# Significant Man-Hours Saved by Transitioning AFT Fathom™ Model to AFT Impulse™ to Analyze Surge Transients

CASE STUDY

**Refinery Cooling Water**
Oil & Gas Industry

Applied Flow Technology

## Fluor
## Hoofddorp, The Netherlands
## Platinum Pipe Award Honorable Mention: Use of software features and model creativity

Loukas Papathanasiou, Process Manager for Fluor, utilized AFT Fathom and AFT Impulse to complete the design of a cooling water system and the analysis of that system's surge transients. Using both software programs together gave him the ability to easily simulate, analyze, and troubleshoot the massive system.

Papathanasiou created a steady-state model in AFT Fathom to simulate the cooling water hydraulics during a major upgrade to a refinery in Kuwait. Part of the Kuwait National Petroleum Company (KNPC) Clean Fuels Project (CFP), the Mina Abdullah Refinery was expanded to refine 454,000 bpd via this multi-billion-dollar project.

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Fluor designed and constructed the new cooling water system, which circulates 40,300 m3/h (177,000 gpm) of cooling water to the new CFP units.

Papathanasiou used AFT Fathom to size the equipment and to model heat transfer to determine fluid temperatures. Then the extensive AFT Fathom model was used to generate the AFT Impulse model (Figure 1) which preformed the surge analysis to ensure technical integrity during transient events, in compliance with the international standards (ASME, AWWA) and the SHELL Design and Engineering Practices (DEP).

The AFT Fathom model made extensive use of the heat exchanger feature to properly size and ensure the capacity of the equipment for the upgrade.

The AFT Impulse model made use of the discrete gas cavity model (DGCM) to calculate cavitation and vapor formation. This was important for the execution of this study considering extensive vacuum generation and collapse had been occurring in various locations throughout the system.

The dual vacuum break/air release valve feature was important too, as these were used to mitigate the excessive surge pressures by letting in atmospheric air to prevent low vacuum pressures.

Finally, the Scenario Manager contributed in optimum handling of changes and operating cases in the model as it automatically applied the change to all sub-scenarios.

The model was created based on thousands of isometrics. "Using the seamless transfer from the AFT Fathom steady state hydraulic model to the AFT Impulse, the manhours spent for the surge analysis were significantly reduced, resulting in reduced cost and schedule for this Lump-Sum project," said Papathanasiou.

*Fluor Corporation is a multinational engineering and construction firm headquartered in Irving, Texas. Fluor is one of the world's largest engineering, procurement, fabrication, construction and maintenance (EPFCM) companies, providing innovative and integrated solutions to government and private sector Clients in diverse industries. For over a century, Clients have trusted Fluor to successfully, ethically and safely complete their capital projects.*

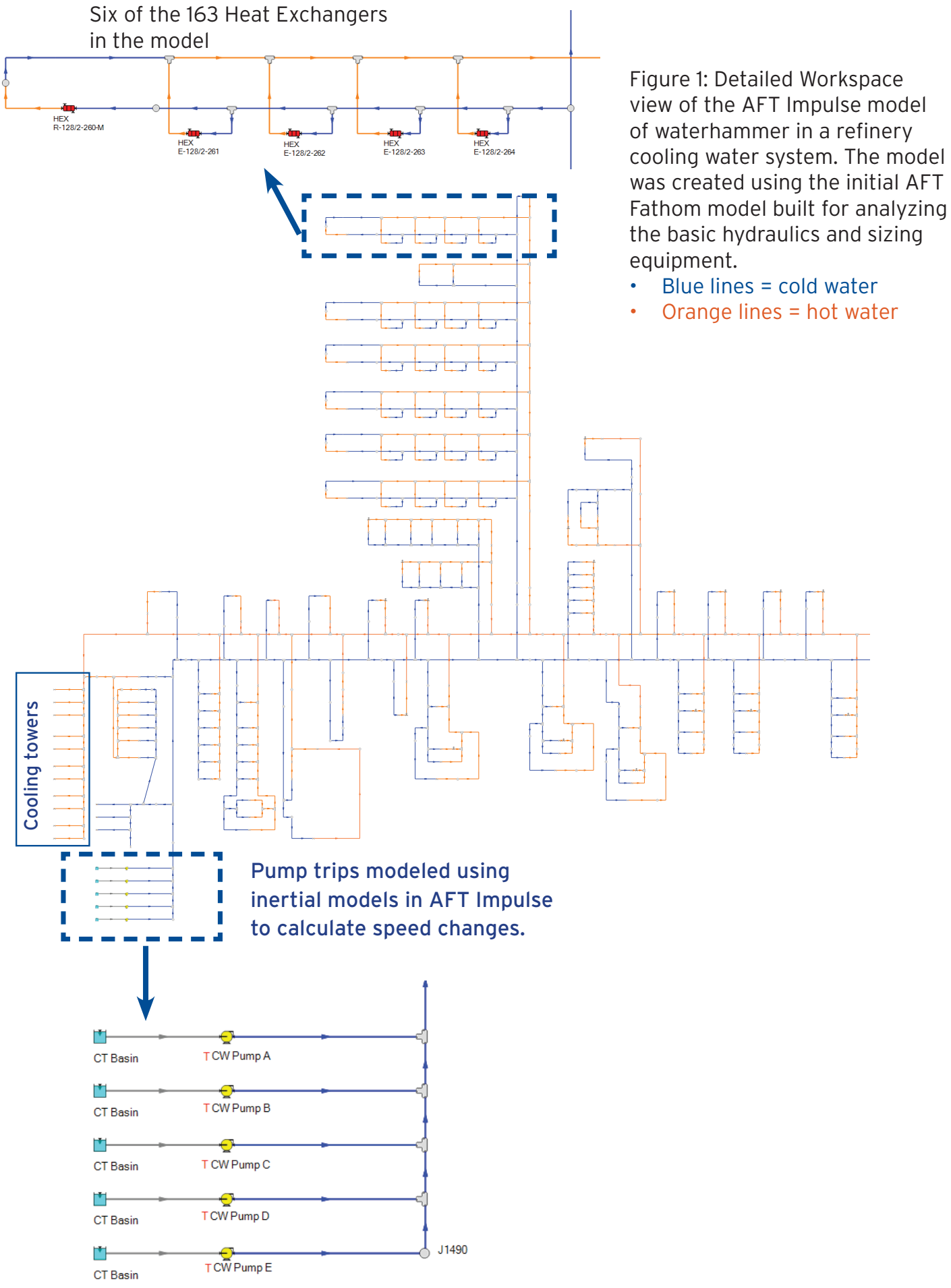


Figure 1: Detailed Workspace view of the AFT Impulse model of waterhammer in a refinery cooling water system. The model was created using the initial AFT Fathom model built for analyzing the basic hydraulics and sizing equipment.

- Blue lines = cold water
- Orange lines = hot water