



Optimization of Plant and Field Assets Using Symmetry Dynamic Simulations

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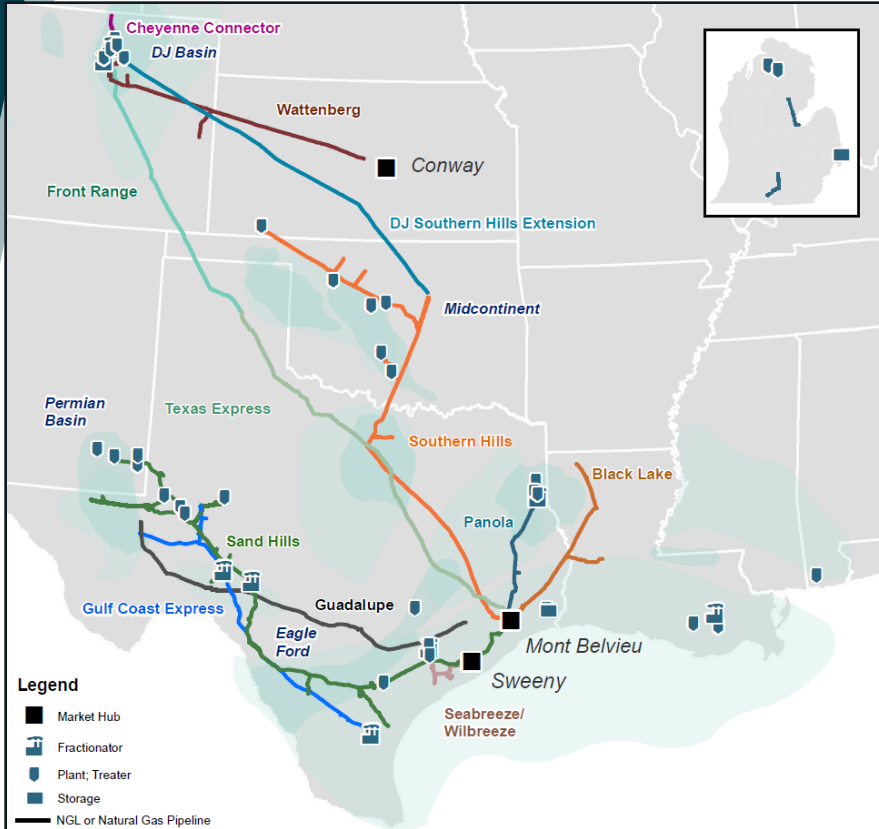
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Schlumberger-Private

Introduction

DCP and the Integrated Collaboration Center (ICC)

Strong Portfolio of Assets



Leading Midstream Provider



- ✓ **Integrated Logistics & Marketing and Gathering & Processing** business with competitive footprint and geographic diversity
- ✓ **Unparalleled interconnectivity and access to fractionators** on the Gulf Coast, including Mt. Belvieu and Sweeny, with Conway for optionality
- ✓ **Leading industry positions in premier basins**, including the DJ Basin, Permian, Eagle Ford, and SCOOP

57K Miles of Pipeline

39 Plants

6.0 Bcf/d processing capacity ⁽¹⁾

1.7 MMBpd NGL Pipeline capacity

2.8 Bcf/d Natural Gas Pipeline capacity

One of the largest NGL producers and gas processors in the United States

ICC and Remote Operations

Integrated Collaboration Center (ICC) Linking Numerous Data Sources

SCADA
and DCS

Financial
Data

Real-Time
Prices

KPIs

Contracts

Engineering
Data

Integrated Collaboration Center

- Tracking data and optimizing the majority of plants
- Incorporating operations, engineering, commercial, and market data
- Focus expanding to the field, including large infrastructure of pipelines and compressors
- 24/7 monitoring for major field assets

Remote Operations

- 20 facilities incorporated into the ICC for remote operations in 2019; five transitioned in 2020; more in 2022/2023
- Driving increased cross-functional collaboration among engineers, plant and field coordinators, optimizers, and board operators
- Strengthening integration between plants and across regions

Achieve Real-Time
Optimization and Decision
Making

Digitally Enable the
Business and Workforce

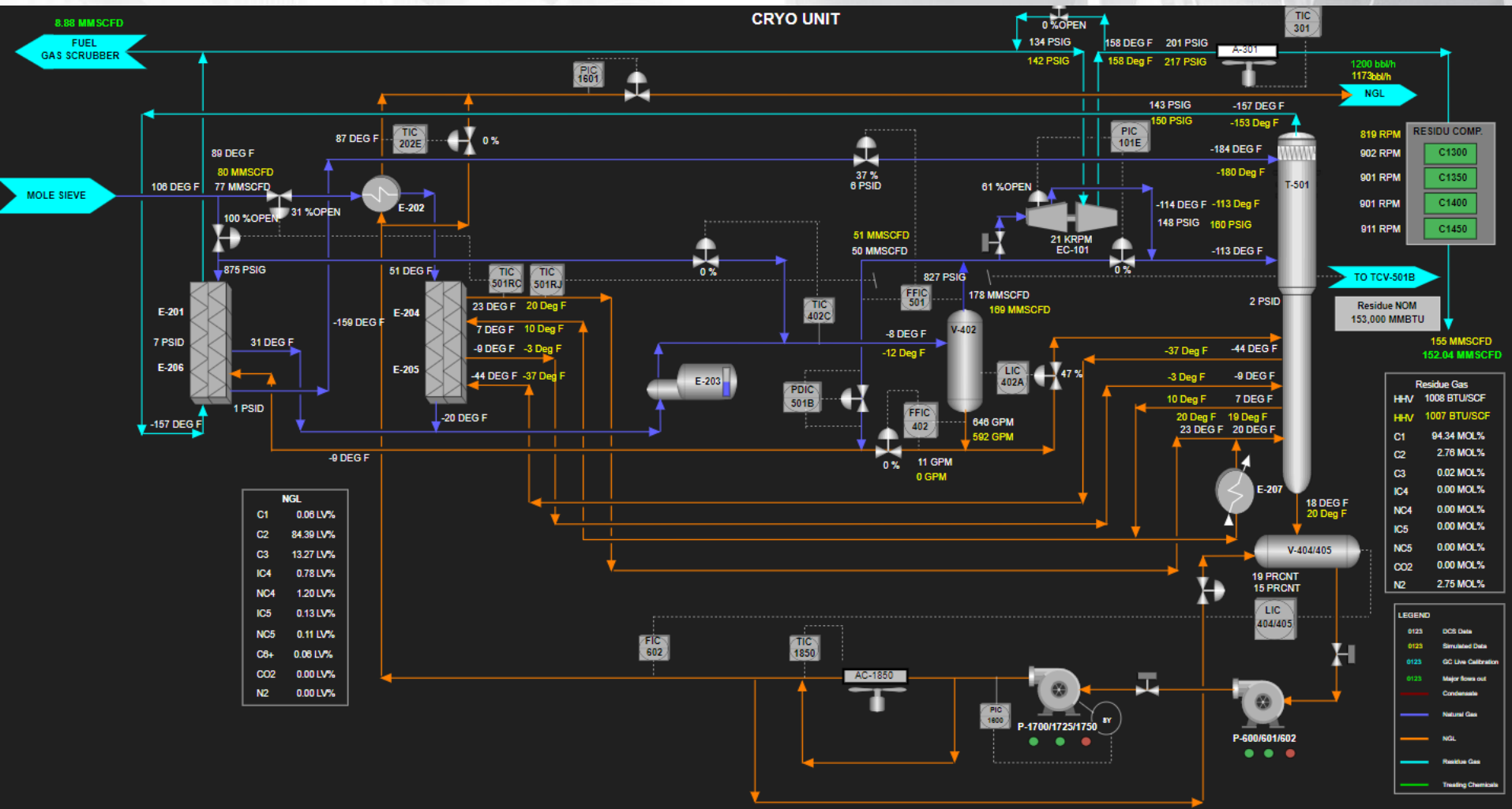
Increase Cash Flow While
Diminishing Risk



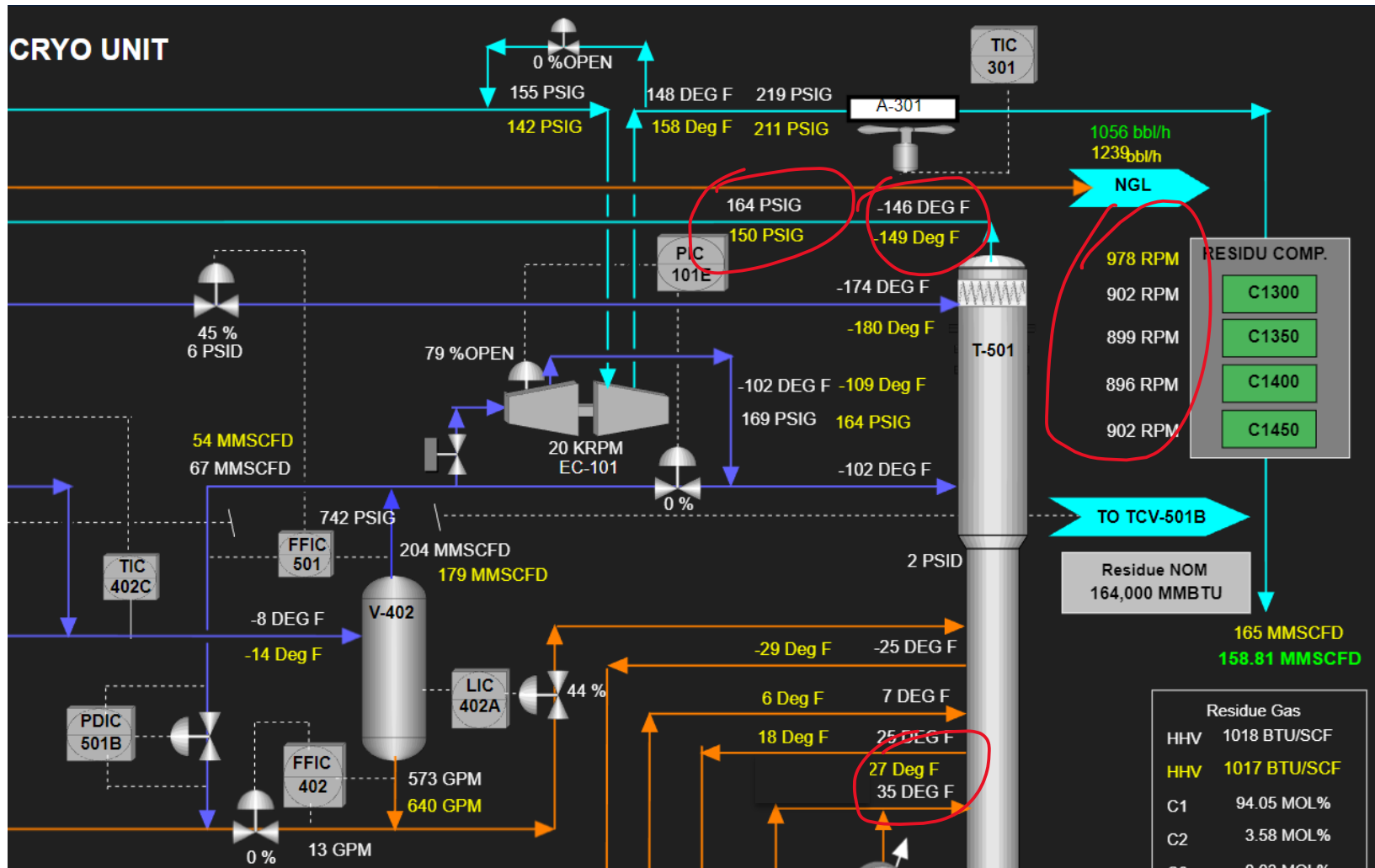
ICC Plant Screens

Visualizing Plant Performance

ICC Plant Screen Example



ICC PI Screen with Simulation Data



Actual performance (white) compared to optimized simulation data (yellow) provides real-time guidance to plant operations

Symmetry Dynamic Process Simulations for Unsupervised Optimization

• Symmetry Dynamic Simulation Setup

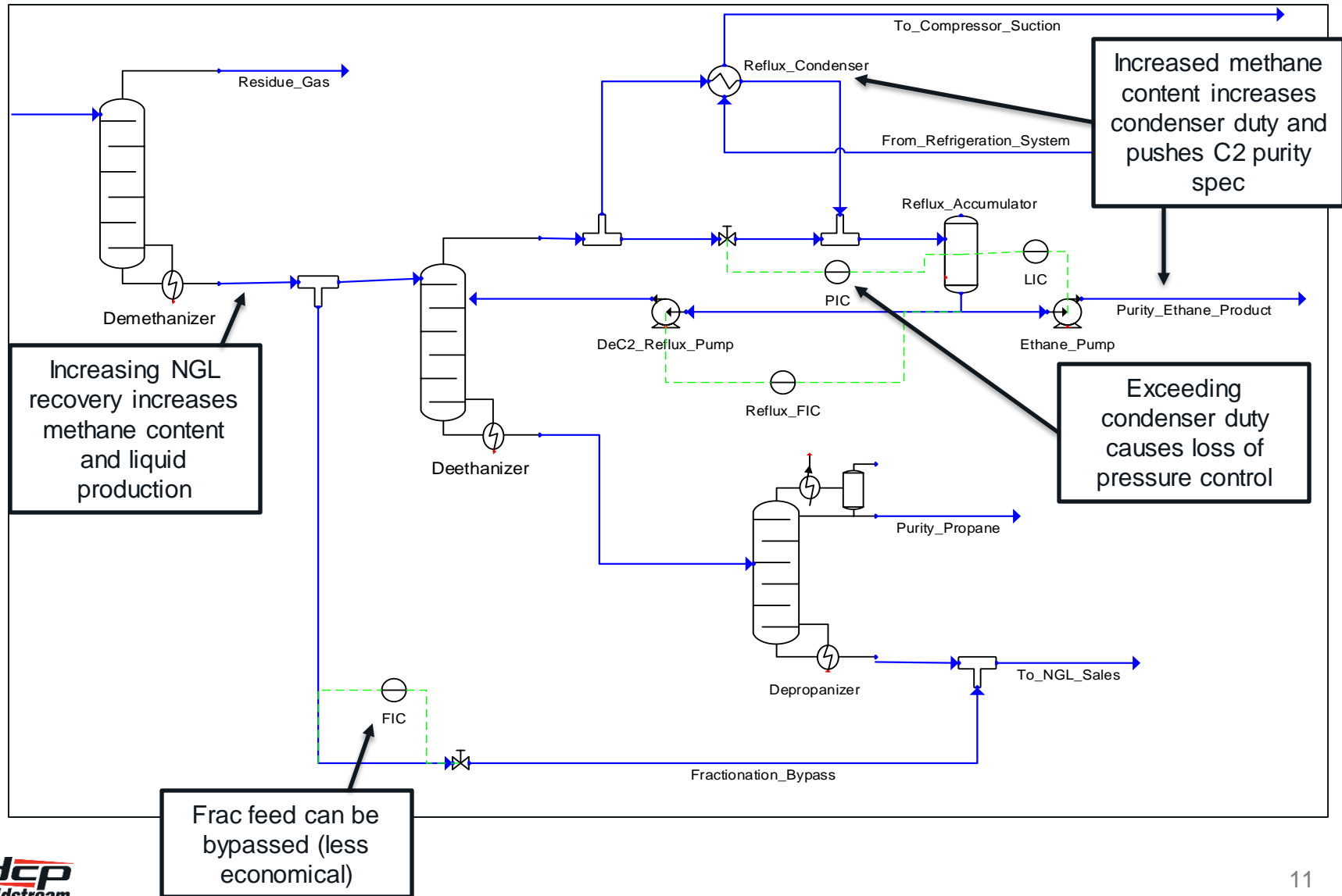
- The process simulation optimizes plant performance based on
 - Feed gas rate/composition/pressure
 - Ambient conditions
- Runs continuously outputting data to plant screens every ~10 seconds
- Why dynamics? Increased engineering rigor in steady-state = less model stability
- DCP's use of dynamics allows for maximum model rigor
 - Power of the pressure/flow solver engine
 - More physically representative
 - Easier to maintain and use

• Where the Pressure/Flow Solver Excels

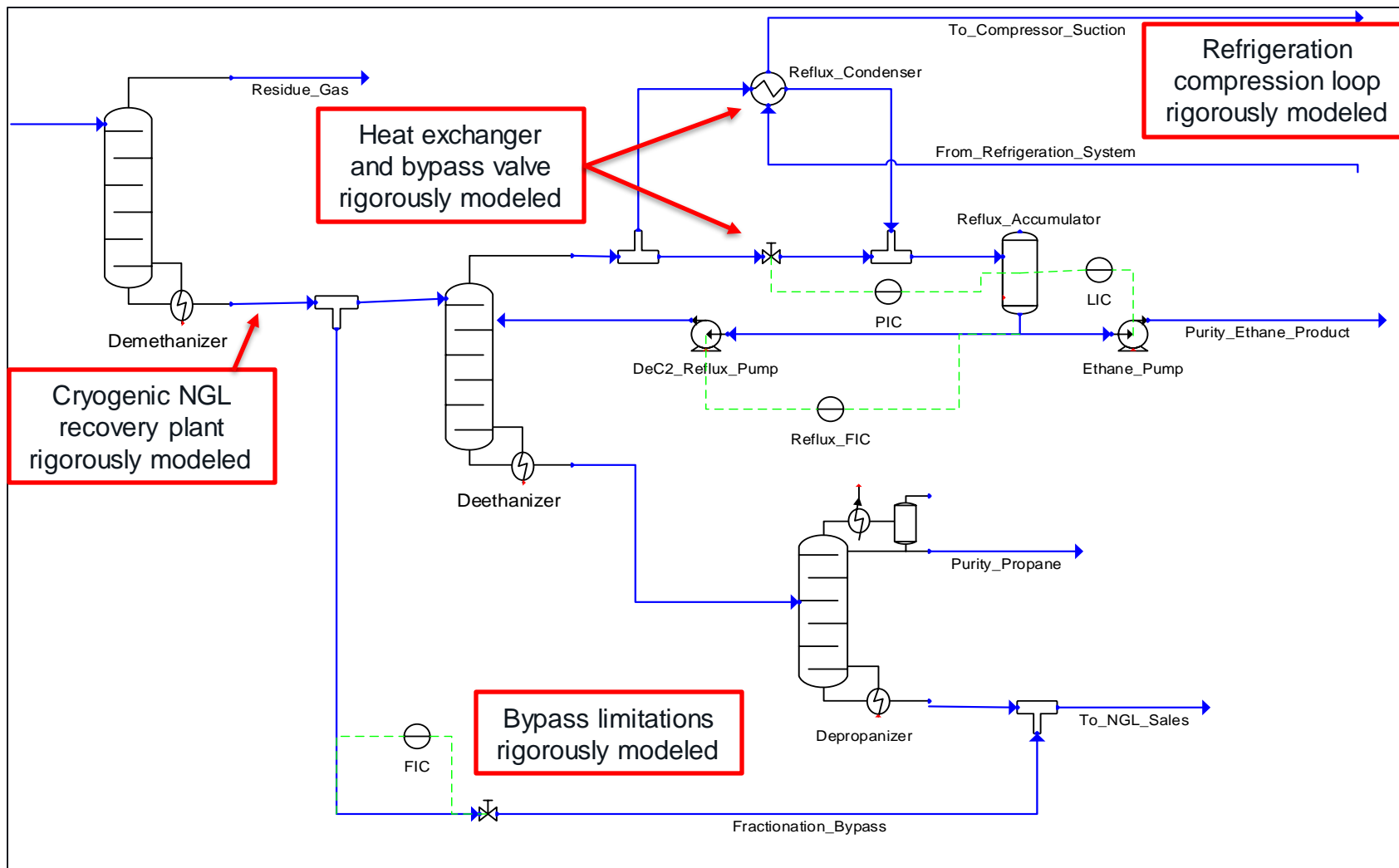
- Reciprocating compression modeling
 - Reciprocating compressor with geometry – increasing suction pressure increases flow and HP, important for understanding bottlenecks
- Turboexpander / Compressor curves
- Piping, including thermosiphons
- Refrigeration system details
- Control loops
- Pump curves
- Control valve data
- Heat exchangers (rating mode for shell-and-tube and BAHX)

Powerful capabilities for incorporating engineering data, without causing convergence/stability issues. Gives the most accurate predictions and analyses.

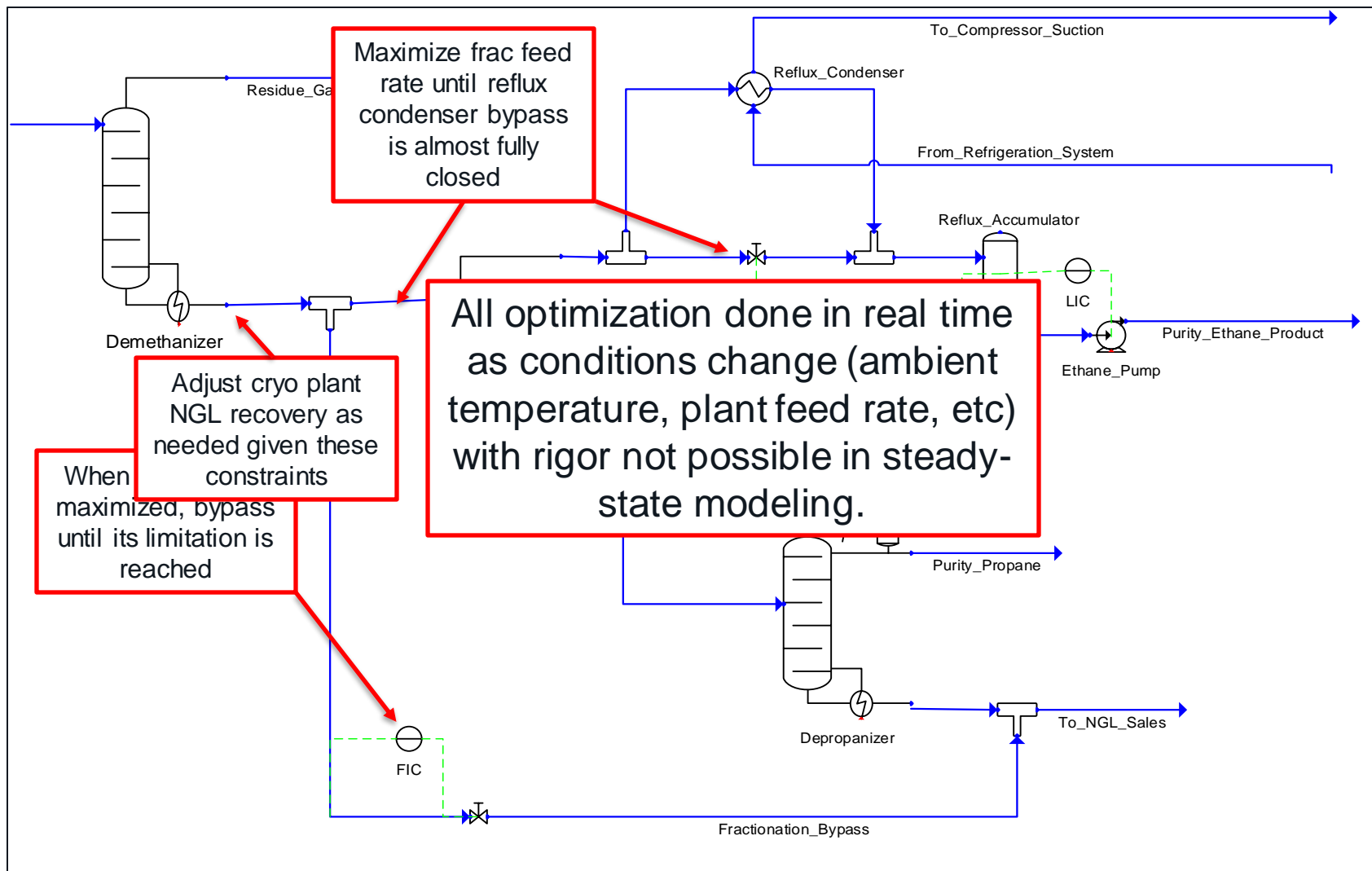
Optimizing an NGL Recovery Plant and Bottlenecked Fractionation Plant

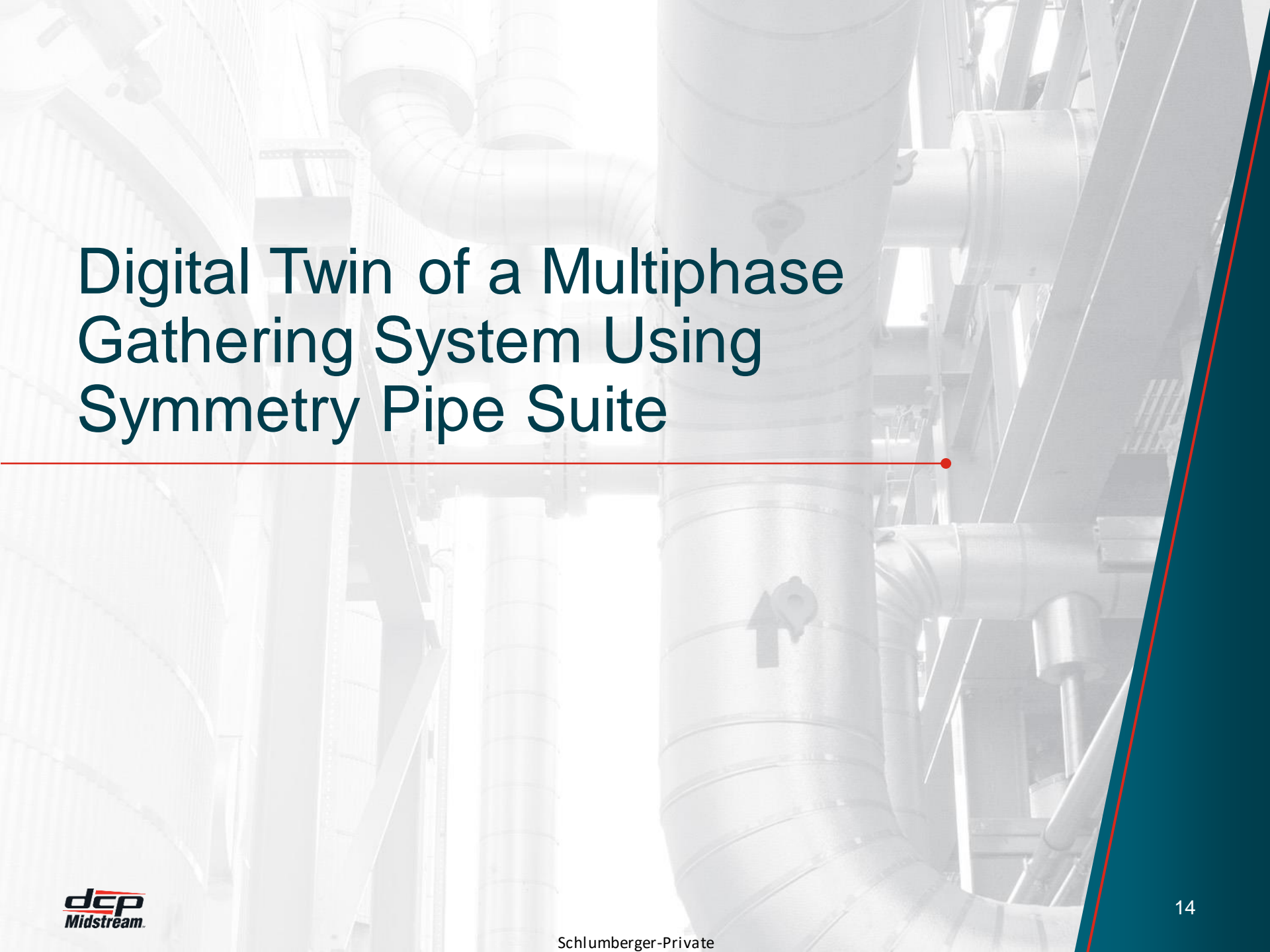


Optimizing an NGL Recovery Plant and Bottlenecked Fractionation Plant



Optimizing an NGL Recovery Plant and Bottlenecked Fractionation Plant

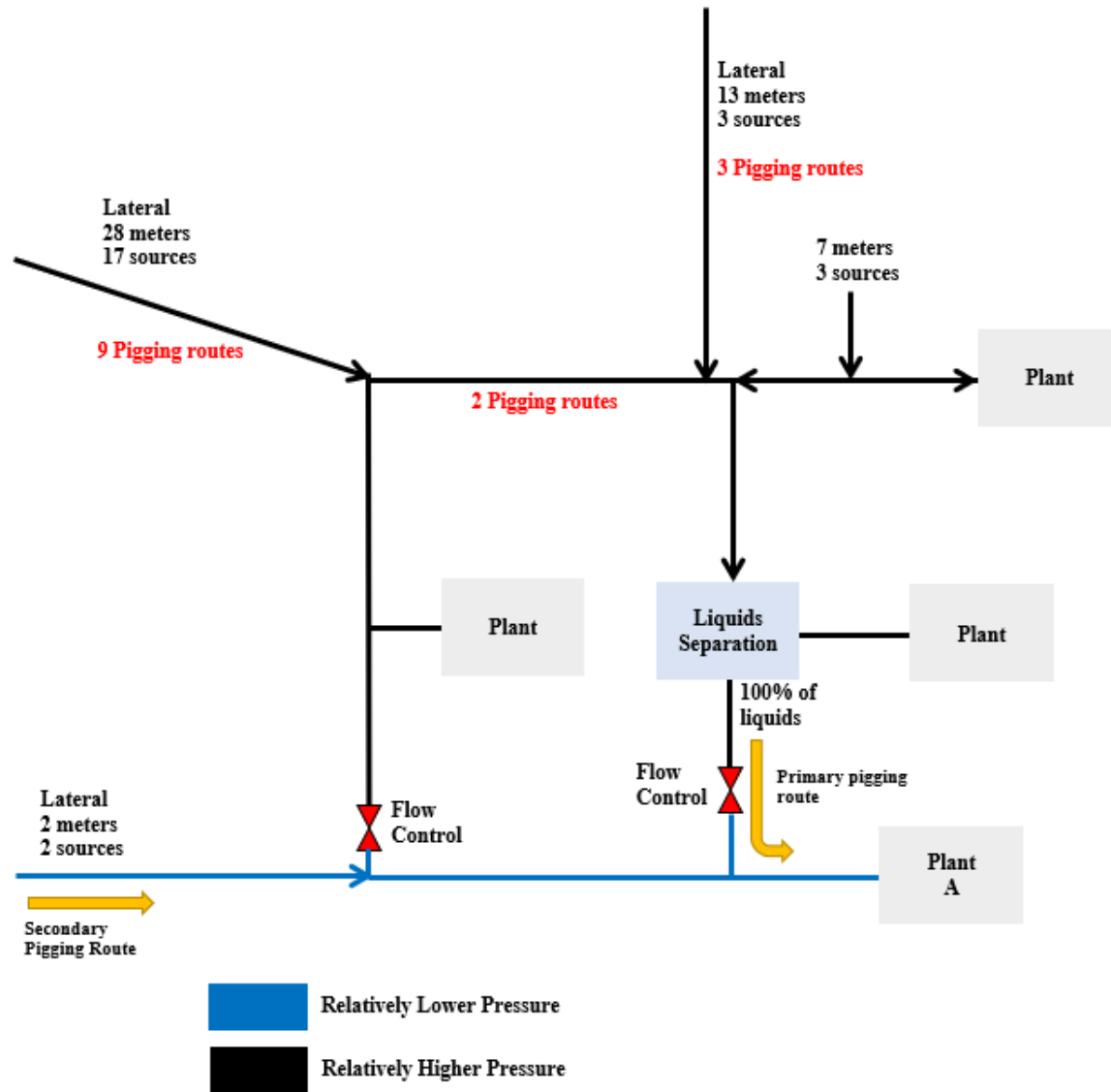




Digital Twin of a Multiphase Gathering System Using Symmetry Pipe Suite

Construction of the Model

- Pigging inputs captured via mobile application
- “Snapshot” simulation functionality for offline analyses



Condition-Based Pigging

A Successful Trial

• Why Condition-Based Pigging?

- Safety

 - Some risk incurred with every pig launch

 - high pressure

 - liquids disposal

 - hydrate formation

- Emissions reductions

- Reducing field activities in sensitive areas

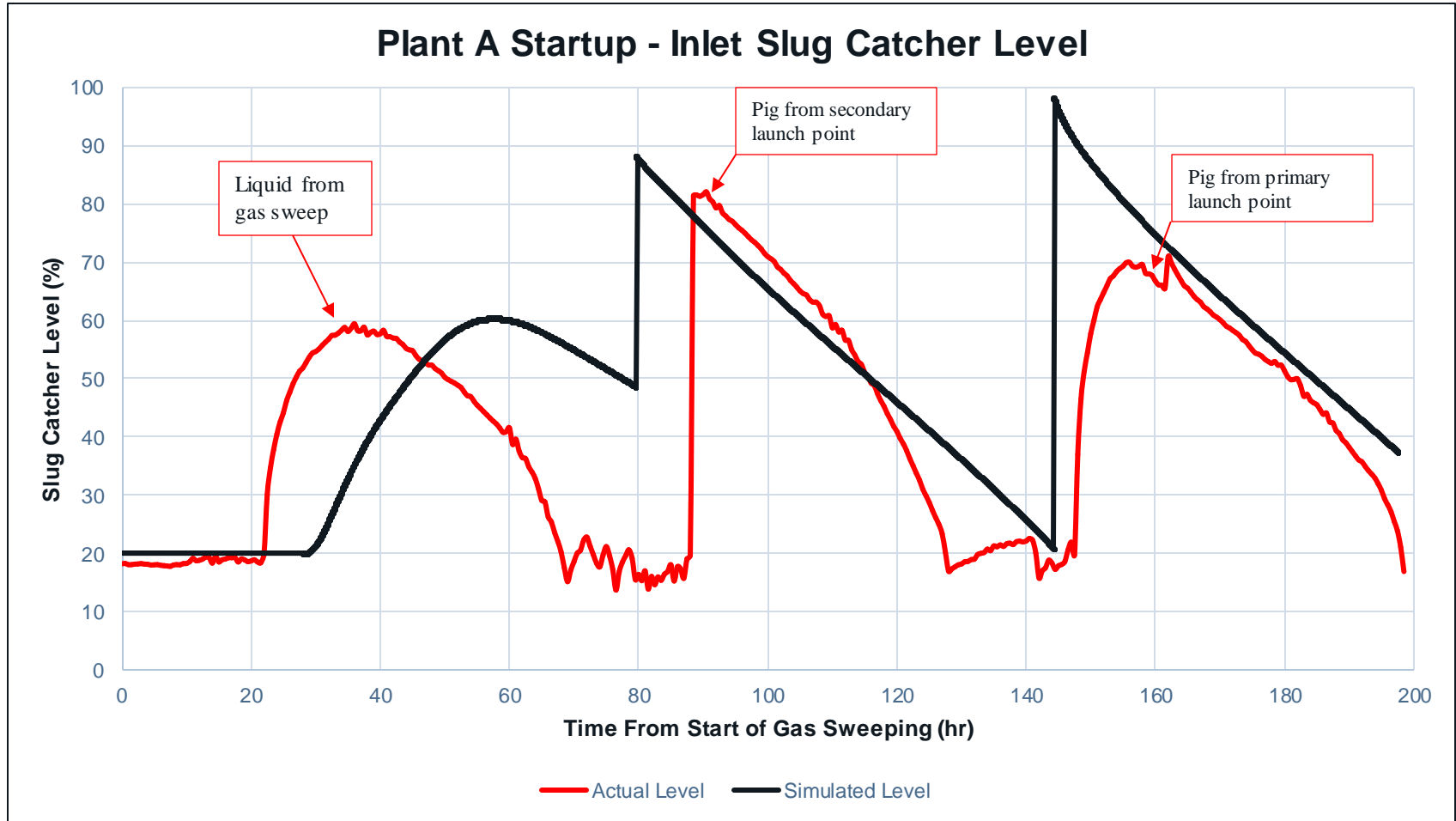
- Personnel resources

- **Success for Condition-based Pigging**
 - Symmetry Dynamics Pipe Engine predicting liquid holdup across the system to within 20% of actual
 - Using condition-based pigging, average level in slug catcher is 90%, compared to 40% prior.
 - **Nearly 40% reduction in number of pigs launched with no plant downtime for same period**
 - 30 fewer launches in a year from one launcher

Using the Simulation to Avoid Downtime

- Avoiding Plant Downtime with Digital Twin
 - Plant is going to restart after maintenance activities
 - Significant presence of liquids in inlet line (2-3x inlet slug catcher capacity)
 - Multiple options for startup plan in the field
 - “Snapshot” Symmetry pipe model used to perform case studies on all possible options
 - Plan developed using these results

Results of Plant A Restart Execution



Plant utilizes stabilizer at 100% capacity for 8 days, processing all liquid in the line without any downtime from excess liquids

• Takeaways

- Facilities
 - Real-time optimization of facilities possible using the dynamic engine to provide guidance to operations personnel
 - Dynamic simulations have the ability to incorporate significantly more engineering detail, improving accuracy
 - Can optimize process (revenue) as well as equipment count (costs)
- Field
 - Symmetry Dynamics pipe digital twin has been able to accurately predict liquid holdup in a large gathering system to within ~20%
 - Successful trial of a condition-based pigging program, with a near 40% reduction in pigging frequency achieved
 - Snapshot functionality has been used to perform case studies on difficult startup conditions to avoid plant downtime



• Thank You

