FUEL OIL DISTRIBUTION

Steinmüller used Flownex to simulate a fuel oil distribution network. The Flownex models served as a comparison study between the current fuel distribution network and proposed changes to the network. By implementing the proposed changes and accurately simulating the proposed changes, Steinmüller was able to efficiently make design decisions and determine the possible cost implication due to the changes.

POWER INDUSTRY

CUSTOMER PROFILE:

Steinmüller is an innovative engineering services provider operating in Southern Africa for over 45 years. With the global backing of the Bilfinger-Berger Group they excel at developing, implementing, optimising and maintaining industrial plants using state-of-the-art technologies.

CHALLENGE:

Steinmüller used Flownex to simulate a fuel oil distribution network. The Flownex models served as a comparison study between the current fuel distribution network and proposed changes to the network. By implementing the proposed changes and accurately simulating the proposed changes, Steinmüller was able to efficiently make design decisions and determine the possible cost implication due to the changes.

BENEFITS:

By using Flownex and its ability to calculate momentum conservation, Steinmüller can calculate the system resistance and associated pressure drop with the fuel oil distribution pump at different positions. This provided Steinmüller with the pressure difference over the system and determined the impact of the different layouts on the fuel oil distribution pump.

SOLUTION:

The "what if" study on the fuel oil distribution network provided Steinmüller with accurate predictions of the fuel oil flow and allowed the engineers to make critical decisions with great certainty. It was found that the oil pressure inside the supply manifold remained relatively constant throughout the system, which leads to acceptable fuel supply deviation between the different units.

"Excellent for "What if" studies"

Philip Oosthuizen
Senior Process Engineer
Steinmuller Engineering Services

STEINMULLER – FUEL OIL DISTRIBUTION

INTRODUCTION

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CHALLENGES

Being able to calculate the integrated system resistance or pressure drop enables one to determine the pump, fan or compressor operating conditions. Therefore the size of the pumps, fans and compressors can be determined.
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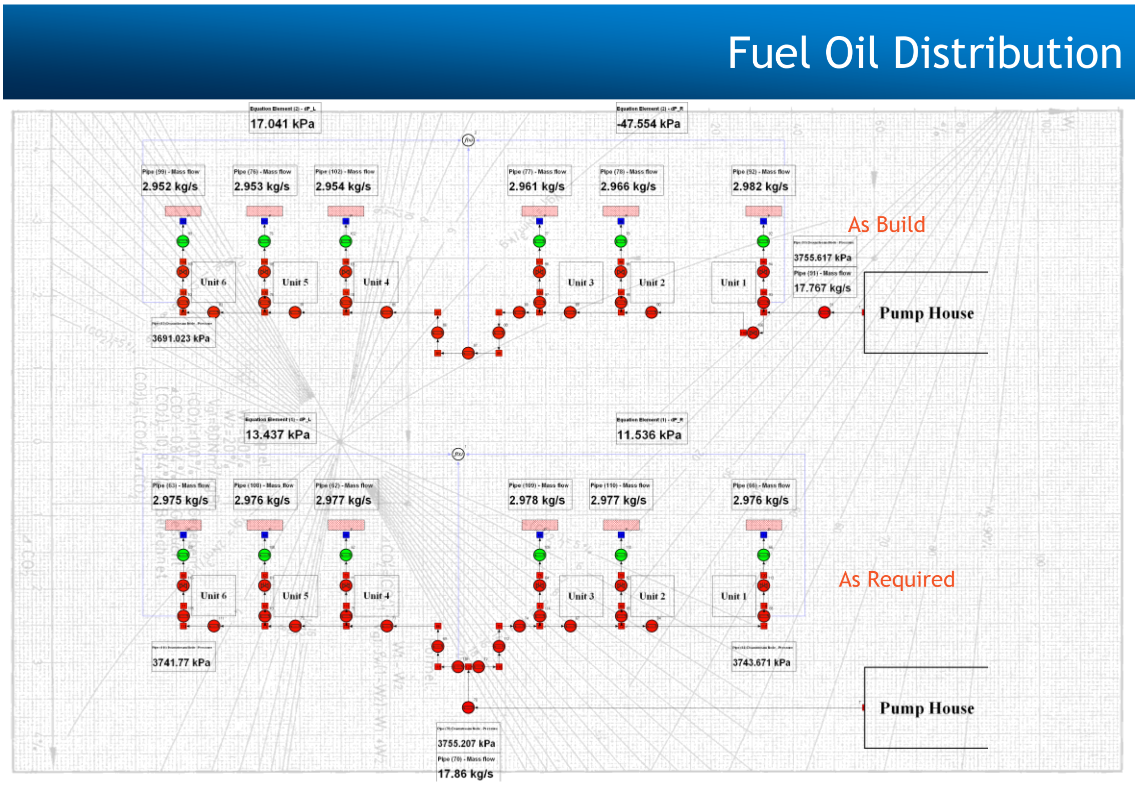

Steinmüller
engineering services

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From the momentum equation we can see that the mass flow will be affected if the forces (resistance) differ for the different branches. Therefore, in order to force the flow to be similar in each branch, the resistance path for each branch should be similar. With the pump in the incorrect position and many high primary resistances in the line (due to long pipe runs) it will cause an increased pressure drop and as a result larger pumping power required to balance flow at the branches further away from the pump.

SOLUTION

The integrated system resistance in all the pipes is taken into account in the conservation of momentum in Flownex. This ensured that Steinmüller could set up an accurate model of an existing fuel oil distribution network. After obtaining similar results compared to the actual fuel oil distribution network it was discovered that due to the large diameter ratio of the supply manifold and fuel oil spray nozzle, a high enough back pressure is created to pressurize the whole manifold.

Heat loss from the pipes to ambient conditions was also taken into account, for the viscosity of oil changes drastically with temperature, especially in the low temperature range. The heat transfer properties of the pipe and insulation layers were taken into account and appropriate free convection heat transfer correlations were implemented to accurately predict the temperature distribution throughout the system.

RESULTS

The “what if” study on the fuel oil distribution network provided Steinmüller with accurate predictions of the fuel oil flow and allowed the engineers to make critical decisions with great certainty. It was found that the oil pressure inside the supply manifold remained relatively constant throughout the system, which leads to acceptable fuel supply deviation between the different units.

The ability of Flownex to simulate various scenarios quickly also allowed the engineers to do a cost analysis on the current pumping power required and the power required after the pump connection relocation. It was found that the design change had no cost impact on the pumping station and some money was actually saved due to less material being required for the supply piping.

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