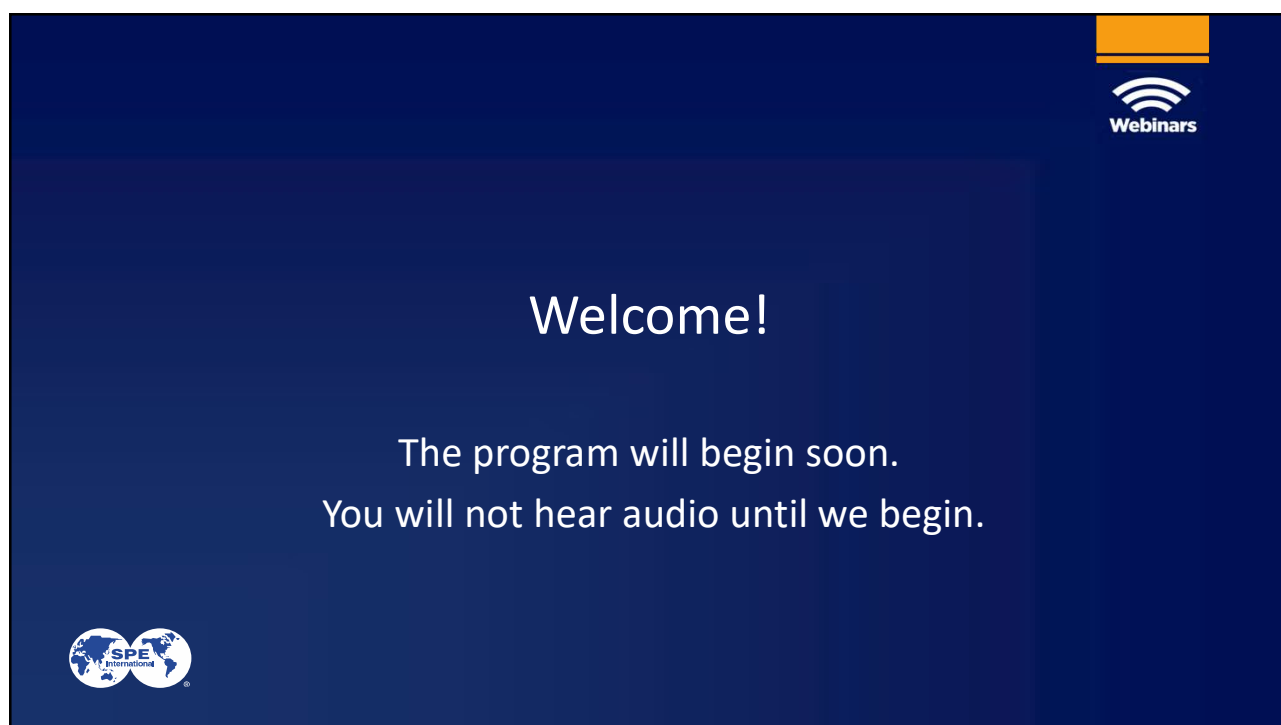




A dark blue rectangular slide with a white Wi-Fi symbol and the word "Webinars" in the top right corner. In the center, the word "Welcome!" is written in large white font, followed by two lines of smaller white text: "The program will begin soon." and "You will not hear audio until we begin." In the bottom left corner, there is a logo for SPE International, which consists of two white globes with the letters "SPE" and the word "International" between them.

Webinars

Welcome!

The program will begin soon.
You will not hear audio until we begin.

 SPE International



Data Driven Gas Lift Optimization

Agustin Gambaretto - Production Operations Engineer
May 19th, 2023





Agenda



- **Gas Lift Challenges**
- **Data Driven GLO Approach**
- **Study Case**



Gas Lift Challenges



Field resources & time

- Hands on process
- Reduced operation efficiency



Well performance

- Changing well conditions
- Outdated physics model
- Slugging behavior



Manual Operation

- Basic optimization process
- Personnel intensive



Missed Production Opportunities

- Complex data analysis
- Off-radar underperforming wells
- Short term fixes

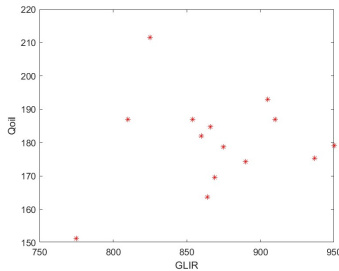




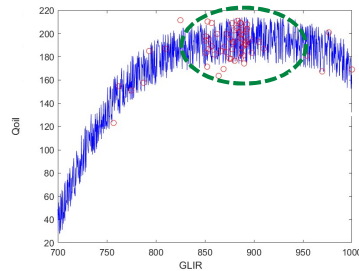
Gas Lift Optimization Challenge



**GL vs Qoil
Distribution**



**Underlying Well
Behavior**



How do you ensure
your well is in the best
operating envelope?



DDGLO Process – Startup

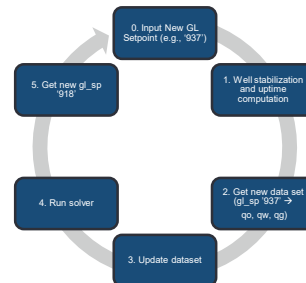


Method 1: Initial Dataset Generation

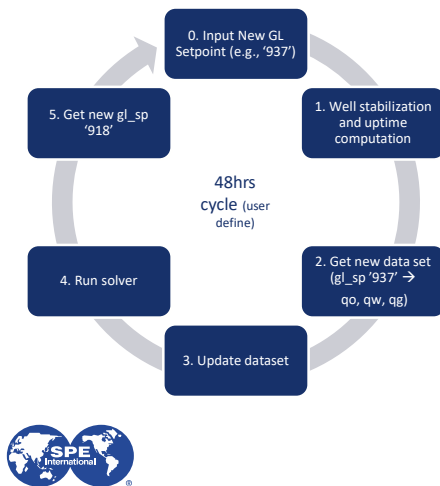
1. Define data retention size
2. Input well/group level constraints
3. Autonomous data generation process

Method 2: Gas Lift Optimization

1. Single Well
2. Multi-Well
3. Dual String

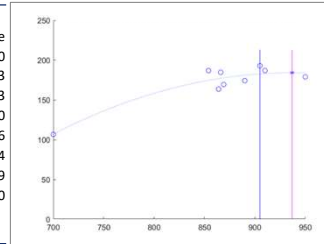


DDGLO Process – Optimization



Dataset

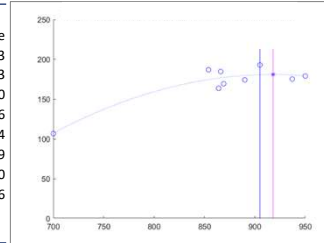
GL Setpoint	Oil Rate
910	187.00
854	186.93
905	193.03
890	174.30
864	163.66
869	169.54
866	184.79
950	179.10



Output → 937

Dataset

GL Setpoint	Oil Rate
854	186.93
905	193.03
890	174.30
864	163.66
869	169.54
866	184.79
950	179.10
937	175.26



Output → 918

DDGLO Main Inputs and Constraints



Well Level Constraints:

- Min GL
- Max GL
- Liquid production
- Oil production
- Water production
- Gas production

Group Level Constraints:

- Total available Gas Lift
- Total Liquid Production
- Total Oil Production
- Total Water Production
- Total Gas Production

Optimization Inputs:

- Price of Oil
- Price of Gas
- Cost of Processing Water
- Cost of Processing Gas





Features

Single Well
Dual String
Multi-well

Constraint and
unconstrained
conditions

Closed-loop and
autonomous
optimization

Data driven

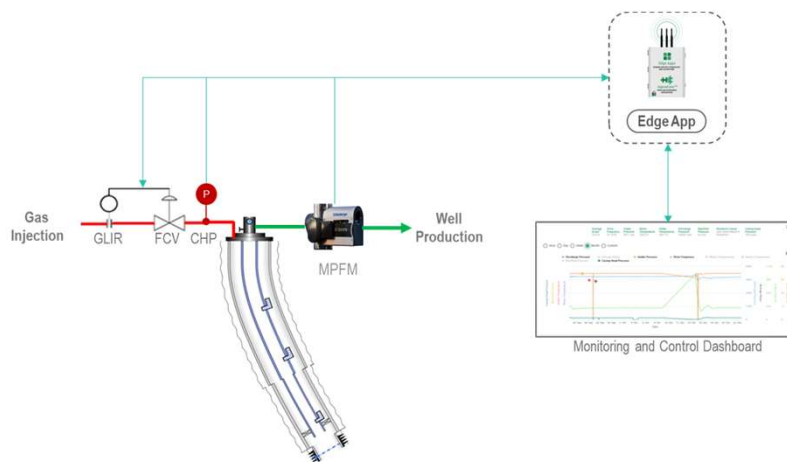
Immediate
identification of
underperforming wells

Adjust to well
changing conditions

Safe Operation



Field Equipment Setup



Hardware

- Gateway
- GLIR
- GL FCV
 - ✓ w/Remote Control
 - ✓ w/PID GLIR control close loop
- Multi-Phase Flow Meter (MPFM)



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PERMIAN BASIN – CASE STUDY



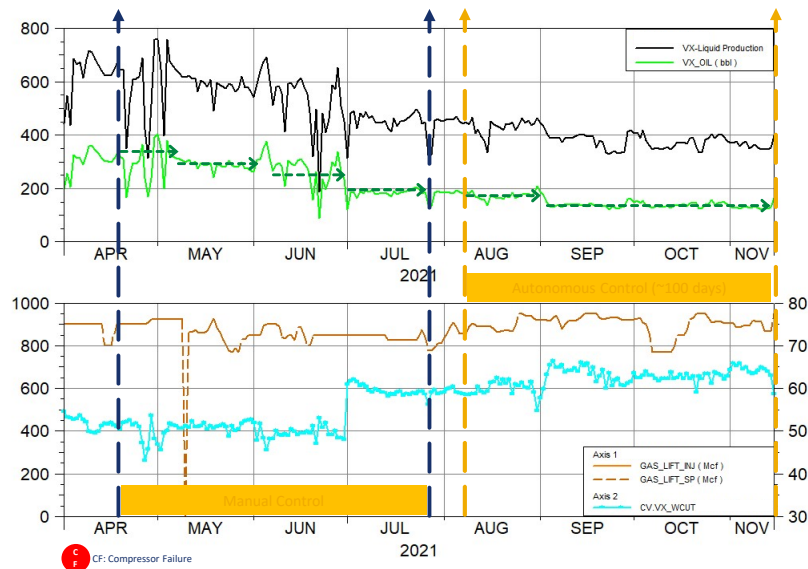
Case-1: Single Well



- **Single Well Optimization: Well A**
- **Main Highlights:**
 - ✓ Fully autonomous workflow execution
 - ✓ Production maintenance inline with natural well declination
 - ✓ Good performance under changing conditions



GLO Well A



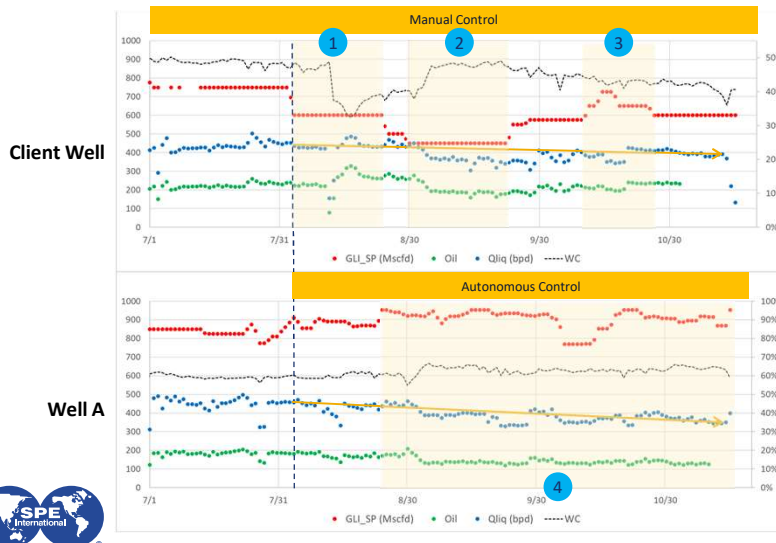
	MANUAL	AUTO
Well		
VX-Coil (bbbl/d)	259.75	146.59
VX-Qliq (bbbl/d)	542.31	388.97
VX-Wcut (%)	52.47	62.39
VX-GLIR (Mscf/d)	862.08	897.53
# days	99	101
GUF (bbbl/MMscf)	301.30	163.33

Comments:

- Fully autonomous GLIR setpoint
- Production consistent with the natural well declination
- Maintained stable production during the last 3 months
- Main production losses associated with big changes in water-cut
- Overall higher injection rates due to higher water-cut

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Missed Optimization Opportunities: Water-cut change



Comments:

- **Client Well**
 - 2 periods showing changes in water-cut, but no changes in GLIR
 - GLIR setpoint unchanged for 2/3wks
 - Well performance improved after GLIR increased
 - Manual changes increased demanding more attention from field personnel
- **Well A**
 - Increment in water-cut in similar period (early November)
 - Higher GLIR able to support better production drop
 - No manual intervention



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Case-2: Multi-Well



- **Multi-Well Optimization:**

- ✓ Well B
- ✓ Well C
- ✓ Well D

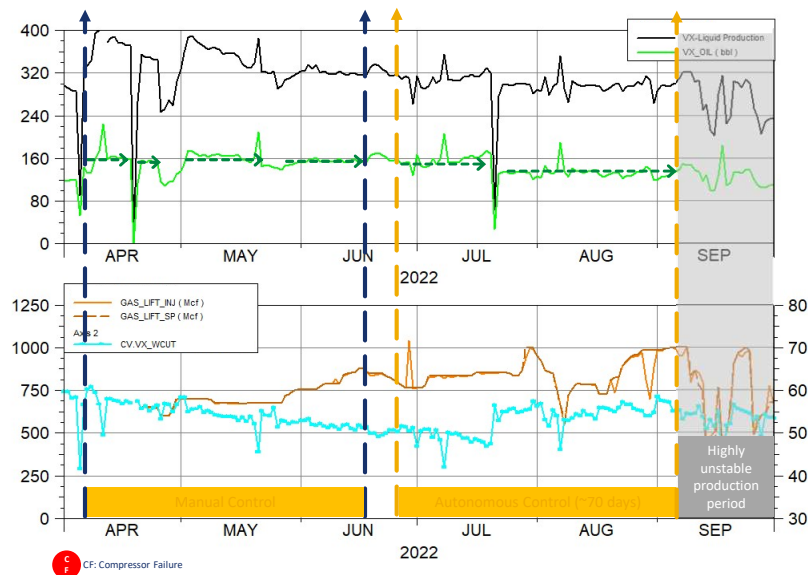
- **Main Highlights :**

- ✓ Fully autonomous workflow execution
- ✓ Production maintenance inline with natural well declination
- ✓ Step-change for underperforming wells



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GLO Well B

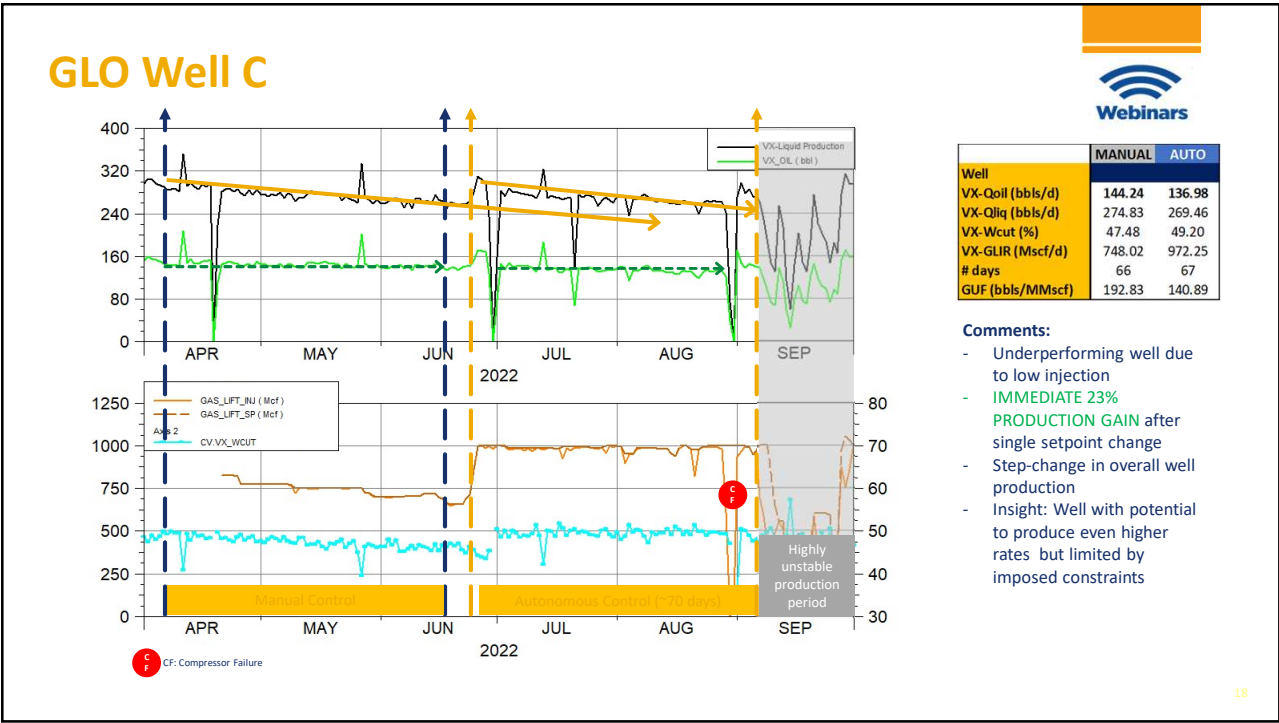


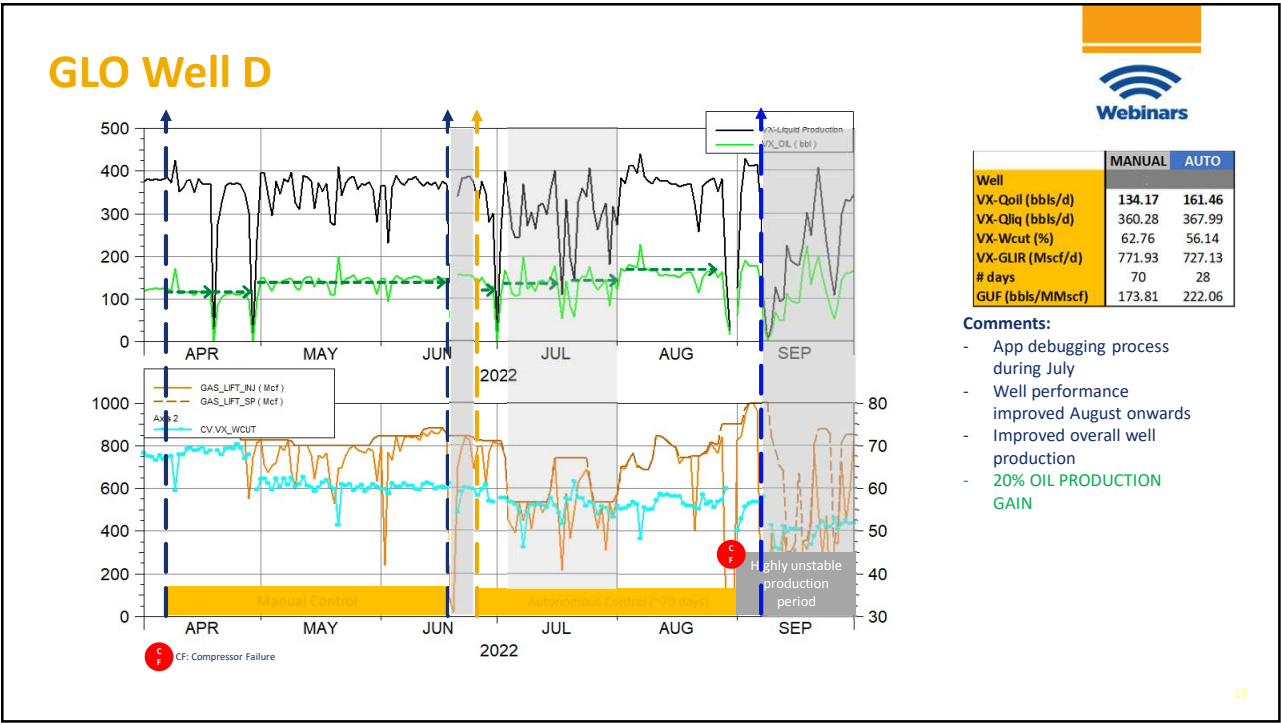
	MANUAL	AUTO
Well		
VX-Qoil (bbbl/d)	152.96	140.30
VX-Qliq (bbbl/d)	335.33	299.31
VX-Wcut (%)	54.30	53.19
VX-GLIR (Mscf/d)	724.33	845.55
# days	72	70
GUF (bbbl/MMscf)	211.17	165.93

Comments:

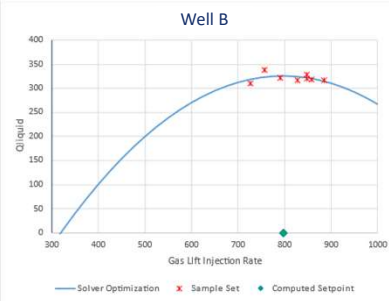
- Production consistent with the natural well declination
- Maintained stable production during the last 2 months
- Increased injection rates due to higher water-cut

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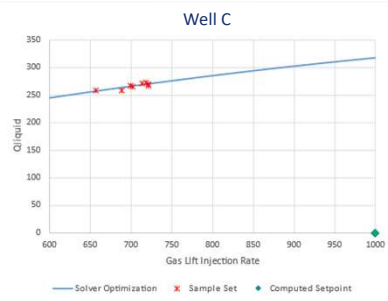


Immediate Identification of Underperforming Wells (1/2)



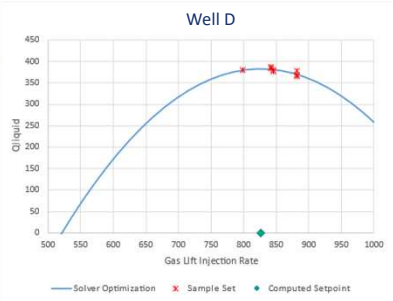
COMPUTED SETPOINT: 797MSCFD

OUTPUT TYPE: OPTIMIZATION



COMPUTED SETPOINT: 1000MSCFD

OUTPUT TYPE: OPTIMIZATION

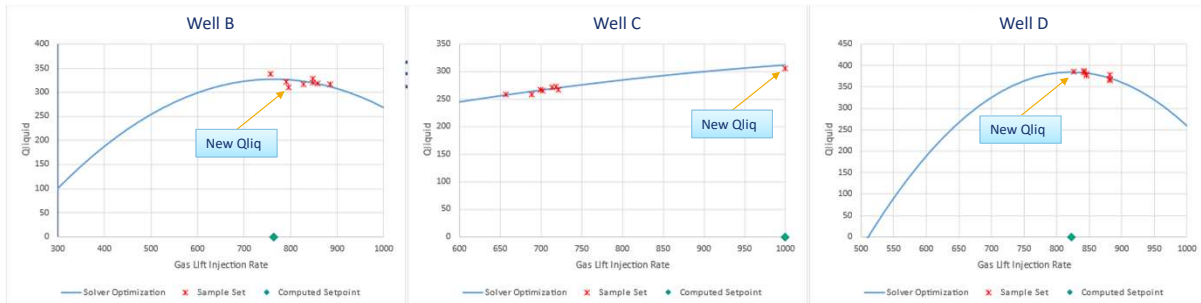


COMPUTED SETPOINT: 826MSCFD

OUTPUT TYPE: OPTIMIZATION



Immediate Identification of Underperforming Wells (2/2)



COMPUTED SETPOINT: 764MscfD

OUTPUT TYPE: OPTIMIZATION

COMPUTED SETPOINT: 1000MscfD

OUTPUT TYPE: RESAMPLE UPPER LIM.

COMPUTED SETPOINT: 826MscfD

OUTPUT TYPE: OPTIMIZATION

**23%
Incremental Oil
Production**



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Case Study: Deployment Results

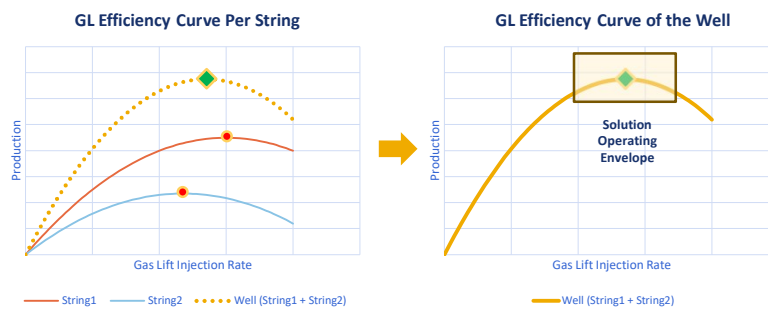


- **Proved fully autonomous execution on 8 wells**
- **3 wells with performance step-change → Avg impact of 18%**
 - ✓ Well C
 - ✓ Well D
 - ✓ Well G
- **5 well production maintained in autonomous mode**
- **Improved 4X Monthly GLI Setpoint changes**
 - Weekly vs bi-daily optimization
 - Adapting to new well conditions
 - Reduce Field Tech time to supervise wells performance
 - Allow Field Tech to focus on critical wells



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Dual String Wells DDGLO solution



- Single input – GLIR
- Single output – Total Well Production
- Maximize Total Well Oil Production

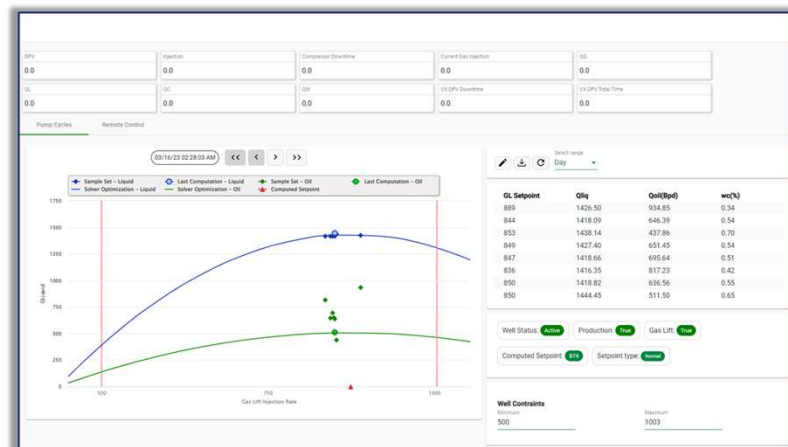


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DD GLO Dashboard and Features



- Performance Tracking
- App configuration
- Field optimization on-demand for constraint conditions
- Insights



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Field resources & time

- Hands on process
- Reduced operation efficiency



Well performance

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- Slugging behavior



Manual Operation

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- Personnel intensive



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- Complex data analysis
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Adjust to well
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- LinkedIn: <https://www.linkedin.com/in/agustin-gambaretto/>

