Automating Gas-Lift Injection Rates

Darren Doige

Oil and Gas,

Industry Solutions

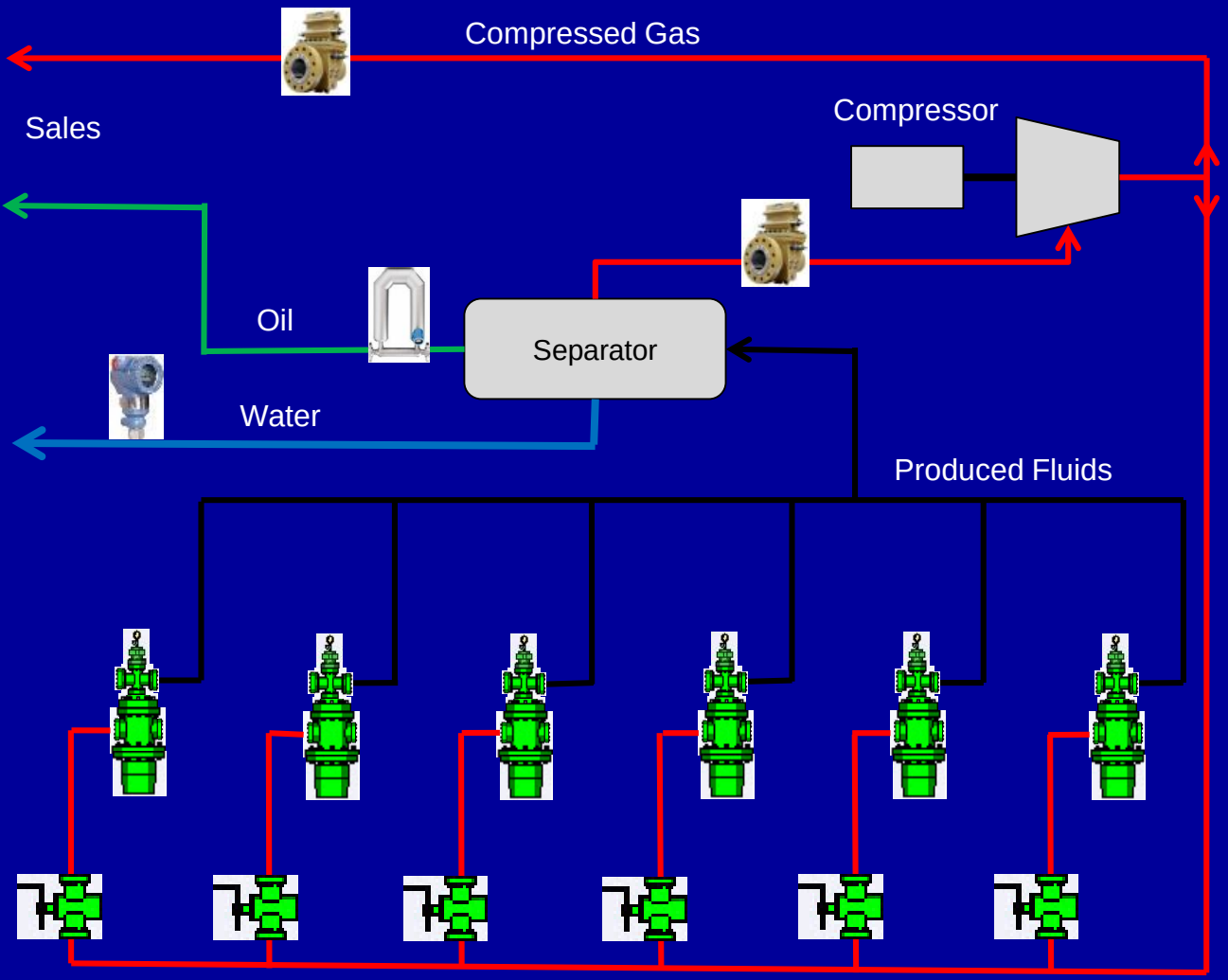
EMERSON™

Agenda

- Traditional Method of Optimization
- Gas Lift Challenges
- Single Well Optimization
- Constraints & Disruptions
- Multi Well Optimization
- Dynamic Lift Optimizer
- Case Study / Typical Business Results
- Conclusion

Traditional Solution

- Manual operations
- Lack of insight into well production
- Optimization is trial and error
- Difficult to respond to changes
- Slow, open loop
- Operating in a dynamic environment



Challenges with Manual Operations

Inability to make real-time **adjustments** to gas lift rates in response to well variability

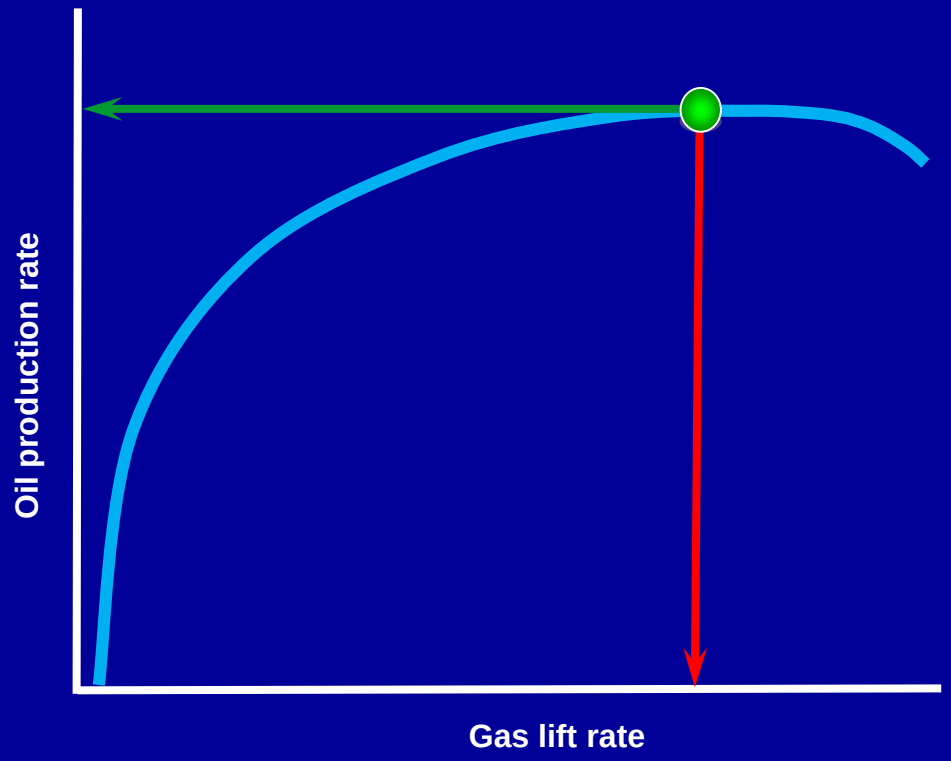
Inability to effectively **distribute** lift gas to the most profitable wells

Inability to meet my **production** targets

“I’m not maximizing production with the most economical use of my lift resources”

Optimize Single Well

- Oil production is a non-linear function of gas rate.
- At low rates, oil production increases with gas lift rate.
- At high rates, oil production decreases because of the increase of back pressure in the flow system.
- Determine gas rate required to maximize production.



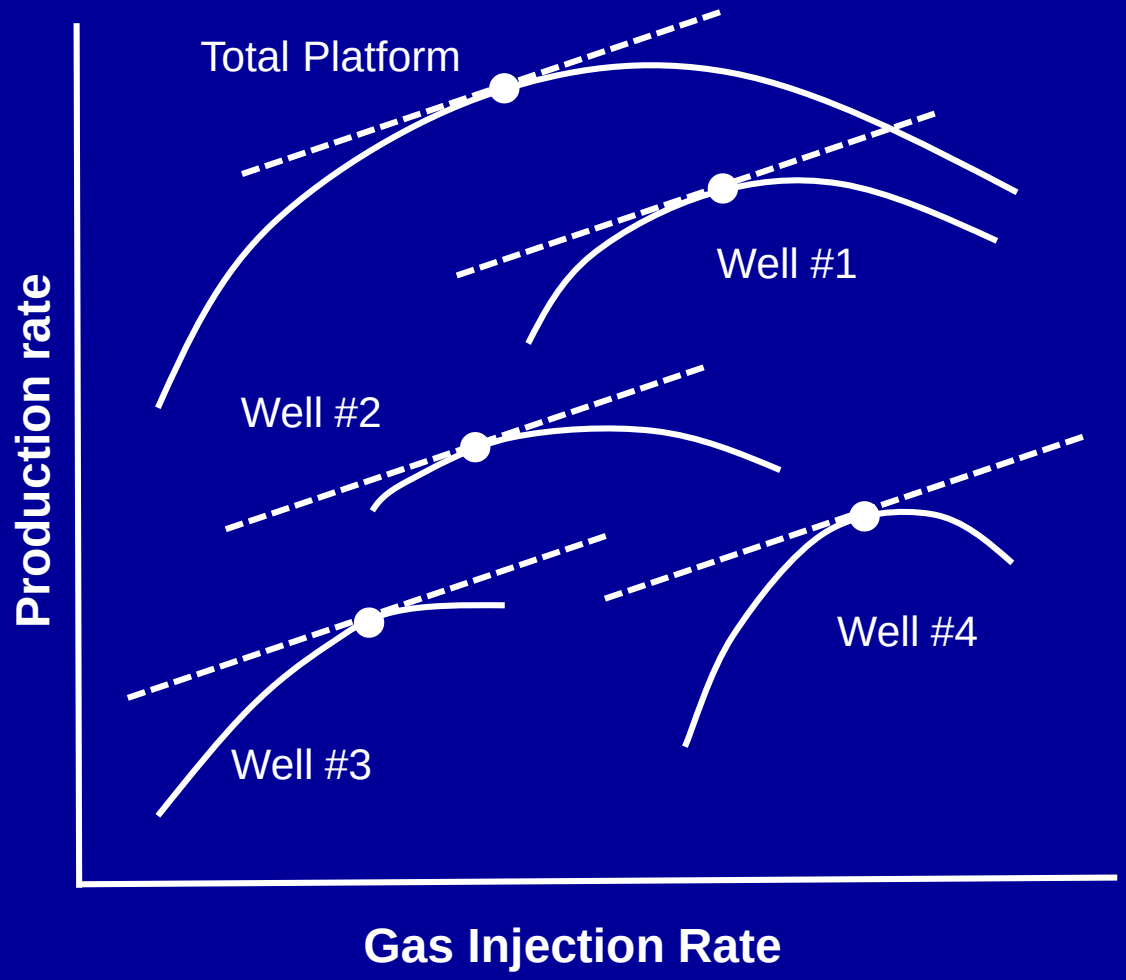
System Constraints & Disruptions

- **Constraints**
  - **Availability of compressed gas**
  - **Separation Capacity**
  - **Water disposal**
  - **Production minimums**
- **Disruptions**
  - **Equipment outages**
  - **Well slugging**
  - **Well workovers & shut-ins**

How much should I produce from each well

if I cannot maximize them all?

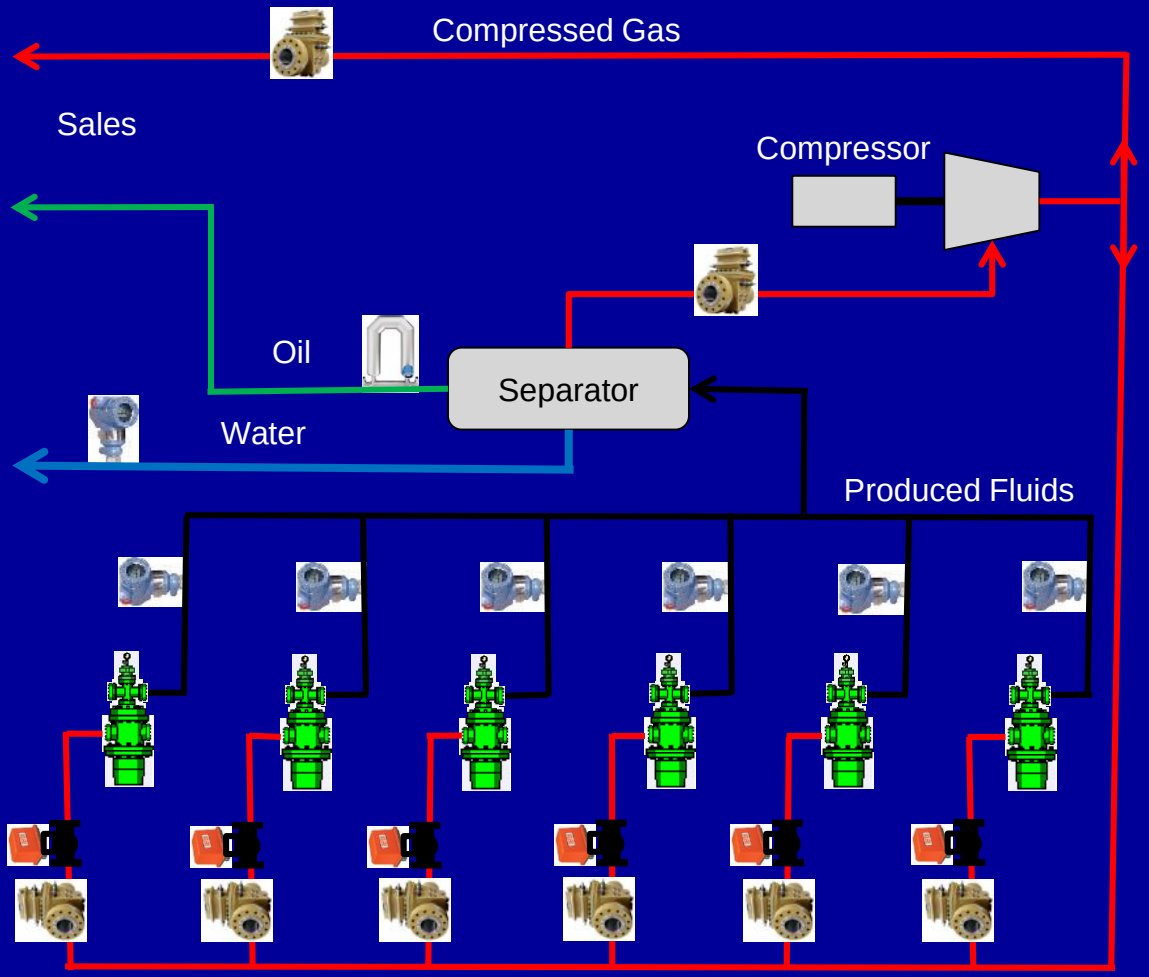
Solution: Optimize the Platform



● Optimal gas distribution

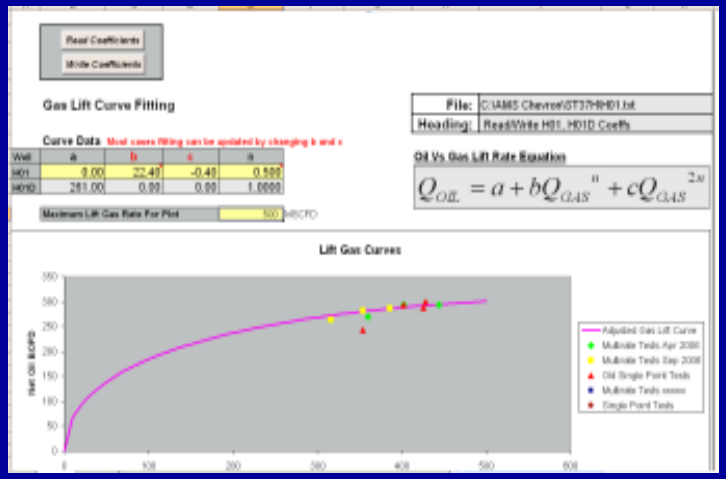
Key Process Enablers

- **Measurement of well production**
- **Insight into facility constraints**
- **Regulation of lift gas**
- **Optimizer**

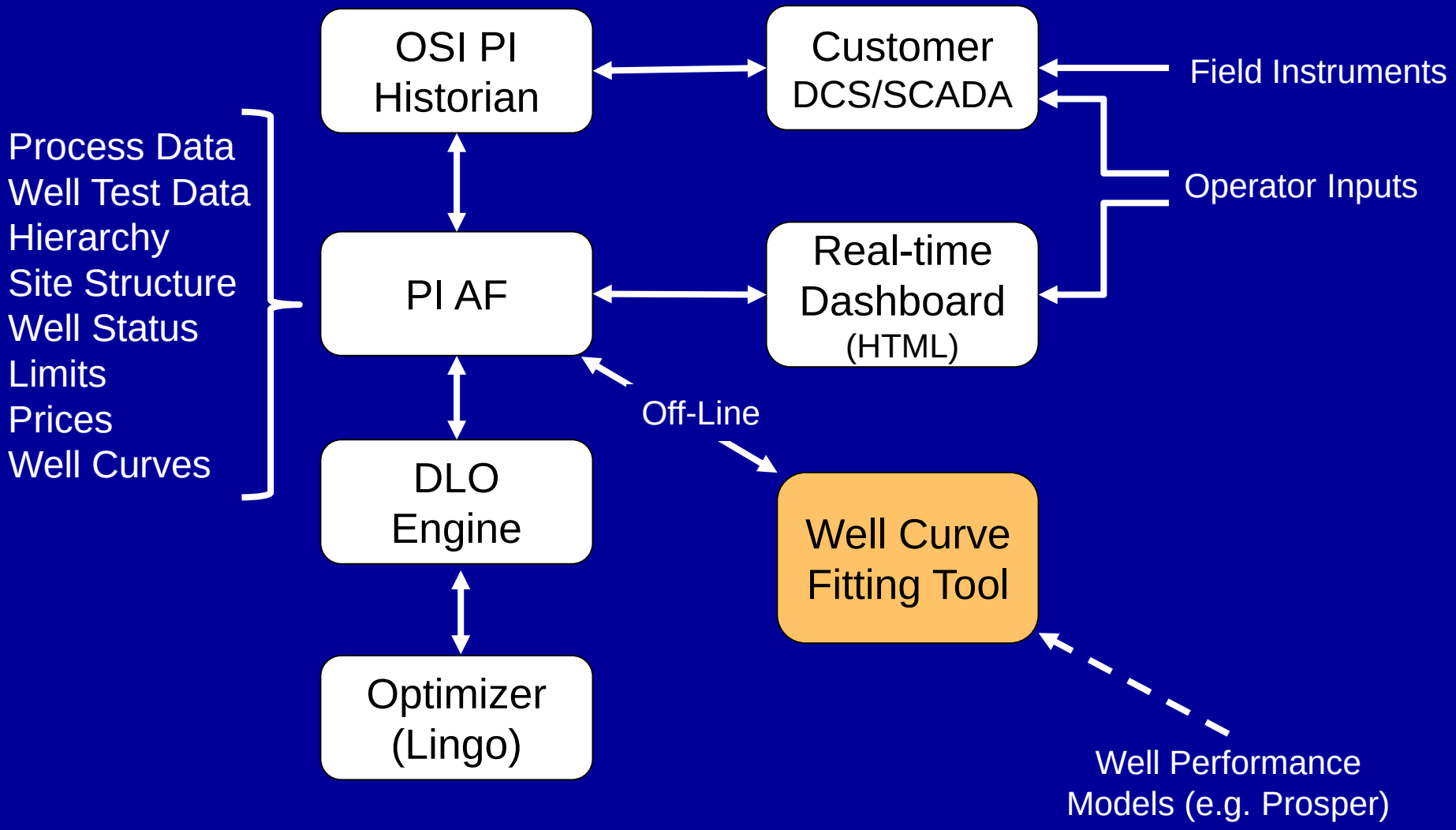


Dynamic Lift Optimizer

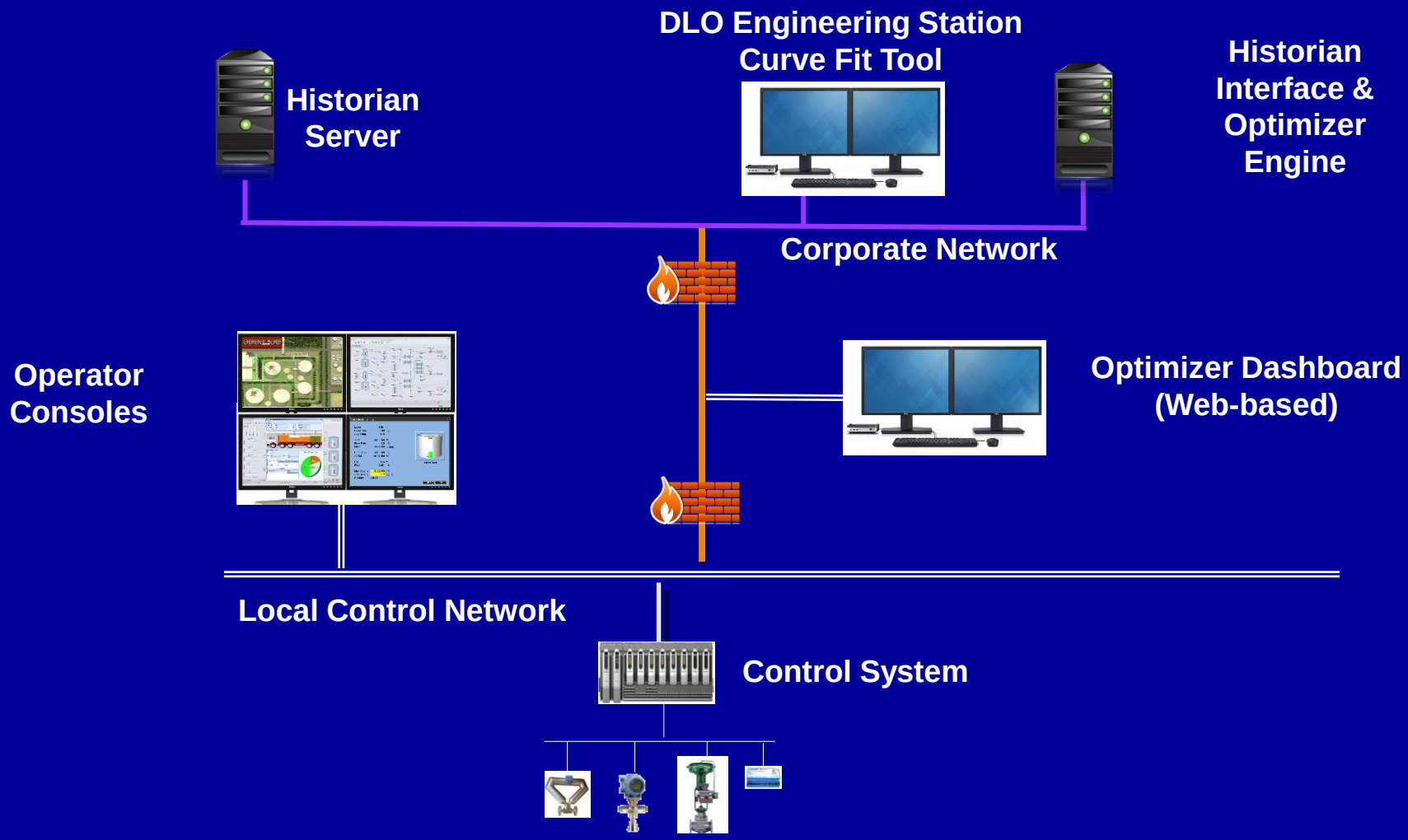
- Online, real-time, closed loop optimization engine
- Gathers real time data from the field
- Tests the various combinations of lift gas rates against operating constraints and converges on an optimum
- Sends new lift gas rates to the automation system either as an advisory or as a new set point
- Makes the most of available gas and allocates gas to wells where it is most profitable



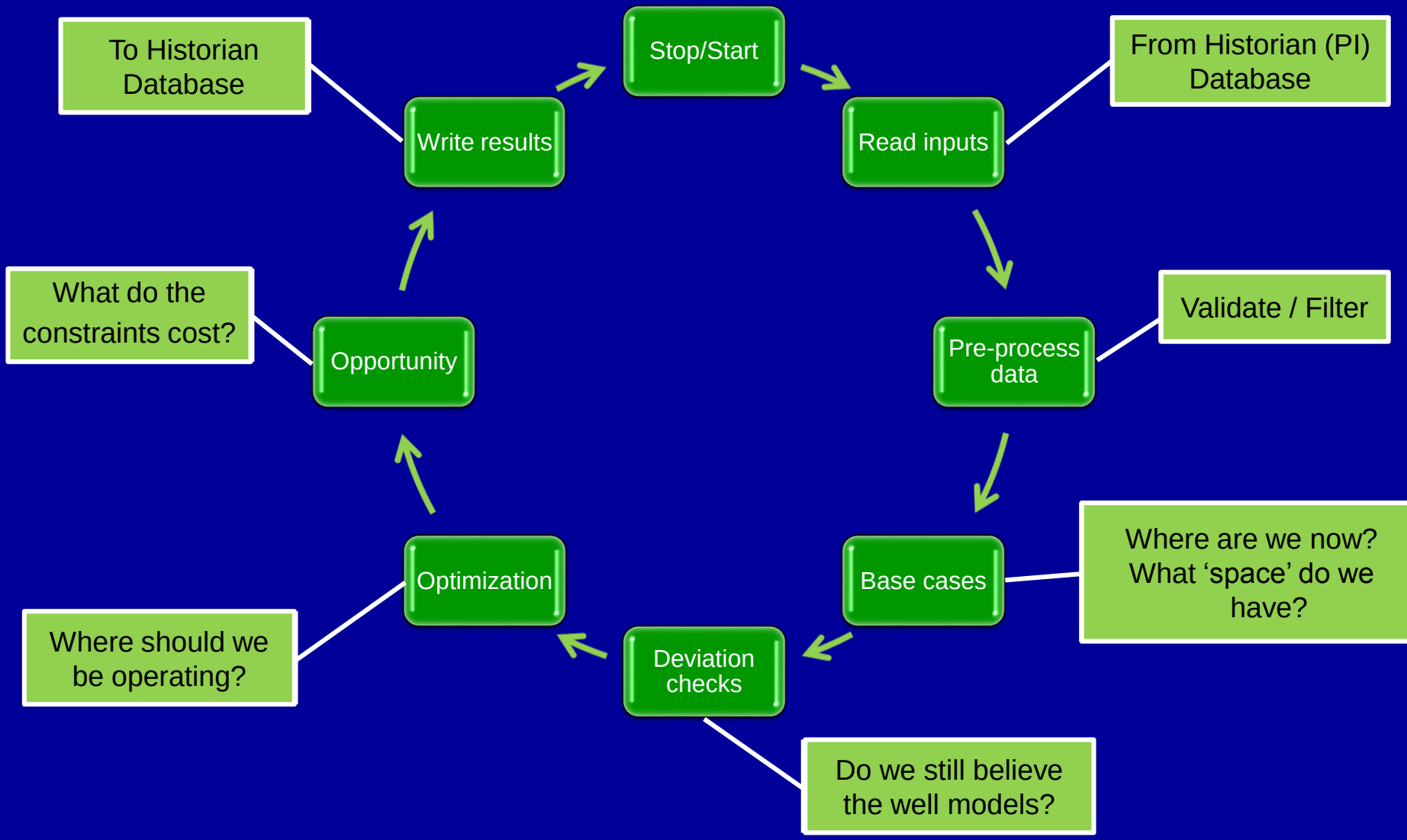
DLO Software Architecture



Optimizer Hardware Architecture

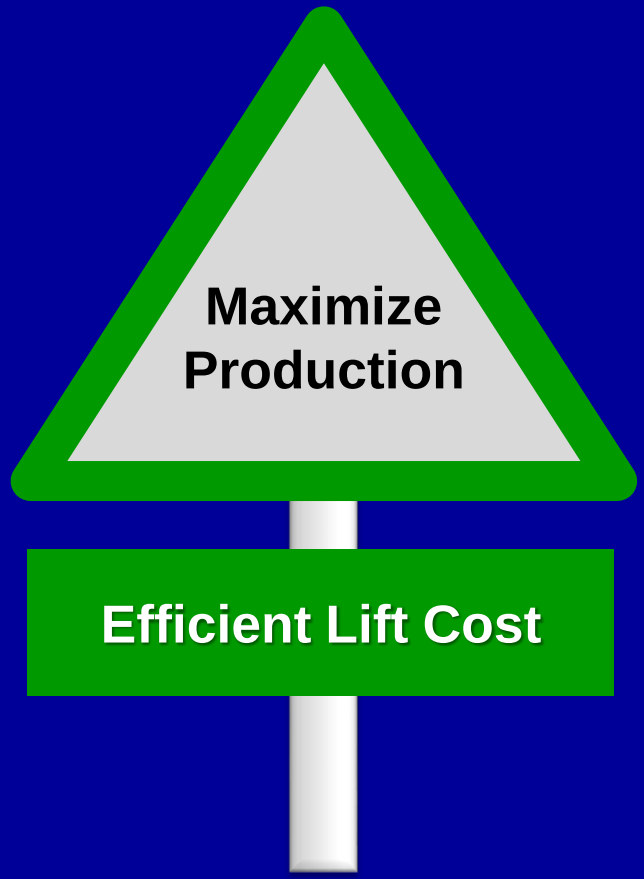


Dynamic Lift Optimization Cycle



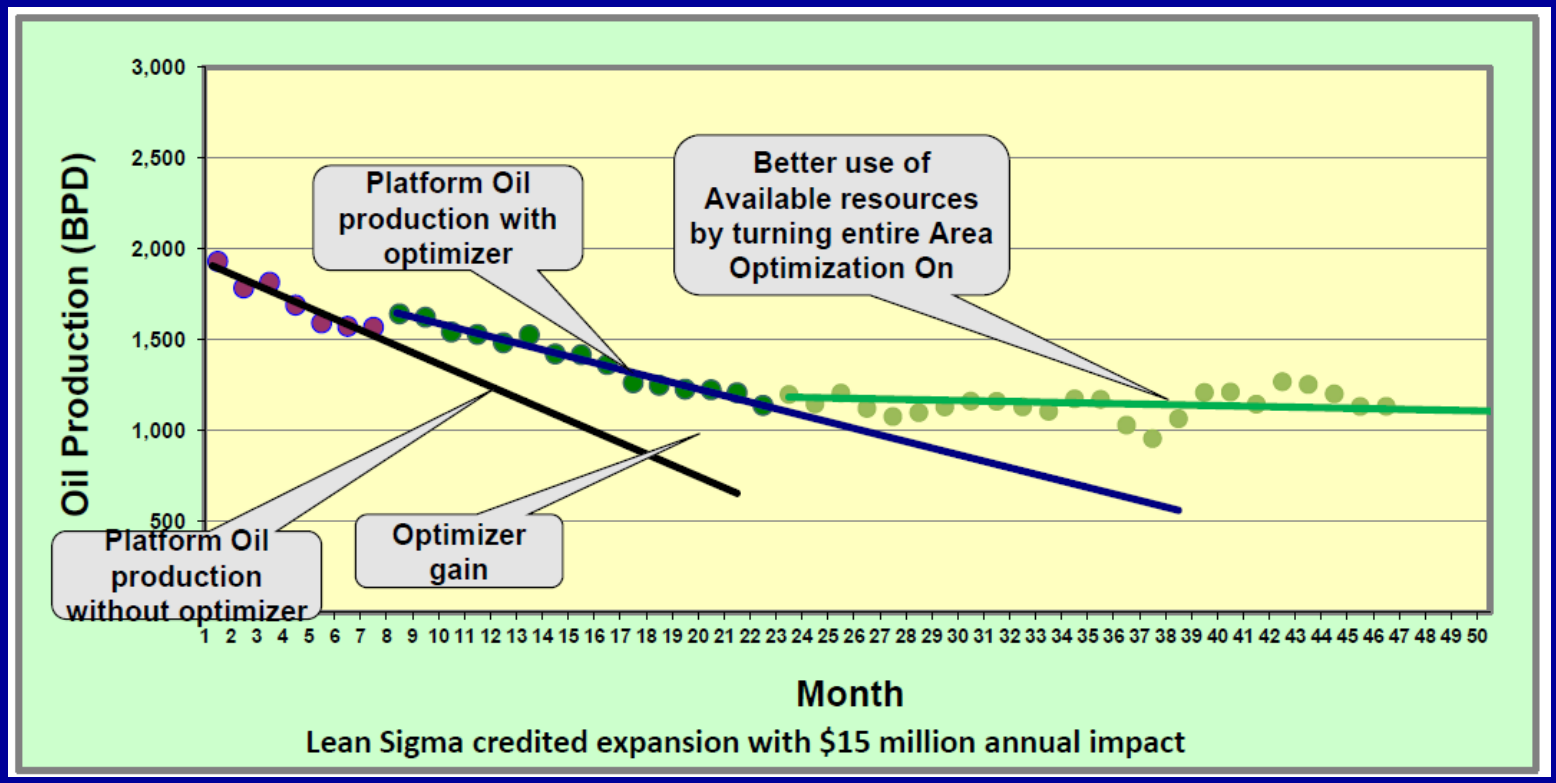
Automation Best Practice…

- Automate well testing to maximize well performance insight
- Optimize gas lift injection flow rates to each well automatically
- Respond to process constraints automatically
- Prioritize gas lift supply to the wells with the highest profitability
- Provide real-time analytical insight into process



Customer Result

- **Installed on approximately 200 wells covering several projects**
  - **Achieved an average of over 10% production increase when decline considered**
  - **$15 million annual impact from case study**



Conclusions

- Online Optimization offers extremely beneficial business impacts
  - Achieved base improvements and reduced the decline trajectory
- Getting the well test data needed to performance match the well models is crucial
- Having a local champion, someone on the ground, to continuously work with operations to get the things needed is crucial
- Reliable measurements for lift gas rates and well tests are required (does not mean no variation – means no systematic problems)

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