



Natural Gas STAR Program

Total Emission Reduction by Optimization of Compressor Utilization

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**ONEOK
PARTNERS**

Why Optimization?

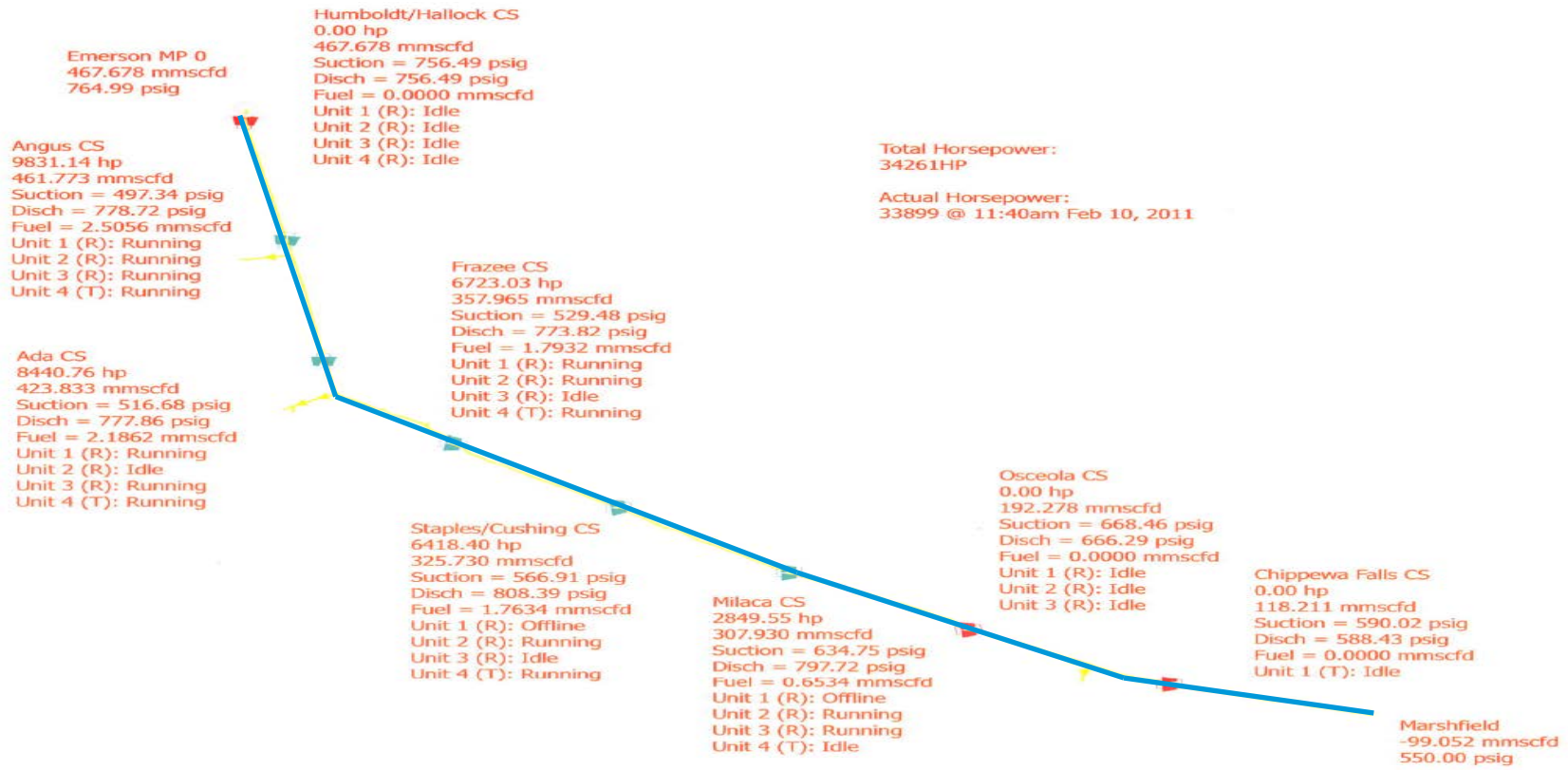
- **Today's technology offers an opportunity to instantly calculate the minimum operational requirements to meet market demand**
- **Invested in a tool that uses modeling technology already in use by ONEOK in a new way**
- **Existing models provided sufficient analysis for steady state commercial project assessment, however, did not contain performance data needed to assess costs of compression and optimal compressor sequence of operation**
- **The optimization team spent several months per pipeline reviewing data and meeting with operators at every compressor station to create models usable for this new purpose**

Collaboration & Coordination

- **Daily coordination occurs between the modeling team, gas control, commercial and operations**
- **Enables multiple user groups access to modeling and optimization technology**
- **This investment is expected to yield various returns across the user groups**
 - Environmental, Operations, Commercial, Gas Control, Safety, etc.
- **All users will have the ability to understand system response to the market at their fingertips**

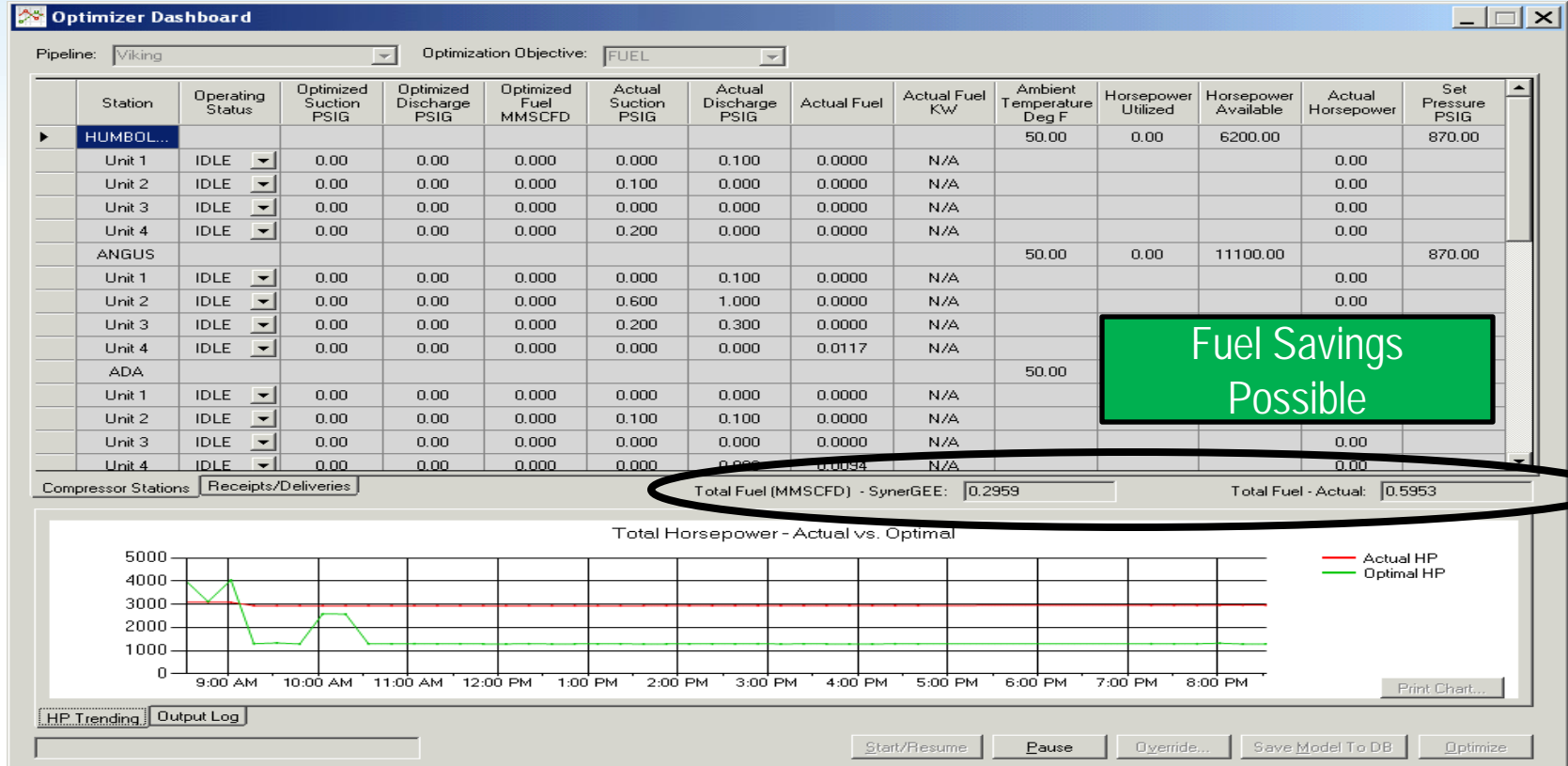
Model Output

Manual Setup and Analysis by Engineering



Main Screen

Quick picture of horsepower efficiency and fuel burn



Auxiliary Screen

Performance vs Pipeline Capacity

Optimizer Dashboard

Pipeline: Optimization Objective:

	Meter Name	Meter Number	Receipt or Delivery Meter	Volume MMCF	Actual Pressure (PSIG)
▶	Emerson	17003	R	280.984	828.272
	St. Vincent	17016	R	0.000	828.828
	Hallock	27003	D	-0.433	827.554
	Stephen	27004	D	-0.270	800.970
	Argyle	27005	D	-0.212	785.983
	Warren	27006	D	-0.756	766.023
	Thief River Falls	27051	D	-3.163	754.096
	East Grand Forks	27007	D	-3.463	691.285
	North American F...	27083	D	0.000	684.132
	Grand Forks	27008	D	-26.010	688.945
	Crookston	27009	D	-5.873	727.929
	Ada	27010	D	-0.678	672.153
	Hawley	27014	D	-1.217	633.933
	Moorhead	27011	D	-11.794	610.666
	Fargo	27012	D	-35.561	610.066

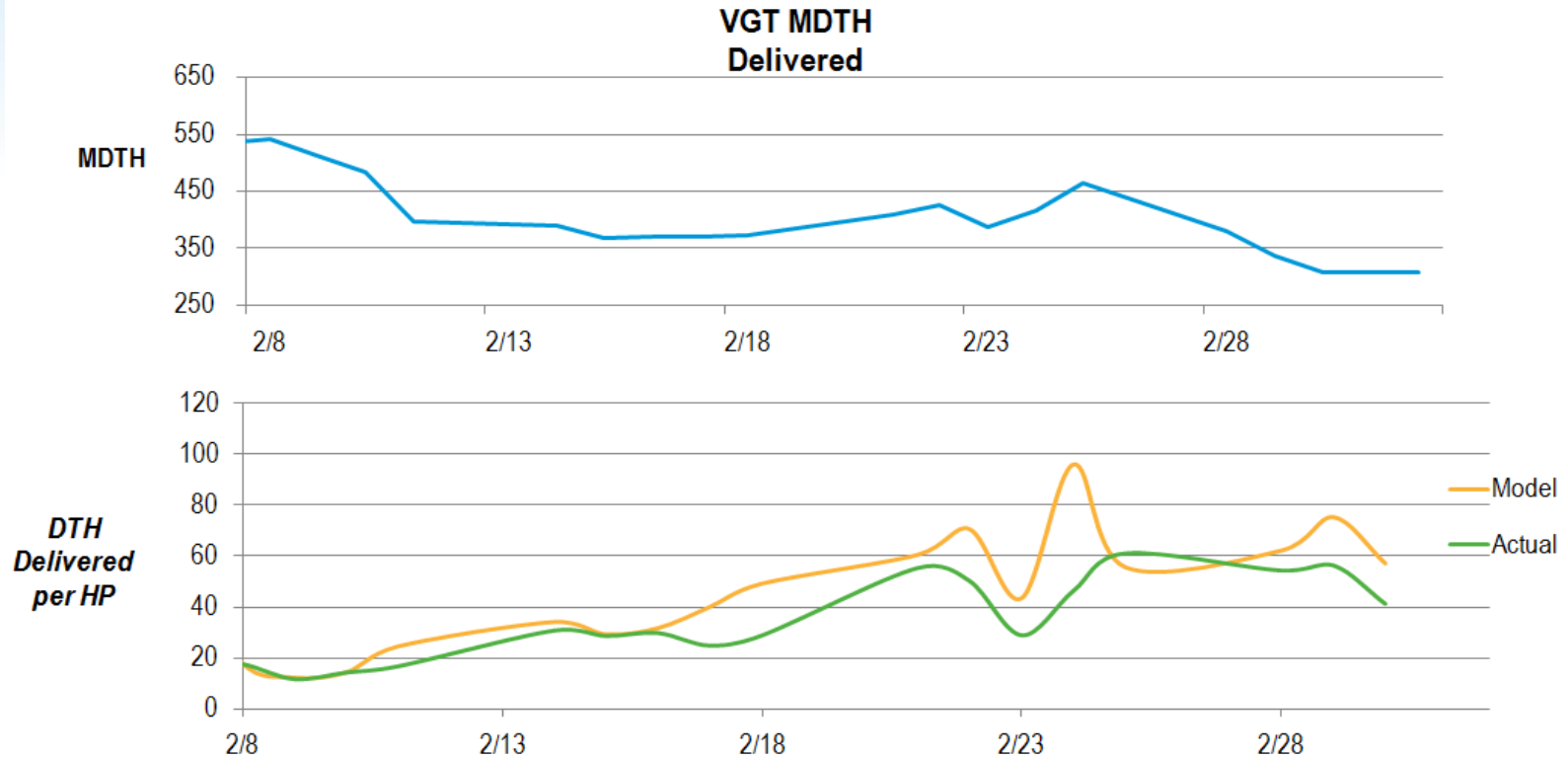
Compressor Stations Receipts/Deliveries

Total Fuel (MMSCFD) - SynerGEE: Total Fuel - Actual:

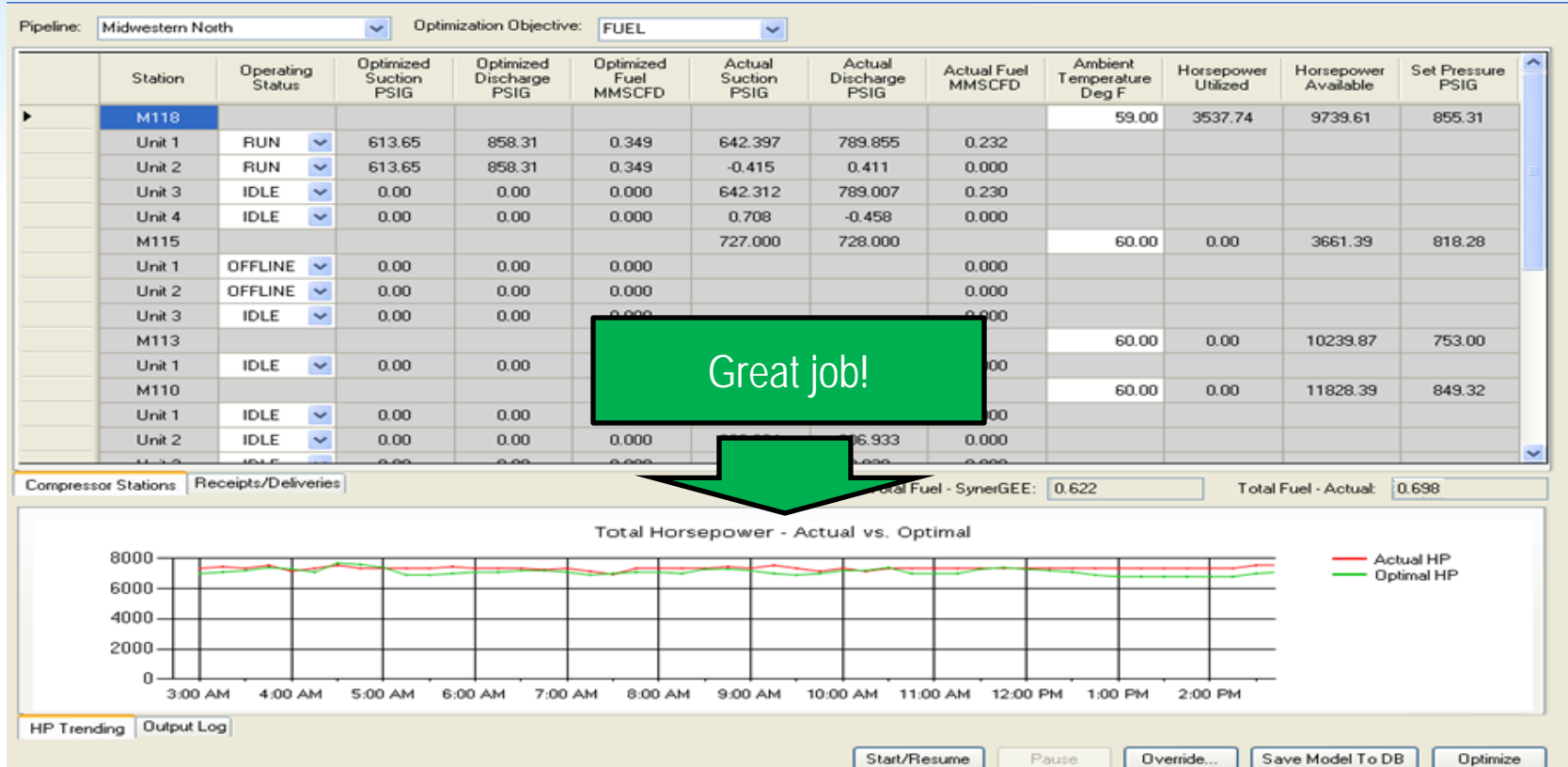
Volumes can be changed here to calculate additional overhead expense

Output Analysis

Management Tool



Actual vs. Optimal



Great job!

Measurable Outcomes

- Optimum fuel usage
- Reduced emissions
- Reduced compressor start up/blow downs
- Commercial optimization for daily capacity

Questions?