University of Alabama Reduces Energy Usage with AFT Fathom™ - Saves $60,000 a Year

CASE STUDY

Chilled Water System

Campus & Educational Facility Distribution Industry

Bernhard TME Engineering
Little Rock, Arkansas, USA
Platinum Pipe Award Winner - Operational Benefits and Sustainability

Bernhard TME Engineering (TME) was awarded a project by the University of Alabama at Birmingham to create a hydraulic model of their existing district chilled water system. Three existing chilled water plants with 38,100 tons (34,600 metric-tons) of cooling capacity serve 48 existing buildings on the campus, covering a little more than a square mile (2.5 square kilometers) of area (see Figure 1). The chilled water is used for air conditioning the buildings in the hot and humid southeastern USA.

The university also asked TME to (1) model new piping plans and two additional 8,000-ton (7,300 metric-ton) chilled water plants to support the university's expected 20-year growth, and (2) provide strategies for optimizing their current plant operation to be more energy efficient. The plant operates off of a fixed differential pressure set point based on the combination of dry bulb and wet bulb outside air temperature. The differential pressure set point has been proven to satisfy the chilled water demand of the buildings after years of experience, but is not necessarily the most efficient way to do so.

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Brandon Smith, commissioning technician, and Wei Guo, energy engineer, at TME, used AFT Fathom to create a hydraulic model of the existing chilled water system.

Smith and Guo were able to run simulations with the the chilled water plants' pumps in several different arrangements in order to determine the most efficient way to run the plants.

A major step to reduce the plant differential pressure set points and reduce overall energy cost was to determine the most hydraulically remote building and add booster pumps to that building. Due to the very large and multi-branched piping layout of the campus, the most hydraulically remote building was not able to be guessed at based on building size or location.

However, with AFT Fathom, Smith and Guo were able to determine the most hydraulically remote buildings based on which building's control valve was most open. Knowing which buildings were most critical allowed TME to add booster pumps and run several different scenarios to determine the best operating condition for the plant.

"This project simply would not be possible without the tools and features that AFT Fathom provides," said Smith. "The ability to quickly change pump speeds via the AFT Transfer sheet [in Excel] and be able to see valve positions when running analysis is invaluable!"

After running the analysis, TME determined through the use of AFT Fathom that one building was causing all of the plants to run at differential pressures much higher than necessary. By adding a booster pump to that building, the campus is able to obtain an annual savings of $60,000 a year.

Bernhard TME Engineering is a full-service mechanical, electrical and energy engineering firm in 14 locations across the country and is comprised of expert professionals dedicated to providing their clients with innovative engineering design and energy conservation. Bernhard TME has provided consulting engineering and energy services for more than 4,500 projects at more than 1,500 facilities across the nation.

Smith and Guo also utilized AFT Fathom to assist with designing the proper pipe sizes for the university's future growth. Additionally, the model is now set up to help make future design decisions such as chilled water plant locations and building booster pump locations, and also assist in determining the best sequence of operations for the plant's optimal savings.

"We were very impressed by how quickly AFT Fathom's is able to process and calculate solutions for such a large piping network," said Smith. "Without the speed of AFT Fathom, this type of modeling project would not have been economically feasible for the university to invest in."

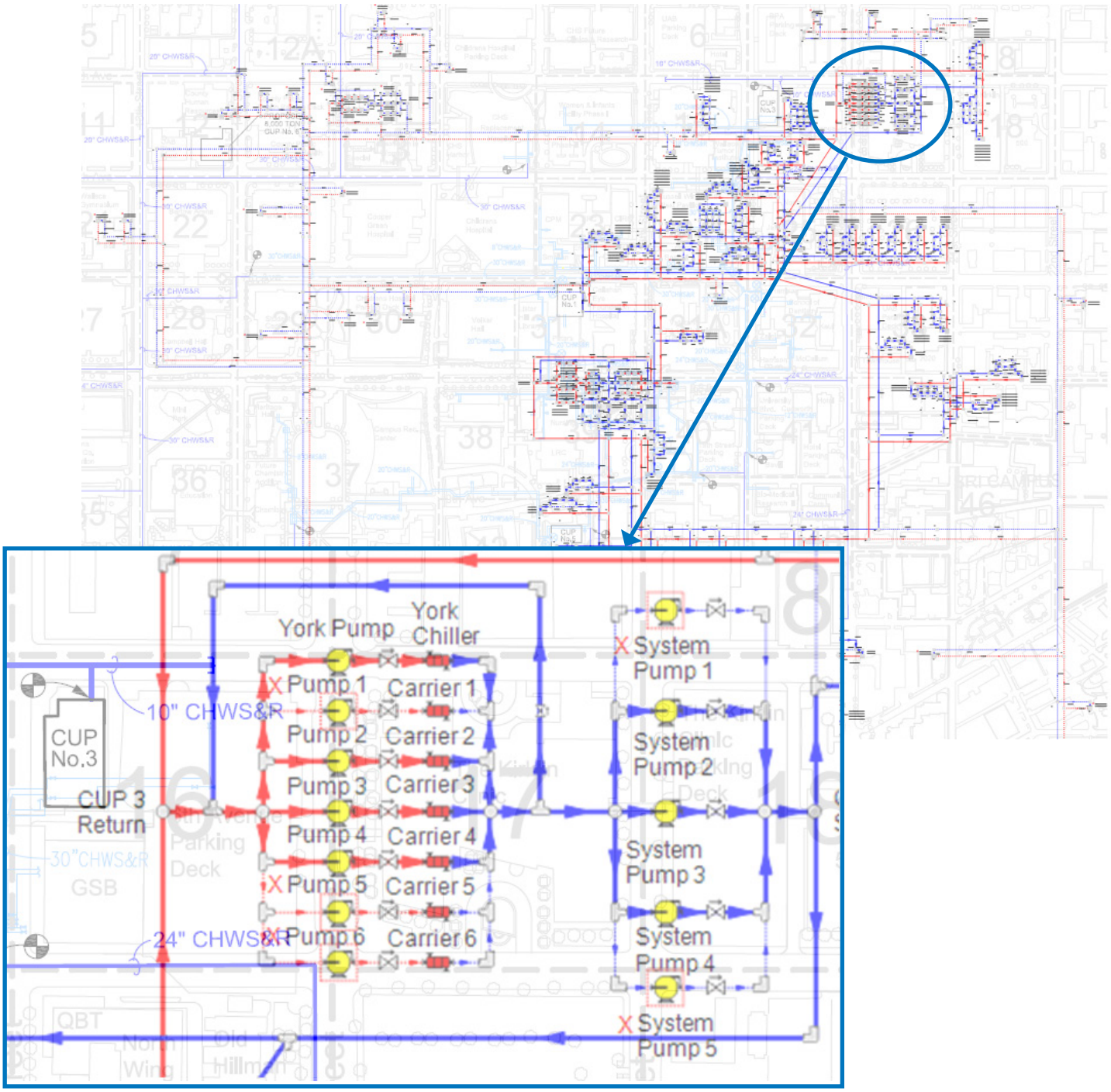

Figure 1 - AFT Fathom model built of chilled water system on top of the university's campus map