



OptiRamp Optimization for Liquid Pipelines

OptiRamp Liquid Pipeline Optimization

- How customers are using *OptiRamp* for midstream
 - Optimizing operations; e.g.,
 - Batching
 - Allocation factors
 - Pump scheduling for optimal line pack, energy savings
 - Flow, delivery assurance
 - Tracking losses
 - Event detection; e.g.,
 - Congealing
 - Leak detection
 - Slugging
 - Pigging
 - Condensate tracking
 - Modeling & real-time simulation
 - “What if” scenarios, training
 - Strategic, operational, & capacity planning
 - Rapidly assess unscheduled changes in operation
 - All customers do it differently based on their objective functions & value stream but with the same *OptiRamp* tools

Total Value Stream

Value Stream 2



- Type of System
- Manual/Automatic
- Recipes
- Lab Results

Energy Management
Open-/Closed-Loop Control
Rational SCADA

Value Stream 1



PT LT TT



PT LT TT



DRA

- Type
- \$/m³

Lab Results DRA Sample

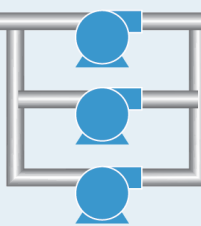
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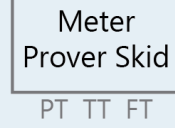
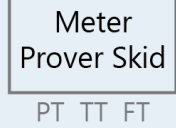
\$/KW



Midline Pumping Station



- Pig Tracking
- Congealing
- Condensate
- Leak Detection



Optimization

- Product Tanks
- Size
 - Product Specs

- Instrumentation
- Wireless
 - Hardwired
 - Type of Level Measurement
 - Temperature

SCADA

- Electric/VFD
- Diesel Engines
- Automatic/Manual
- No. of Operating Pumps
- \$/KW-hr
- Energy Contracts with utility company

SCADA

- Type of Meters
- LACT

SCADA

- Type of Meters
- LACT

SCADA

- Product Tanks
- Size
 - Product Specs

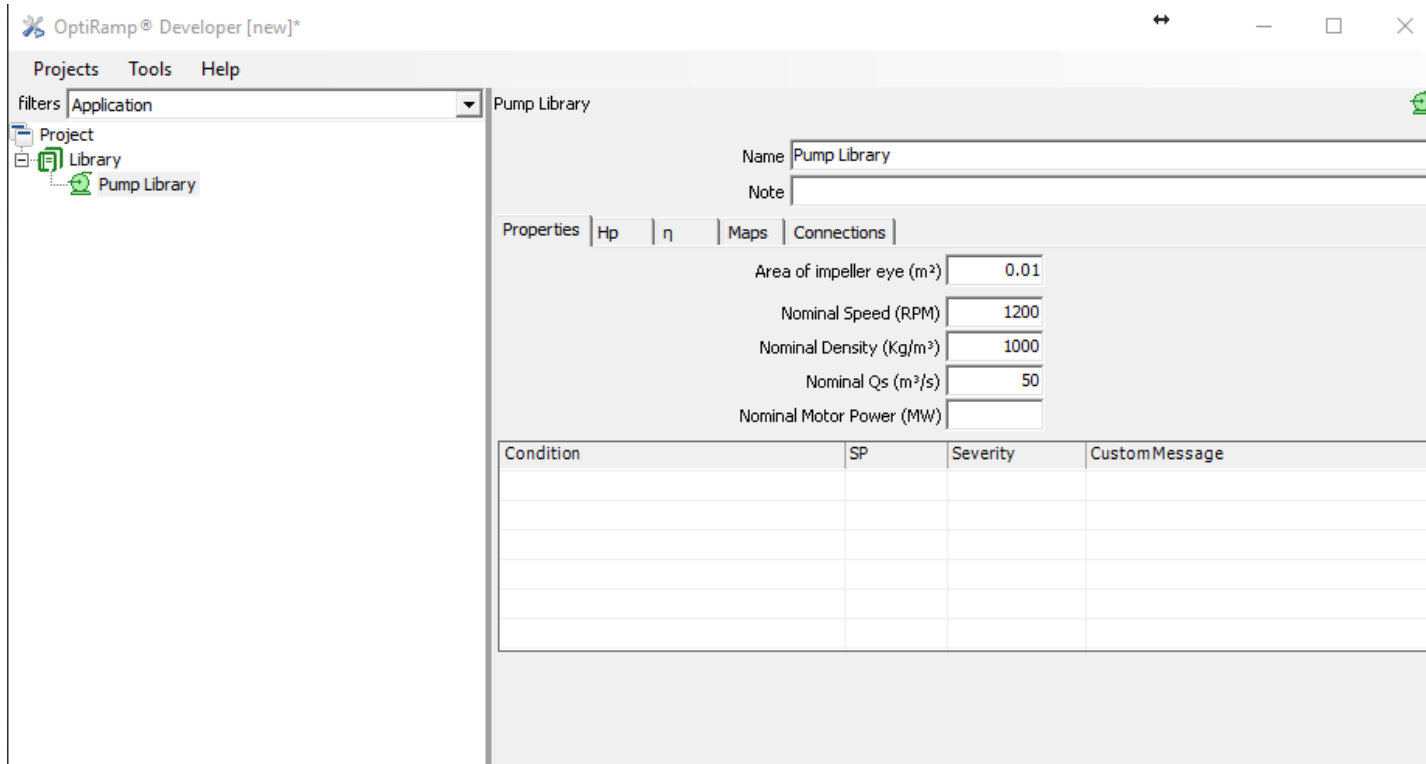
- Instrumentation
- Wireless
 - Hardwired
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SCADA

Model the Process

- *OptiRamp* models all process elements
 - Pumps
 - Pipes/Pipelines
 - Control, block, and gate valves
 - Engines/Motors
 - Fluid Properties
 - Batching
 - Unit Control, Station Control, Pipeline Control
- Process model simulates
 - Production & transportation of fluid flow, pressure, and temperature
 - Pipeline dynamic behavior
 - Large operational range to reliably replicate the process
 - Process response to disturbances
 - Liquid property changes from batching
 - Changes in operating conditions from batching
 - Energy cost and DRA costs

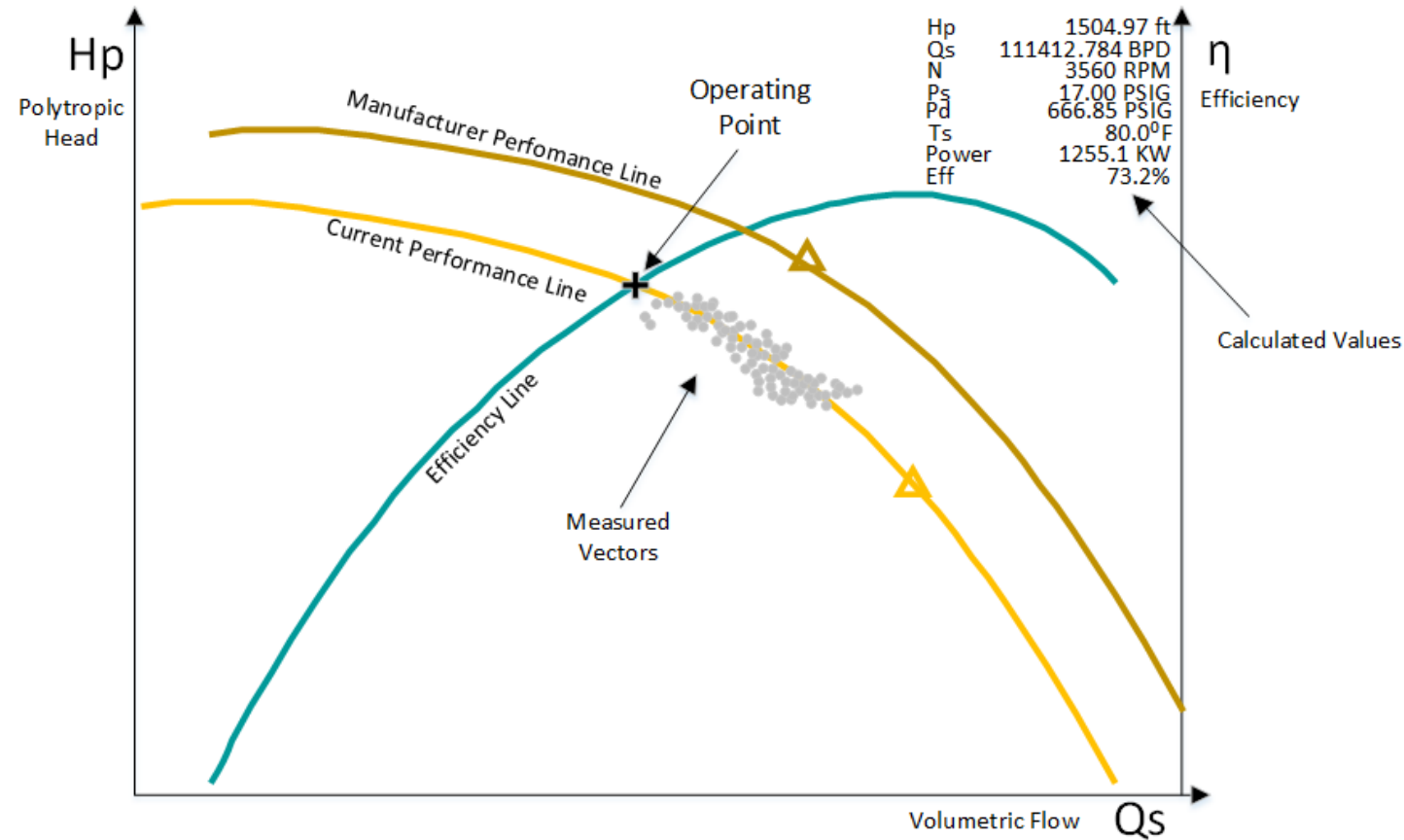
Pumps



- Pump Library
 - Allows configuration of a pump type to be connected to multiple pumps
- Parameters
 - Area of impeller
 - Nominal Speed
 - Nominal Density
 - Nominal Flow Rate
 - Nominal Motor Power

Real-Time Pump Map

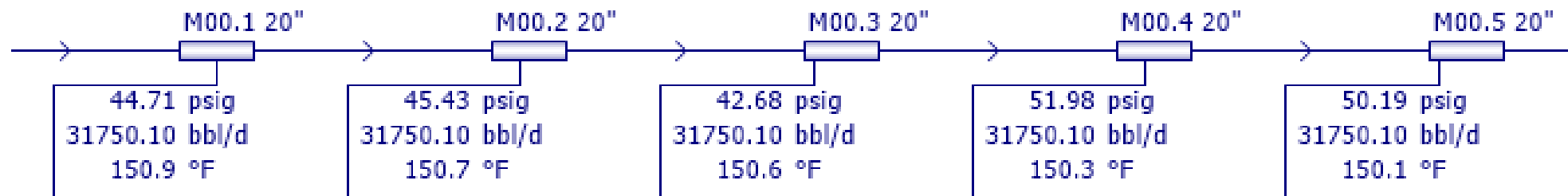
- Pump Curve
 - Shows current pump performance compared to the manufacturer's specified performance
- Displays
 - Manufacturer's Operating Line
 - Current Operating Line
 - Efficiency Line
 - Current Operating Point
 - Measured Vectors



Pipes/Pipelines

- Configured using OEM specifications
 - Standard pipe schedules and sizes included
 - Thickness and diameter may be customized
- Pressure drop calculated for each pipe segment using geometry, elevation, operating conditions

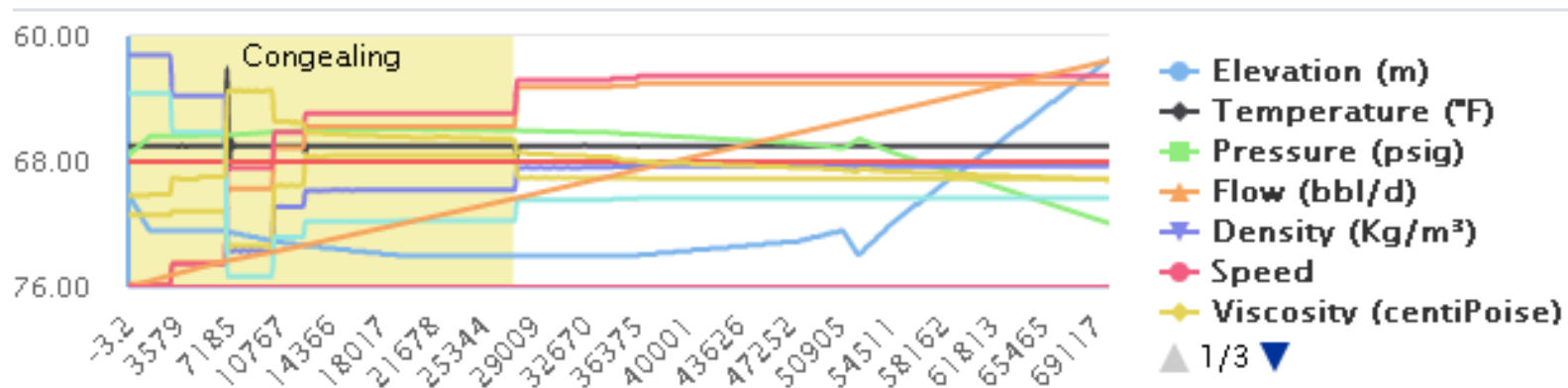
Properties	
Length (m)	6550
Elevation (m)	9.144
NPS	30
Diameter (NPS,in)	30
Roughness (NPS,in)	0.0019685
Schedule	SCH 40s/STD
Thickness (NPS,in)	0.375
Convective Heat Transfer Coeff (J/sec/m ² /K)	2.5



Congealing

- Modeling of congealing (wax precipitation) can be developed based on set of equations to detect growth of higher hydrocarbon fractions
- Based on:
 - Wax Appearance Temperature
 - Pressure and velocity of fluid
 - Chemical potentials of the fluid
 - Heat transfer and friction
 - Fugacity coefficients

- Benefits:
 - Detect wax formation in pipelines
 - Reduce over pressuring and downtime of pipeline
 - Forecast wax formation for quick action

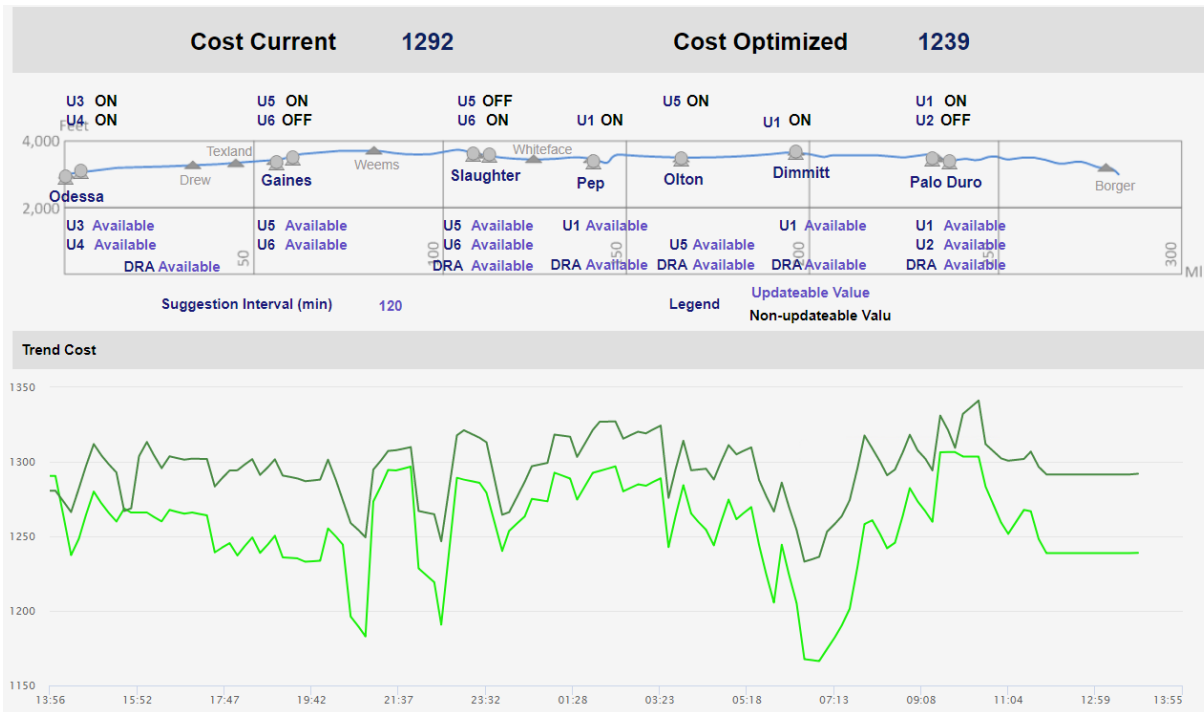


Pump Station Optimization

- Optimization algorithms automatically run with predefined objective function and constraints as inputs
 - Pipeline Pressure Limits
 - Pipeline Flow Target
- Provide pump on/off suggestions based on current load, performance
- Goals:
 - Reduce energy consumption
 - Increase savings
 - Maximize pipeline productivity

NAME	INITIAL	OPTIMIZED	ON STA1_UNIT1
Total Cost.Total Cost	1302.29	1292.11	1259.12
Station1.Downstream Pressure (PSIG)	736	736	736
Station2.Downstream Pressure (PSIG)	692	692	692
Station3.Downstream Pressure (PSIG)	1112	1180	1180
Station3.Sta3_Unit1	On	On	On
Station3.Sta3_Unit2	On	On	On
Station4.Downstream Pressure (PSIG)	681	749	904
Station4.Sta4_Unit1	On	On	On
Station4.DRA Station4.SP PPM	42	42	6

Strategic Operational Planning



Comparing Now to Optimized

- Compares current running scenario to optimized set point
- Suggests set points to drive down cost of operations
- Takes pipeline constraints into consideration to remain in proper operating envelope
- Takes into account pump and DRA availability for optimization

OptiRamp Liquid Pipeline Optimization

Optimize your performance today

OptiRamp is the leading software for optimization in liquid pipeline production. It thrives in real-time decision making and thrives in industrial environments where time is critical. Our software helps build knowledge and gives users a competitive advantage by delivering actionable recommendations to its users. As a result companies can maximize their flow production and minimize their costs to keep their assets running longer, efficiently, and safer. For information contact sales@optiramp.com for demonstration of this solution.