District Heating System Modernized Using AFT Fathom™

CASE STUDY

Hot Water System for HVAC

Commercial Building Industry

Energoprojekt Katowice
Katowice, Silesia, Poland
Platinum Pipe Award Winner - Software Features and Model Creativity

Energoprojekt Katowice was responsible for basic engineering in a project of modernizing a district heating system in Poland. AFT Fathom was used to model the heating water system for many heat loading and unloading cases in the winter time and summer time.

Energoprojekt's engineer, Adam Klepacki, used the Scenario Manager to effectively model various ambient temperature conditions to determine the required pump head rise values to meet specific flow and heating demands.

> "The possibility to perform scenario analyses...and use of [the] GSC module allowed me to complete all tasks and save a lot of time. Saving time for the engineer mean[s] saving the money for the company."

Klepacki used the Goal Seek and Control (GSC) module extensively to vary the pump head rise values to achieve specific flow rates.

The heat exchanger sections were used in combination with flow control valve bypass loops to control the district water heating. In order to control the temperature of the system fluid flowing into the "heat accumulator" which was used to buffer heat production, a recycle stream at a particular temperature was mixed together with a flow stream at a different temperature. The system fluid mixture temperature was controlled with the use of a flow control valve in the recycle stream. The model also accounted for heat input to the system fluid from the pumps through the use of the "heat addition to fluid" feature in the pump specification windows.

Klepacki used the "Fill as Quadratic" feature to generate resistance curves to model the pressure losses for valves, screens, and heat exchangers. In order to keep the model from becoming overly complex, various fittings and losses such as bends, valves, and screens were included in the pipelines themselves as additional pipe fittings and losses.

Klepacki used AFT Fathom's reservoir icon to model the heat accumulator (see Figure 1). The water level in heat accumulators is constant; the only thing changing is the amount of hot and cold water. Hot water is in the upper part of the reservoir (pipe connected to the top) and cold water is in the lower part (pipe connected to the bottom).

In commenting on the benefits of modeling this system with AFT Fathom, Klepacki said; "It would be very difficult and time consuming to calculate such [a] complicated system without specialized software. The possibility to perform scenario analyses (for different operation regimes) and [the] use of GSC module (calculation of main pumps head rise in relation to required water flow) allowed me to complete all tasks and save a lot of time. Saving time for the engineer mean[s] saving the money for the company. Another very important thing is when we need to introduce changes. There is no problem with such a model because every change in the design data can be easily implemented and new results are available in a few seconds."

Klepacki continued; "All of this means benefits for the design process but it is very important to say that a very detailed analysis brings benefits also for the investor who knows that selected pumps exactly match his needs and the system will operate without unnecessary losses."

Energoprojekt Katowice is a leading engineering firm providing design services for conventional power plants, thermal power plants and heating plants.

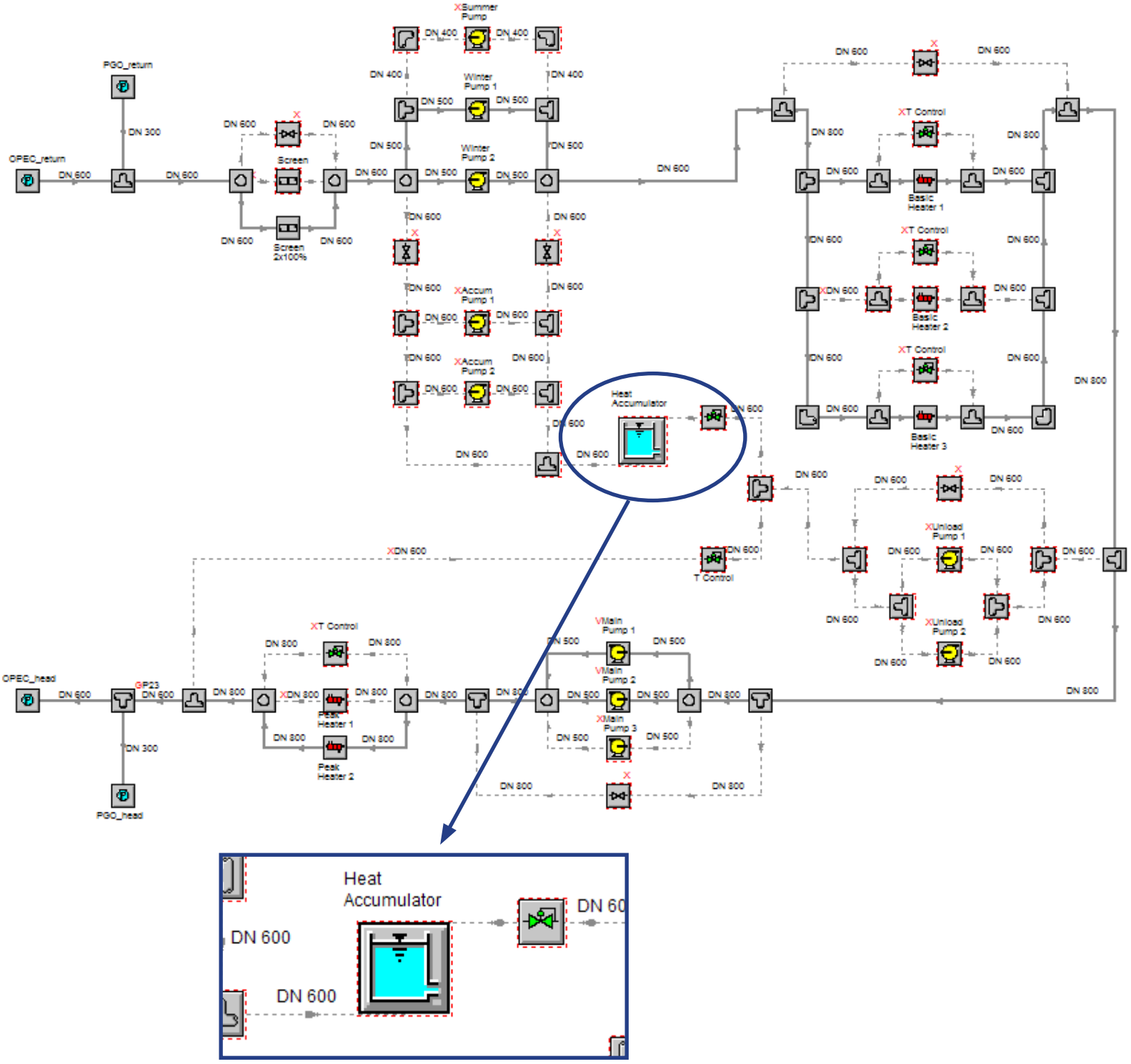

Figure 1 - AFT Fathom model using the reservoir icon to model the heat accumulator