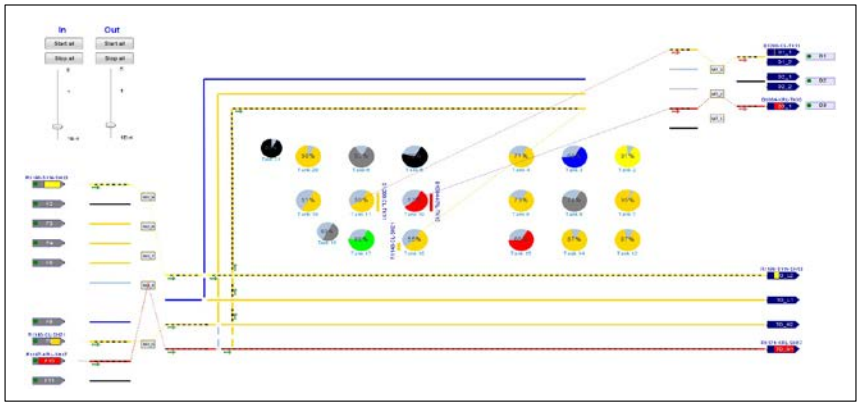
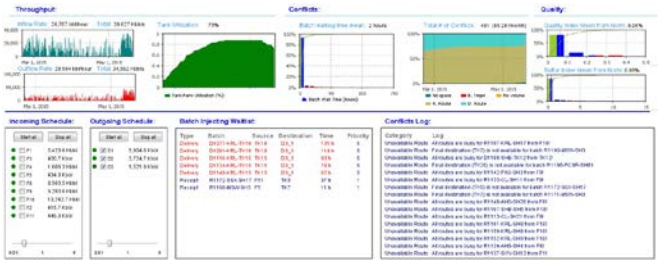
STREAM
systems in motion

Crude Oil Pipeline Merchant Terminal - Greenfield

Case Study

- Merchant Tankage
- Terminal Routing Optimization
- Scalable Infrastructure
- Batch Auto Scheduling
- Custom Business Rules
- Quality Impact Analysis
- Sensitivity and Optimization Analysis
- Capital Projects Scoping
- Feasibility Assessments
- Service level of shipper contract assessment





The Challenge

The client proposed a new greenfield merchant oil terminal nested within two existing oil terminals consisting of connections to several feeder pipelines and respective meter manifolds, a crude oil product terminal storage facility, delivery facilities in form of rail car loading and pipelines, and several long transfer lines between the three terminals.

The client was not able to justify building the new merchant terminal based on the estimated capital cost. The project team had suggested to save cost by replacing dedicated tank lines with shared tank lines, but as the operations team had no experience with this set up, they were not sure they could deliver the throughput committed to potential shippers. The project was stalled. Stream Systems was engaged to determine if the new design of the terminal met throughput expectations.

During initial discovery meetings the operations team voiced worries about maintaining the quality of the sweet crudes when having to give up dedicated tank lines as a safeguard to separate sweet crudes from sour crudes present in the terminal. Another question raised was the amount of conflicts the shared equipment would result in. Quality aspects like sulphur and density tracking and conflict recording became an additional model requirement.

The client subject matter expert who was expected to use the model at the end of the engagement was very sceptical about his ability to use the model himself, an expectation his business leaders had.

Business Objectives

- Reduce the capex for the merchant oil storage facility while maintaining service level requirements.
- Simulate the operation to find the optimal design for the tank lines, the meter manifolds and the transfer lines.
- Maximize utilization levels of major terminal components.

Consideration of the following operations variables:	Consideration of the following terminal design variables:
• Monthly nomination target per shipper and crude • Batch sizes and frequencies rules • Tank allocation, management and switching rules • Meter allocation rules • Routes per commodity with priorities • Conflict resolution and wait list rules • Multi-commodity, commodity pools • Quality calculation • Line management rules	• Incoming/Outgoing/Pipelines/ • Transfer Lines, single direction, bi-directional • Rail loading • Max rates, • Line fill • Tanks, working volume, bottoms • Meter/Manifolds inbound and outbound • Connectivity

Solution

Stream's approach was to focus on terminal throughput and conflicts first, before addressing quality questions.

The challenges addressed in the initial phase included:

- Design a auto batch scheduler meeting monthly nominations for crudes varying from synthetics to dilbits
- Inbound transfer lines with active line management
- Terminal throughput
- Terminal conflicts and types
- Utilization of tanks, transfer lines and meters
- Quality impact of sweet and sour crudes per batch with focus on inbound

This phase shifted the focus to equipment utilization and sulphur pick up as the biggest challenge for the terminal.

Then the scope was expanded to include additional variables such as:

- Outbound transfer lines with active line management, line priming and line push backs
- Mini manifolds reducing shared tank lines impact
- Meter configuration changes
- Tanks floating and tank to tank transfers
- Nomination stress tests increasing volumes and light vs heavy proportions

Results

As a result of Stream's simulation modeling, the client was able to find a feasible design for meter configuration, transfer lines and shared tank lines reducing CAPEX by over 10% of initial project estimate resulting in over $85 million in savings.

The volume stress tests and quality checks on batch level gave additional assurance about the operability of the new terminal.

The client looked to Stream to teach them how to set up experiments and test cases, which we did. Now they have both a working optimization model and the skills to conduct experiments.