



A digital transformation journey for a mature field using production technologies and innovation principles

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The world is changing



1920



1970



2010



Now



\$1M* Cost Saving

in Nigeria via IoT sensors & connectivity



equinor

6%* Production Increase

in US via Ambyint's AI-powered artificial lift solution



Excellence in Execution

Adapting to Oil and Gas Industry

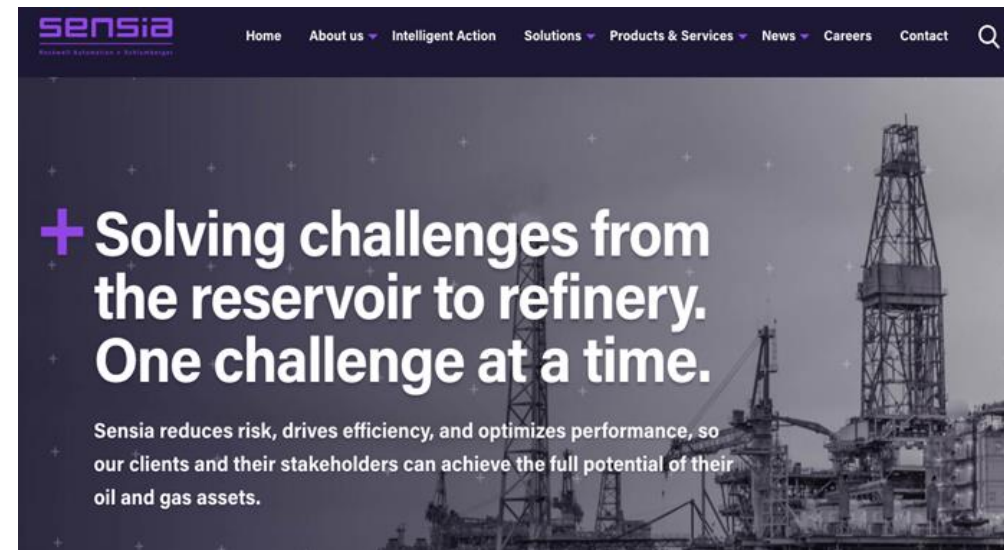
Agora

- Startup created and incubated by Schlumberger
- Think big, prototype small, and scale fast
- IIoT platform—edge computing with ML/AI



Sensia

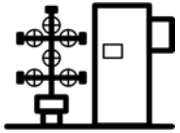
- JV between Schlumberger and Rockwell
- Process automation + Petrotechnical Expertise
- 1,000+ experts serving customers globally



Problem Definition

Challenge

Mixed equipment and Opex concerns



400+ Assets
(ESP, Meters, SRP etc...)



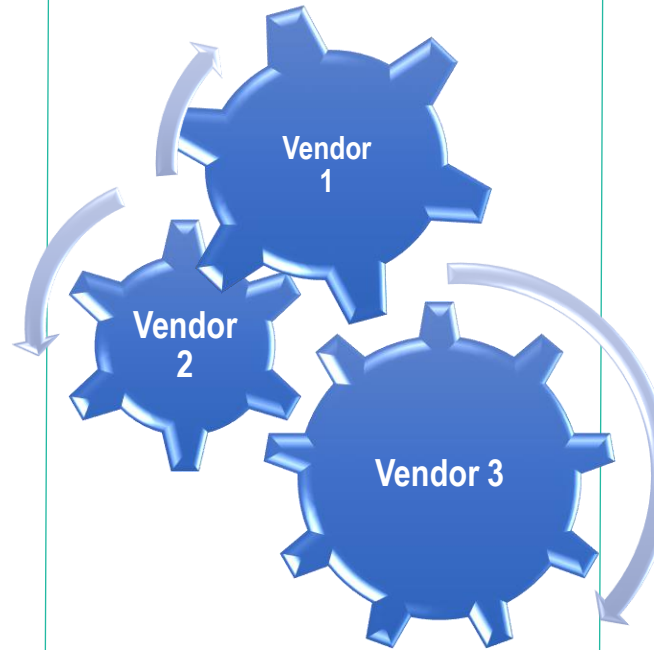
5,000+ Field Visit/Quarter



~72,000 km Driven/Quarter

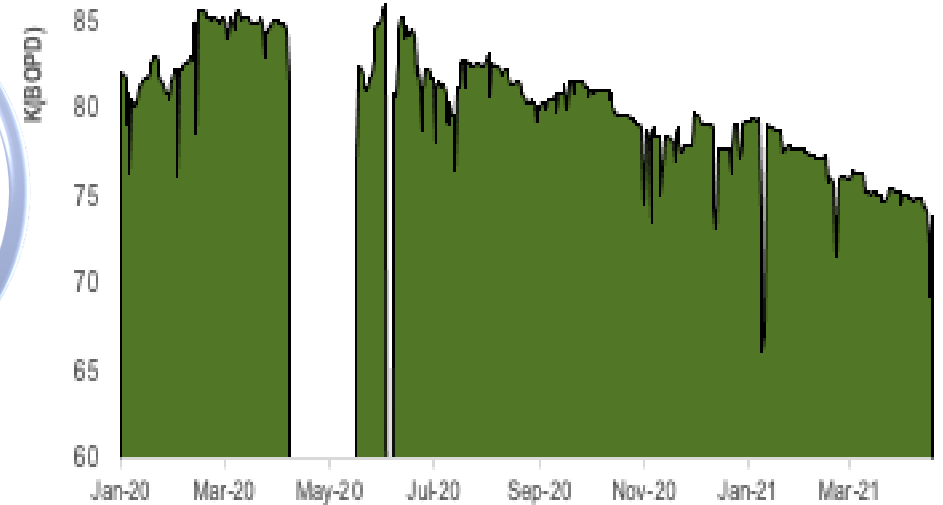
Vendors

Lack of integration



Operator

Declining production and increasing costs



Manage production decline (29%)

Proposed Solution



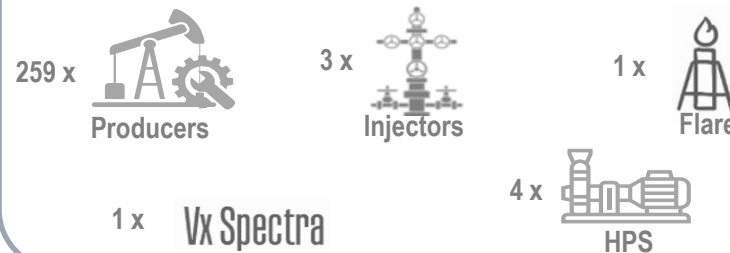
3. Production Workflow Orchestrator

Digital Production Approach



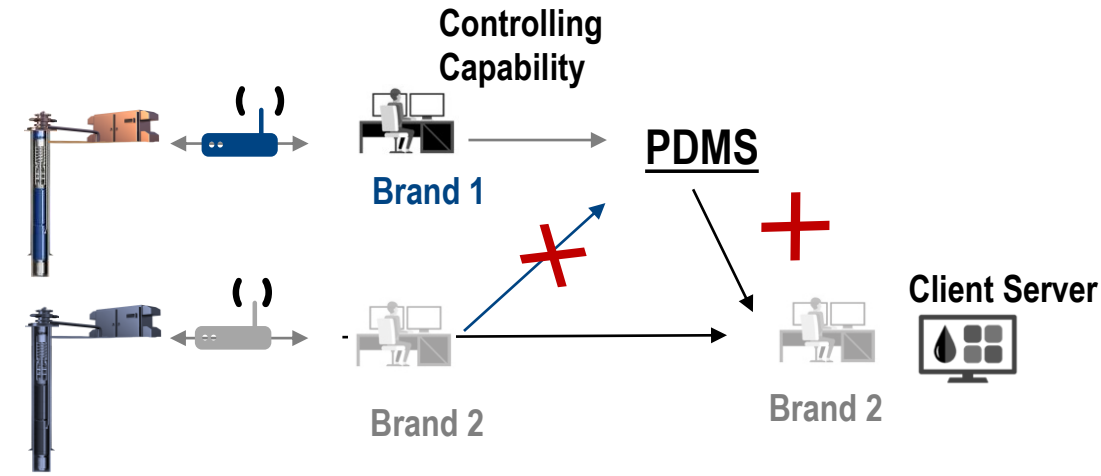
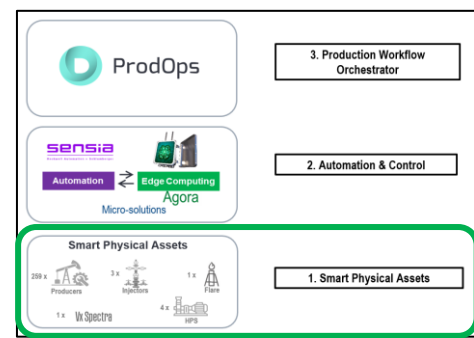
2. Automation & Control

Smart Physical Assets

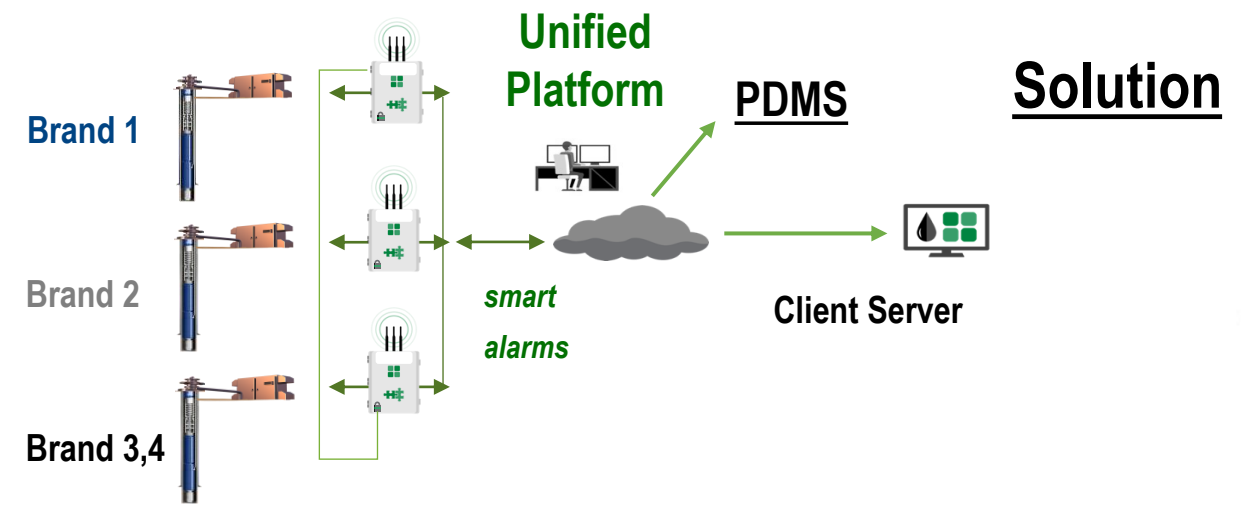


1. Smart Physical Assets

The Compelling Event - The ESP Surveillance



Problem



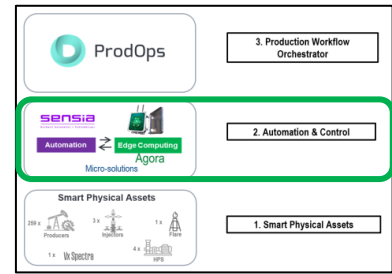
Solution

Reduce downtime and improve people efficiency

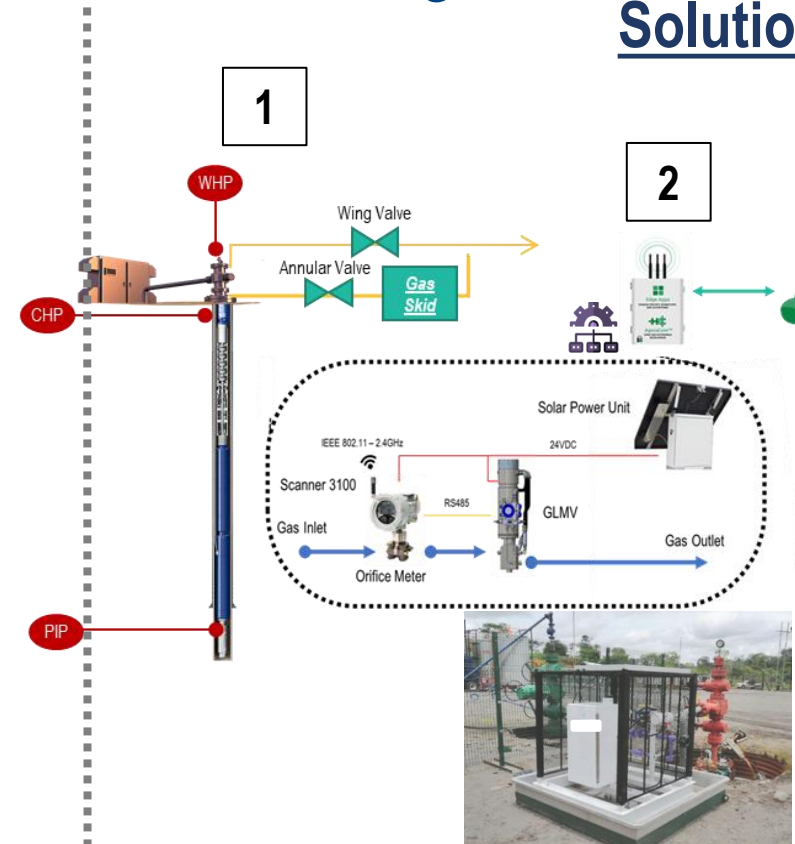
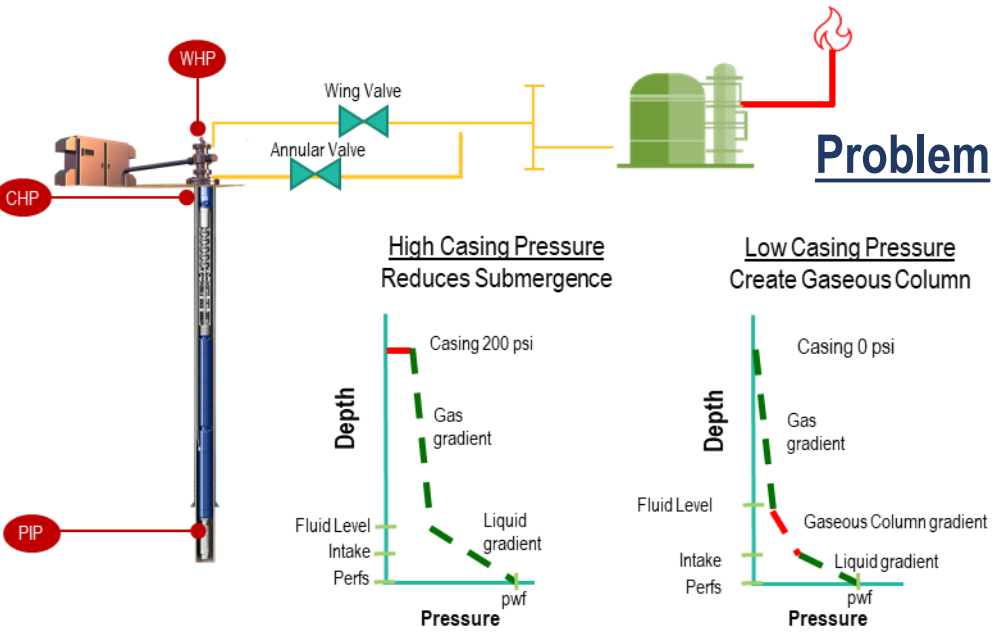
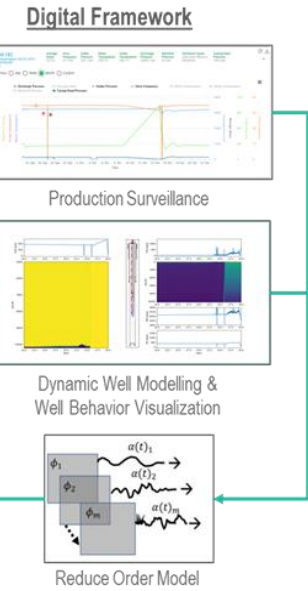
- Contextualized data aggregation, transmission, and visualization for multiple vendors
- Early Events Detection (Change manual process)
- Provide edge AI at the well site with smart alarms
- Decrease field visits for operations support
- Reduce kilometers and CO₂ emissions



Moving to the next Level - Annular Gas Handling



Solution



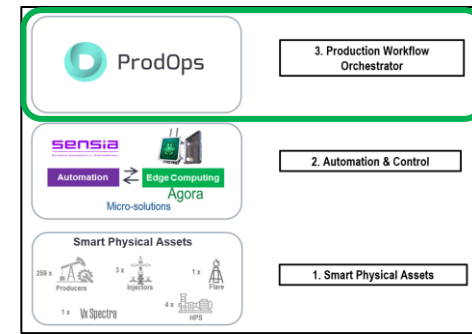
Previous Operation

- Manual bleed off annulus
- ~100 trips/month/well to optimize production
- High PIP fluctuation – ESP performance
- Non-optimized wells

Current Operation

- Production Optimization
- ESP Power Consumption Reduction
- Reduce driving to location (connected, no valve manipulation)

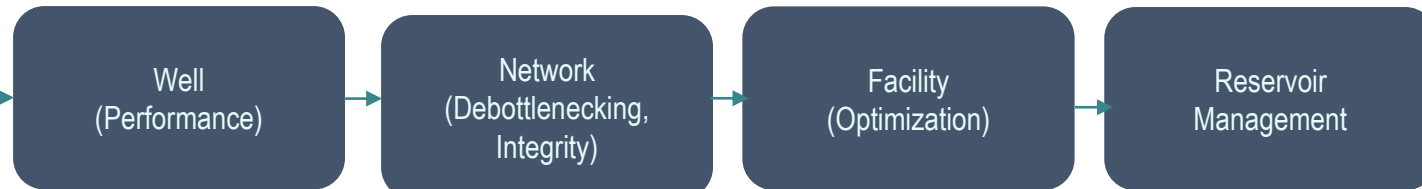
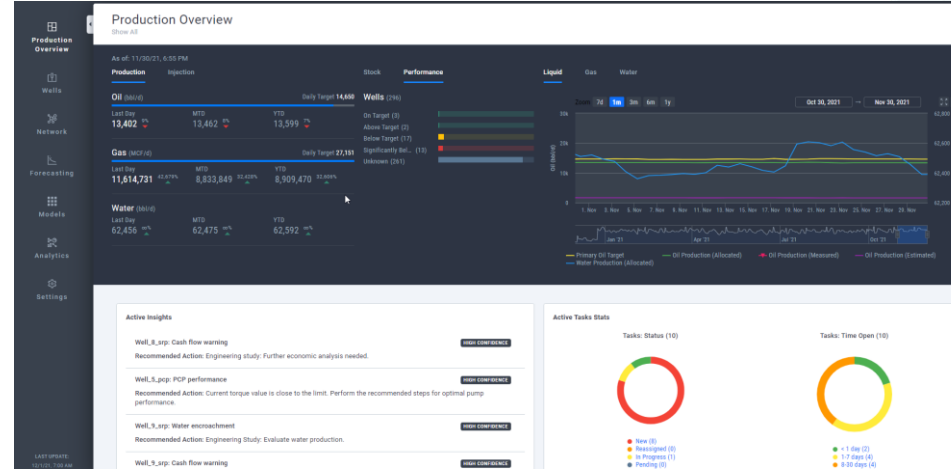
Production Workflows Orchestrator



- ✓ Concept Selection
- ✓ Design
- ✓ Define Plan
- ✓ Deploy
- ✓ Well Construction

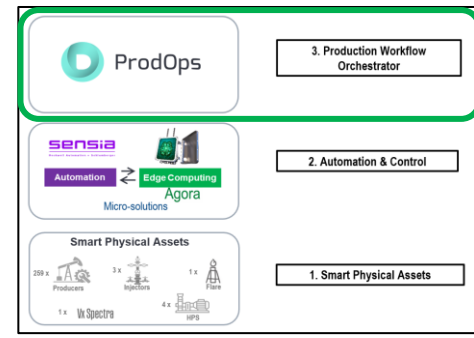


- ✓ Surveillance
- ✓ Analysis
- ✓ Diagnostics
- ✓ Optimization
- ✓ Decisions



Excellence in Execution

Production Workflows Orchestrator



1 Operational Data

Well_1_esp
Oil / ESP / Instrumented

Overview Surveillance

Parameter	Current	10/31/2021	09/30/2021	08/31/2021	07/31/2021	06/30/2021	05/31/2021	04/30/2021	03/31/2021	02/28/2021	01/31/2021
Well Type	Producer	Producer	Producer	Producer	Producer	Producer	Producer	Producer	Producer	Producer	Producer
Well Artificial Lift Type	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP	ESP
Well Test Duration (h)	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Choke Size (in)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Oil Production Rate (stb/d)	424.83 (A)	484.11	499.30	496.69	518.89	531.20	542.38	554.63	568.25	575.19	587.2
Gas Production Rate (Mcf/d)	127.90 (A)	142.43	146.44	146.90	152.16	155.21	158.57	161.59	165.36	167.56	171.1
Associated Water Production Rate (stb/d)	44.79 (A)	61.71	67.70	66.64	76.01	81.99	86.90	93.02	100.19	103.97	110.0
Liquid Production Rate (stb/d)	469.59 (A)	545.81	567.00	563.33	594.91	612.79	629.28	647.64	668.44	679.11	698.2
Bottom Hole Pressure (psig)	1,846.92	1,819.86	1,816.61	1,829.35	1,818.36	1,814.03	1,816.14	1,812.01	1,811.52	1,814.10	1,815.7
Well Head Pressure (psig)	346.97	345.30	345.30	345.30	345.30	345.30	345.30	345.30	345.30	345.30	345.3
Bottom Hole Temperature (°F)	-	-	-	-	-	-	-	-	-	-	-
Well Head Temperature (°F)	83.95	87.56	89.31	89.08	91.50	92.68	94.16	95.56	97.15	97.98	99.4
Casing Head Pressure (psig)	-	-	-	-	-	-	-	-	-	-	-
Gas-oil Ratio (scf/stb)	-	294.21	293.29	295.75	293.23	292.18	292.36	291.34	290.99	291.34	291.4
Gas-Density Ratio (lbm/scf)	77.51	-	-	-	-	-	-	-	-	-	-

3 Software Integration

Active Model

Well_1_esp
Valid From: 10/31/21, 8:01 PM
Last Well Test: 10/31/21, 1:30 PM

[Open](#) [Calibrate](#)

▼ Status: Calibration succeeded
by System Auto-Calibration at 10/31/21, 8:00 PM

Model updated 11/01/2021 based on most recent welltest recorded 10/31/2021. Calibration succeeded, score is 77 (fair). QL measured = 545.82 STB/d, matched = 544.17 STB/d (0.30% difference). PI decreased from 1.2307 to 1.1831 STB/(d.psi). ESP PIP measured = 1558.43 psia, matched = 1558.79 psia. ESP Head factor unchanged from 1.0538. WHT measured = 87.6600 F, matched = 88.5860 F. U multiplier unchanged from 0.9844. WARNING: matched head factor is greater than 1.0

4 Machine Learning Algorithms

Active Insights

Wax deposition risk
HIGH CONFIDENCE

ESP performance
HIGH CONFIDENCE

Recommended Action
Potential Downtrust condition-detected, perform the recommended steps for optimal pump performance:

- Check actual threshold settings. (For example, Low pump intake pressure/ High motor temperature/ High intake temperature)
- Check the tubing head pressure. If the pressure is higher than the normal value, increase the choke opening. This action moves the operating point to the right. Do not exceed the low intake pressure threshold.
- Update the well test and the liquid level measurement and run a model match to validate pump submergence, pump efficiency, and tubing head pressure variation impact.
- If the motor load does not exceed the limit, conduct a RETAP on the well.

ESP performance compares pump current operating point to the ESP Base (Efficiency line, Min Flowrate (downtrust), and Max Flowrate (uptrust)). The alert is triggered when the operating point deviates from BEP beyond a user-set threshold, and when it violates Min or Max Flowrate pump limits.

5 Model Analysis Results

Nodal Analysis Plot
Last Well Test: 10/31/21, 1:30 PM
Conditions Today: 11/25/21, 7:00 AM
Current: 11/25/21, 8:00 PM

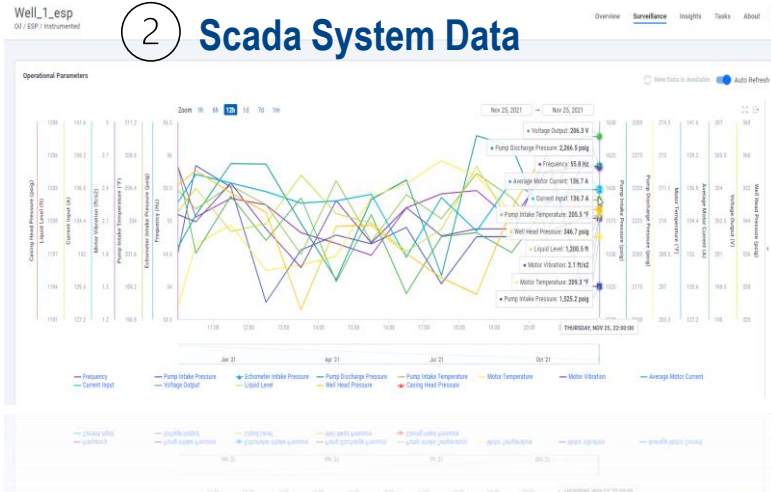
ESP Variable Speed Curve At Flowing Condition
Conditions Today: 11/25/21, 7:00 AM
Current: 11/25/21, 8:00 PM

ESP Performance Curve At Flowing Condition
Conditions Today: 11/25/21, 7:00 AM
Current: 11/25/21, 8:00 PM

ESP Performance Details

ESP Performance Details

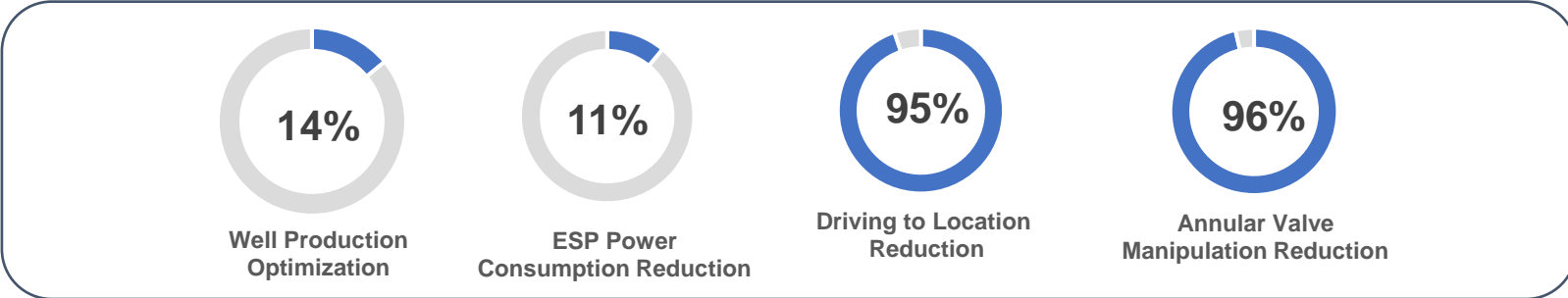
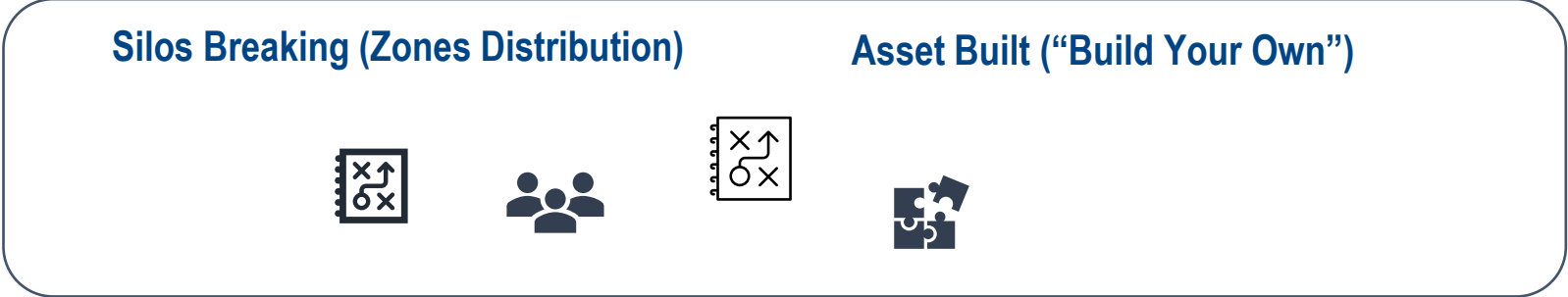
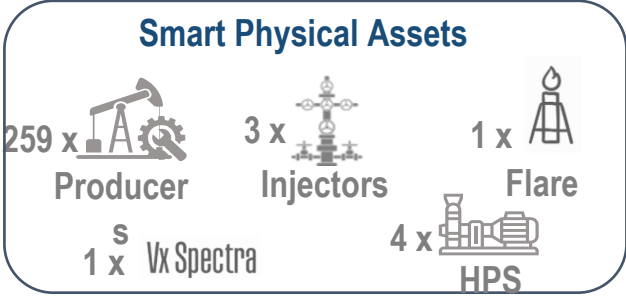
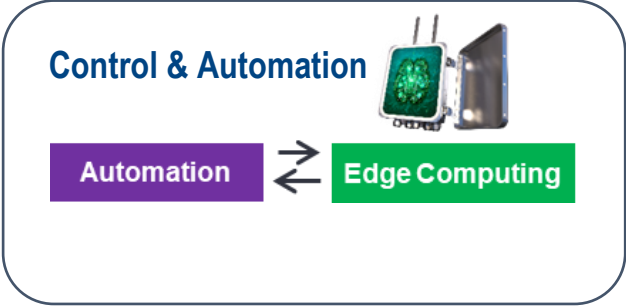
2 Scada System Data



Excellence in Execution

Created Value

Production Workflow Orchestrator



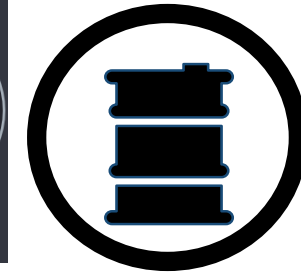
Conclusions



1. Remote centers expansion



2. Reduce operational costs



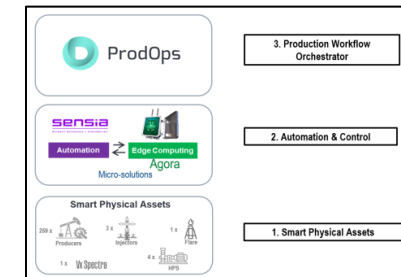
3. ML and AI unlock production



4. Personnel Exposure



5. Environmental Commitment



6. Digital Production Approach



Acknowledgments



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Gian-Marcio Gey
Agora S&C
Manager



Julia Carrera
ECP Agora Operations
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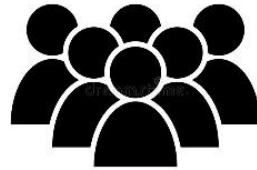
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