

connect

ORLANDO JUNE 1-3, 2026



SeeQ®

ESTIMATING CRUDE OIL NETWORK CAPACITY AND HIGH-PRESSURE RISK USING MONTE CARLO ANALYSIS

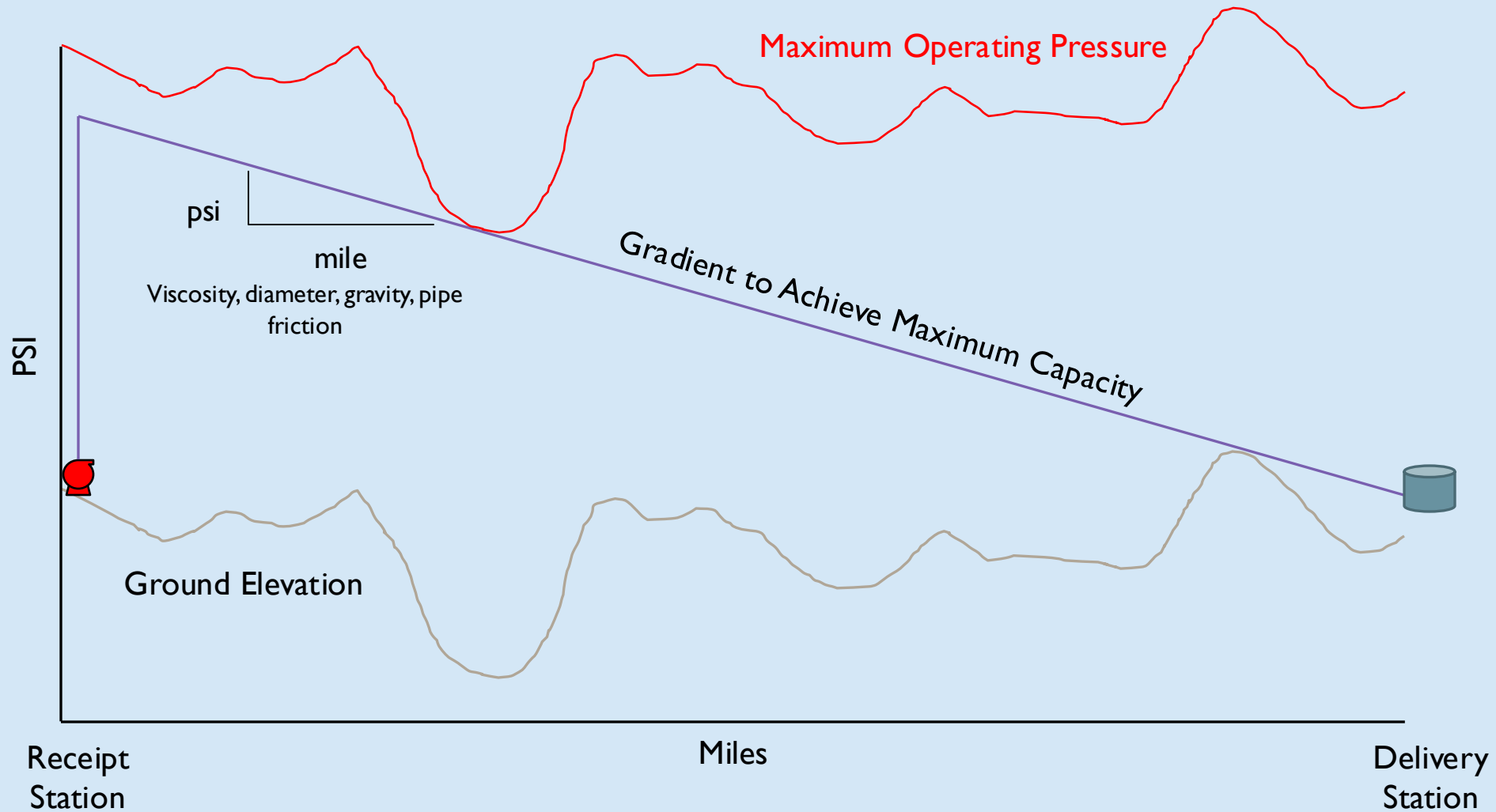
ANDREW FOLTZ, PE

MARATHON PIPE LINE

PROBLEM STATEMENT

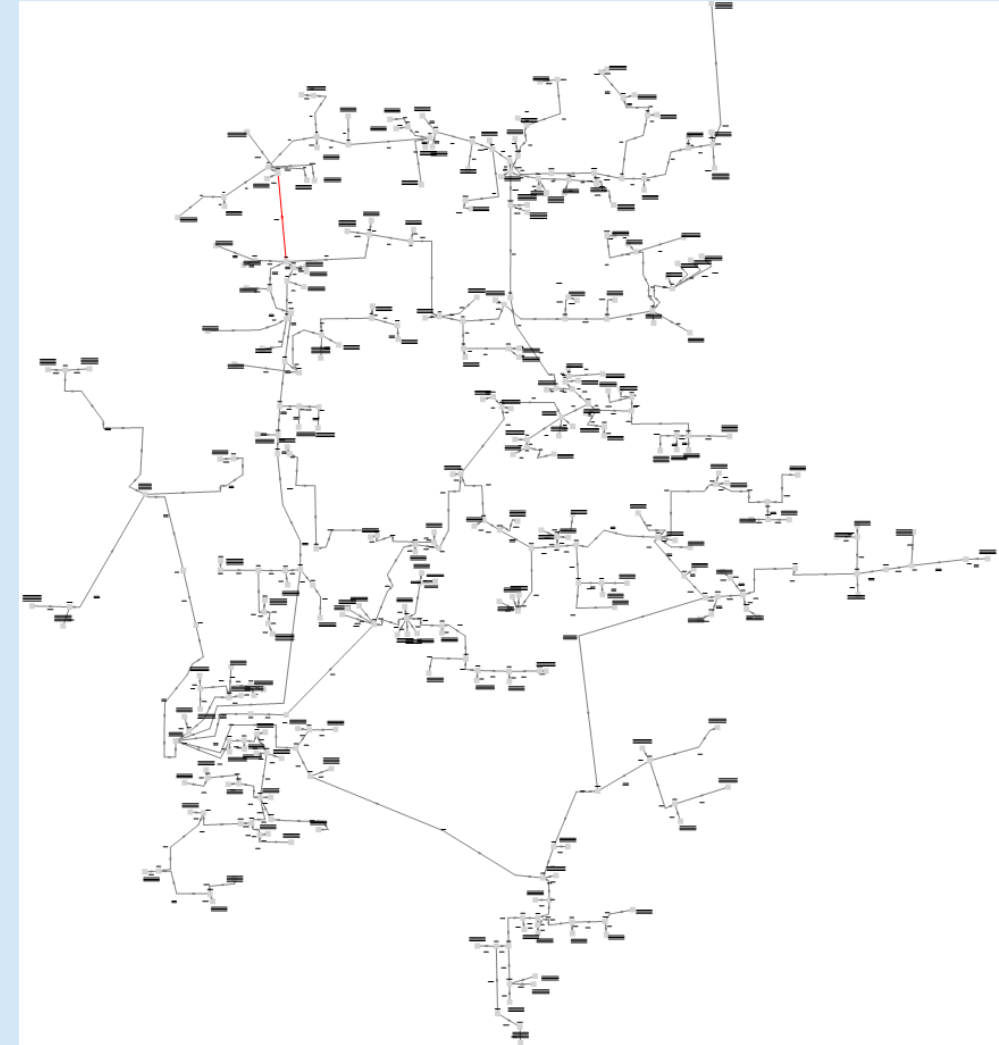
- Commercial tools do not exist to estimate network capacity and high-pressure risk for complex crude oil gathering systems
- Unexpected high-pressure shutdowns impact shipper trust and have negative financial and operational impacts

TRANSMISSION LINE CAPACITY



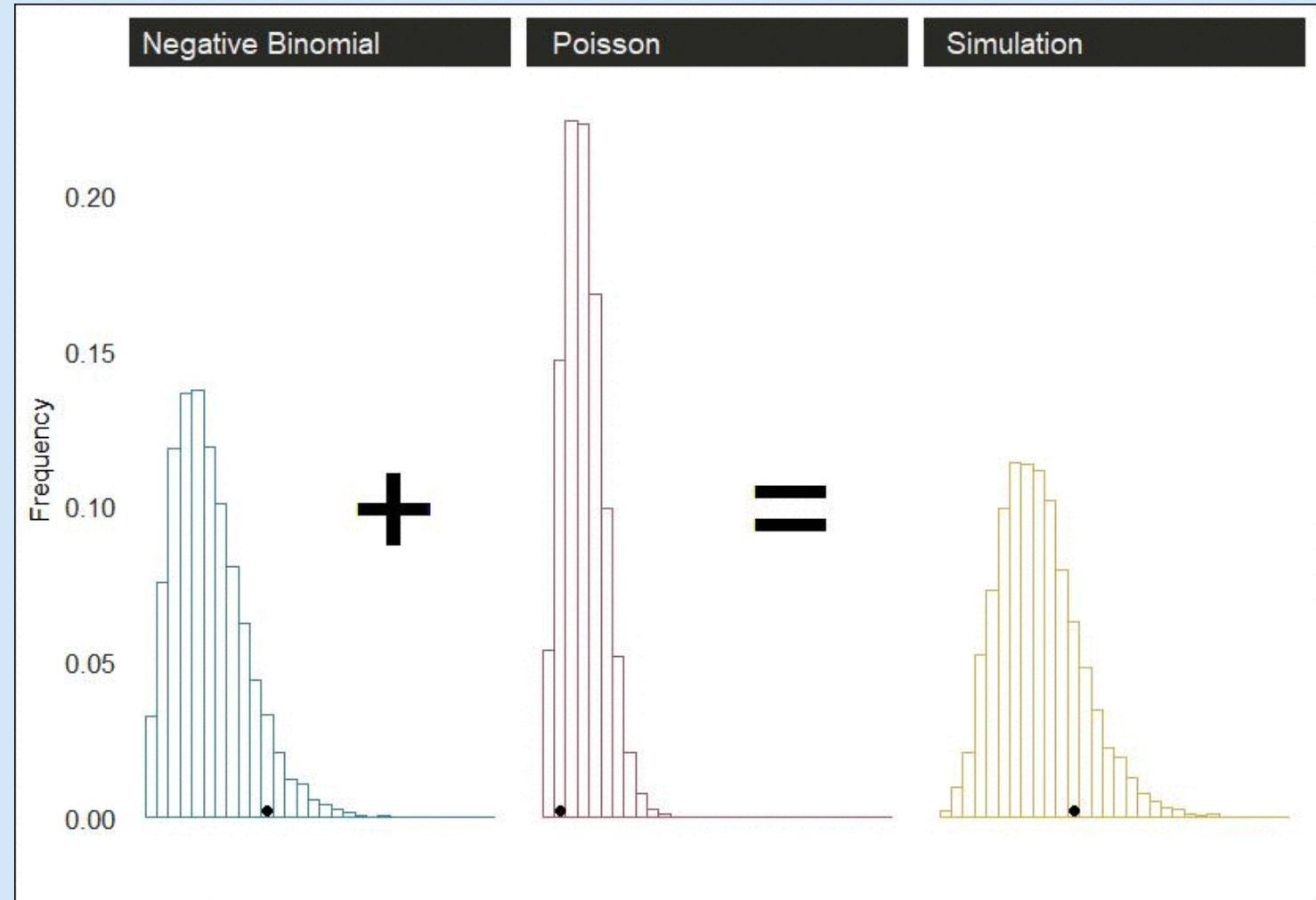
GATHERING NETWORK CAPACITY

- Forecasts in average daily throughput, equipment operates at much higher rates for short durations
 - Running each site at forecast volume is a poor predictor of network behavior
- Network has 192 injection locations → 6.3×10^{57} possible combinations
- Network capacity and high-pressure risk must be evaluated stochastically!



MONTE CARLO BACKGROUND

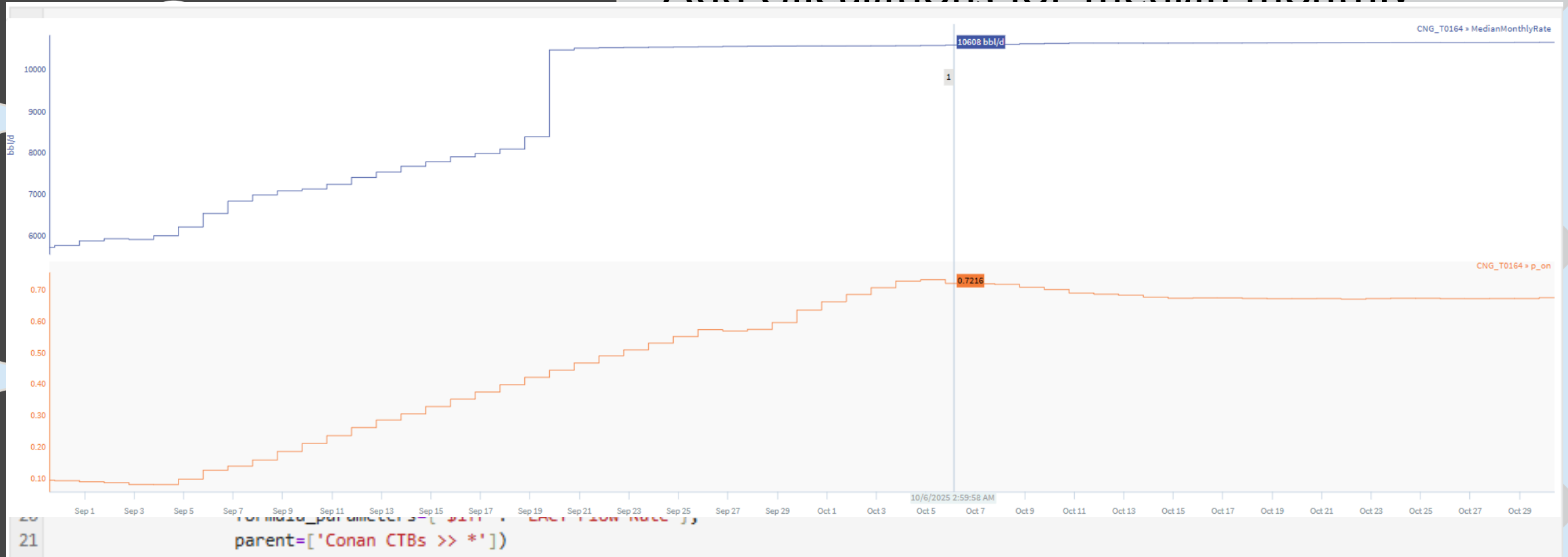
- Inputs vary randomly based on probability distributions
- Model is run iteratively to return range of possible outcomes
- Sites can be treated as binomial distribution
 - What fraction of time does each site run?
 - What flow rate does the site inject at when on?
- Hydraulic simulation run 10,000 times based on site run status to determine high-pressure risk



DATA LAB WORKFLOW

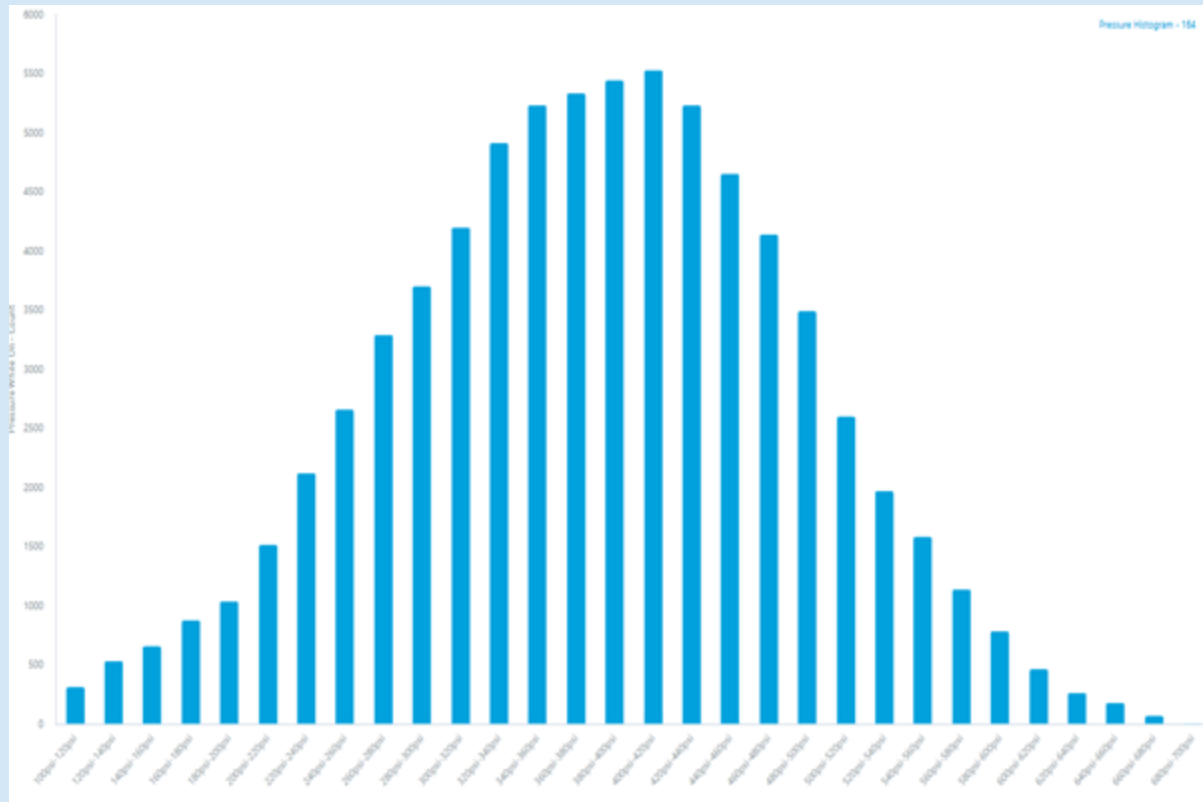
Asset Tree

- Pull site flow using PI Asset Framework
- Add calculations for median monthly

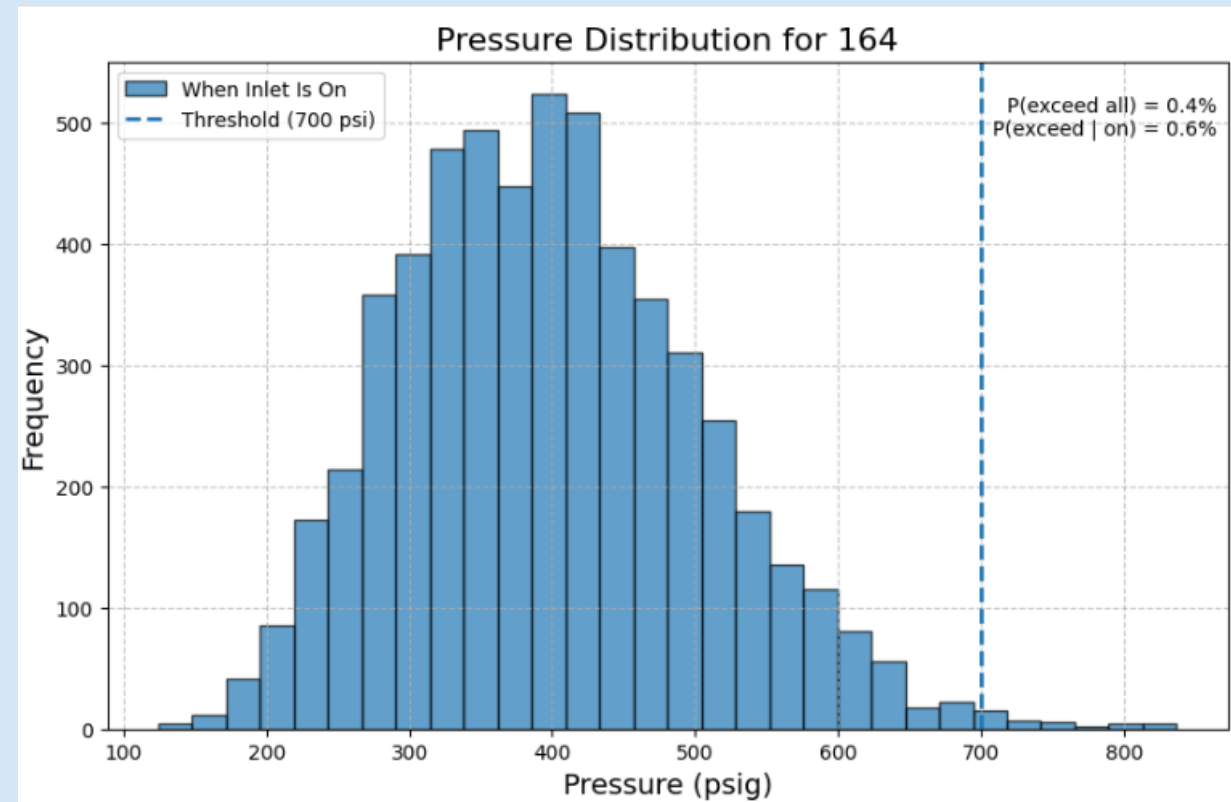


forecasts to run Monte Carlo simulation

MODEL VALIDATION



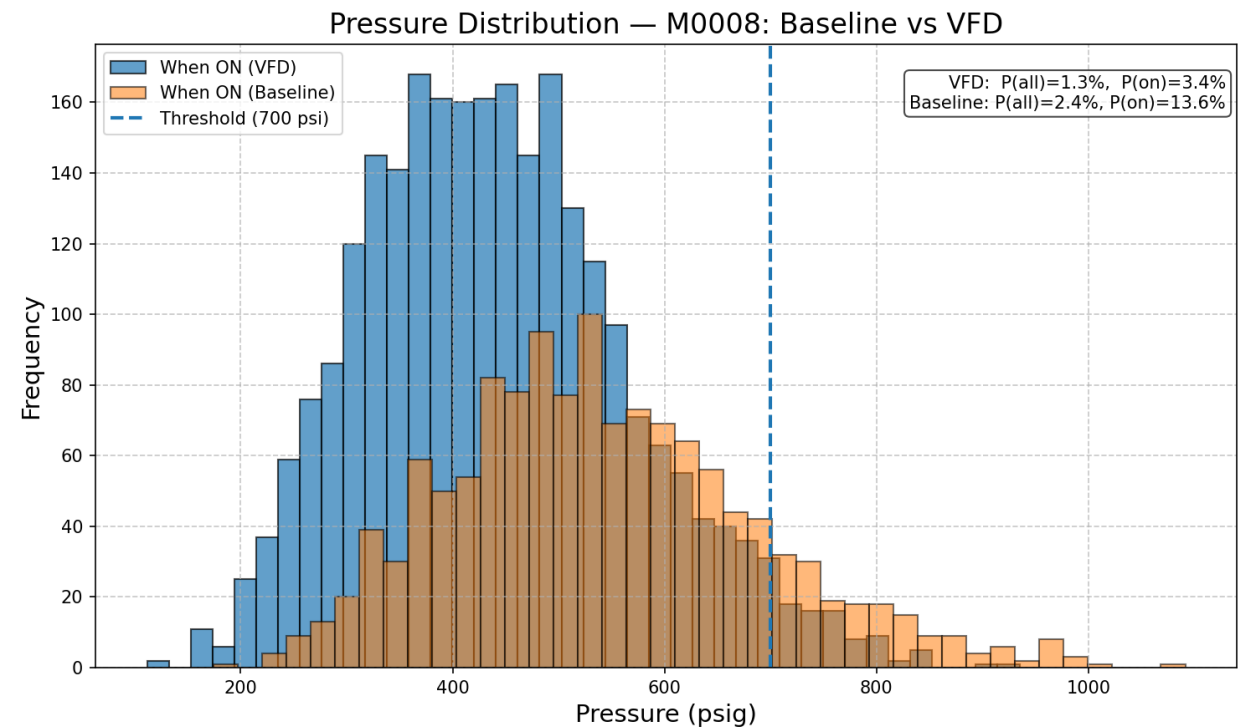
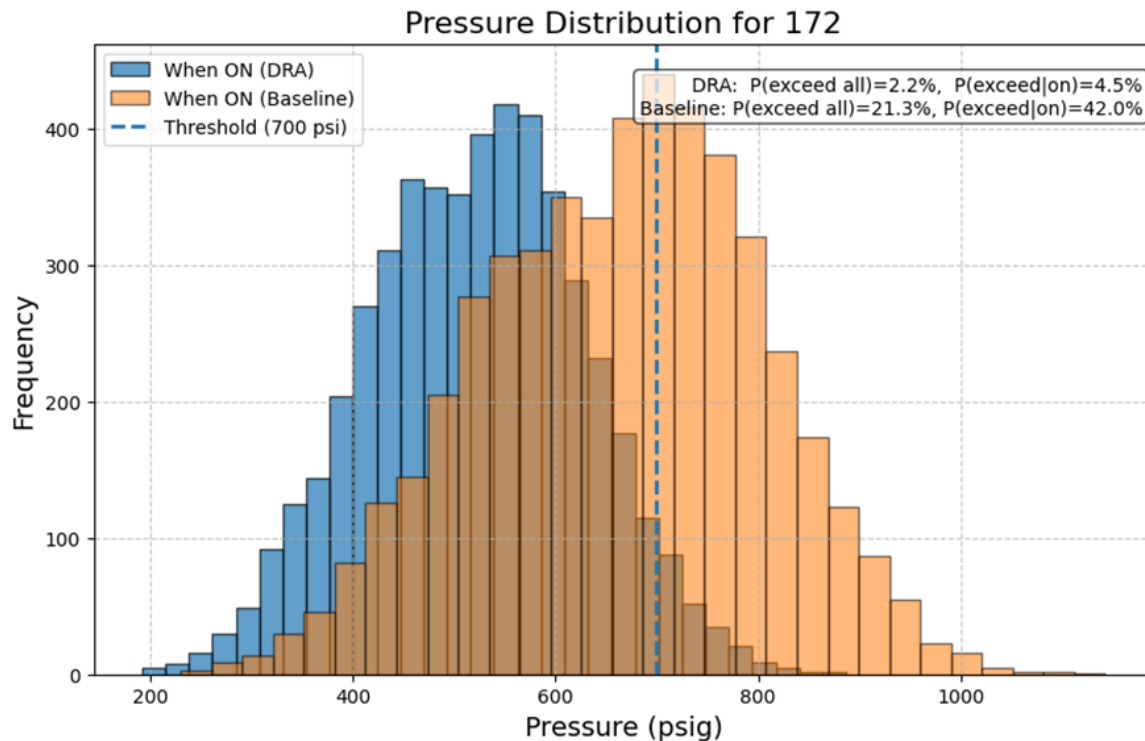
Seeq Workbench Histogram – Historic Operations Data



Seeq Data Lab Monte Carlo Simulation Histogram

SIMULATION – BOTTLENECK SCORING AND MITIGATION STRATEGIES

- Pipe P90 psi/mi, energy consumption, high velocity percentage
- Based on worst piping/site combinations, how does adding targeted drag reducing agent (DRA) or utilizing variable speed drives impact pressure shutdowns



DATA LAB QUICK TIPS

- SPy documentation is invaluable to starting in Data Lab
- Take advantage of open-source libraries
- Vibe code if needed, but don't vibe design



COMMERCIAL IMPACTS

- Avoided volume curtailment of 6,500 BPD at new injection site
- Year-over-year DRA reduction of over 50%
- Driving decisions in targeting capital investment