle Well Reactivation: Well FA-8 Journey through CCO



Nodal Analysis

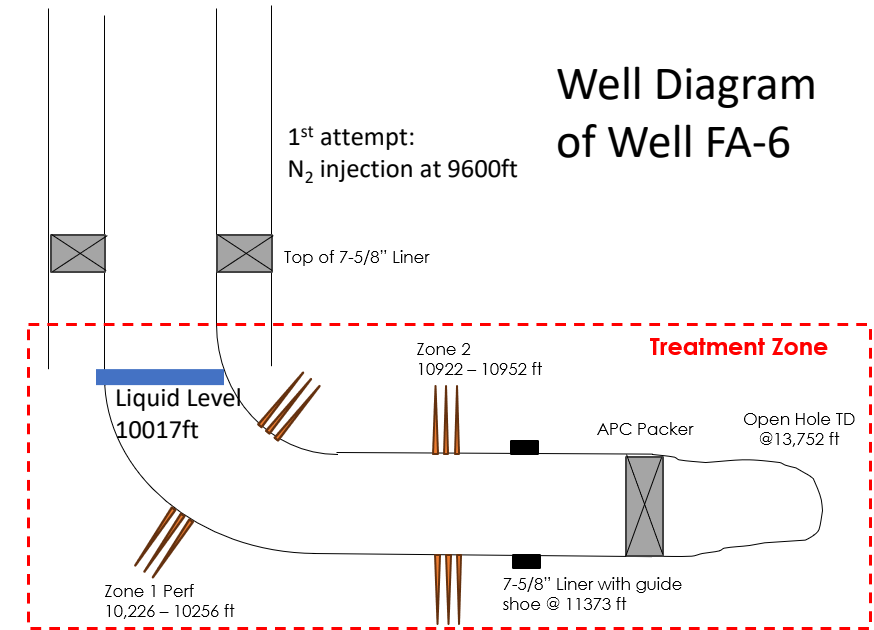


CCO Stages	Suction Pressure, Barg
Stage 1	36
Stage 2	28
Stage 3	20

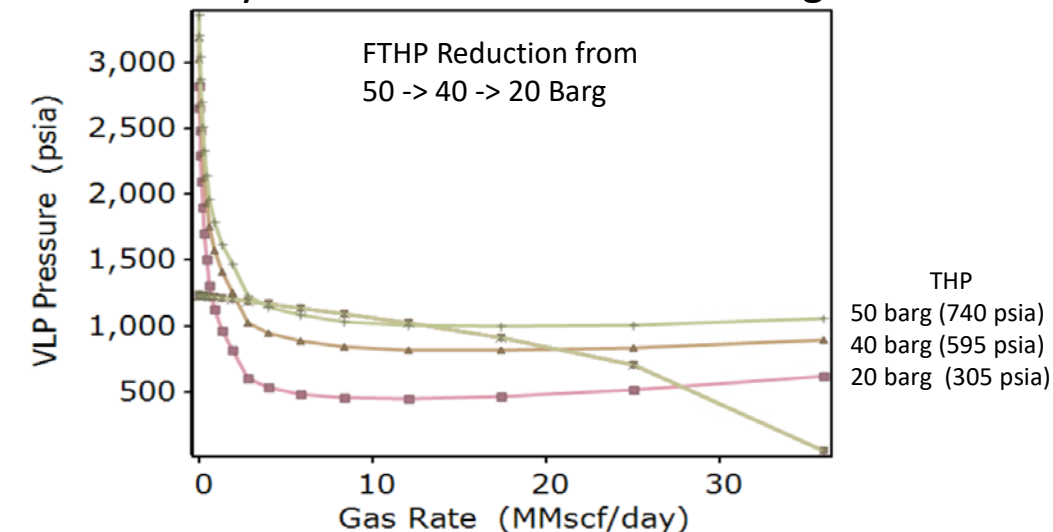
Good understanding of the reservoir and well enables predictable behavior

Liquid Unloading: Utilizing CCO as an Avenue for Well FA-6

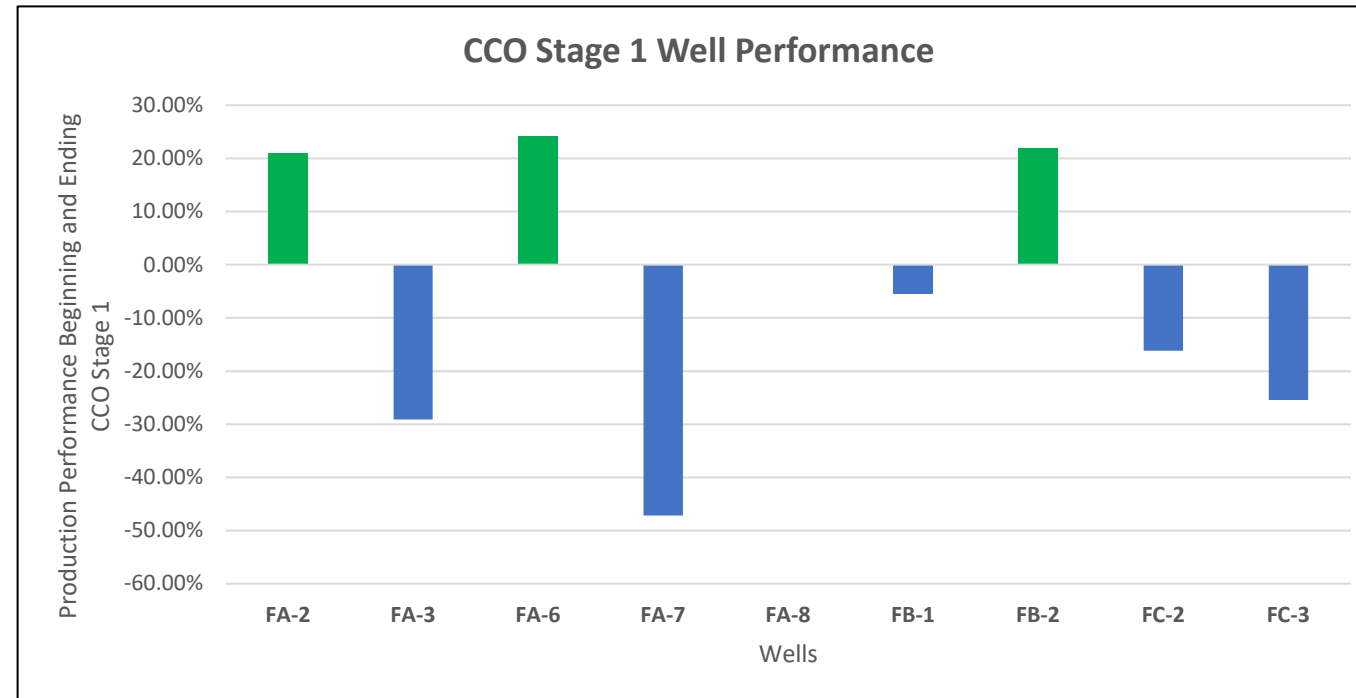
- Matrix acid stimulation was conducted in Well FA-6 three months prior to CCO.
- Analysis supported natural unloading with CCO stage 1 suction pressure.
- Actual execution with successful liquid unloading by further utilizing Production Test Rate (PTR) during CCO stage 1 start up
- Results: Well FA-6 production was improved and restored



Nodal Analysis of Well FA-6 for unloading conditions



Overall CCO Stage 1 Well Performance



- Field A: Well FA-3 and Well FA-7 are ranked for production reduction to cater during any curtailments
- Field B is prioritized for maximum production optimization
- Field C causes high back pressure to Field A and Field B

Conclusion

- Hub production field life extended for another five years due to CCO project
- The project generated Net Present Value (NPV) worth four times of the capital cost spent for the CCO in the period of one year.
- 60% Reserves additional was realized than planned.
- Additional two years of hub production as a result of production enhancement enabled through CCO.