

AFT Fathom™ Improves Water Cooling System Reliability and Saves \$200,000 Annually

CASE STUDY

Refinery Cooling Water System
Oil & Gas Industry



Flowserve Corporation Elkton, Maryland, USA Platinum Pipe Award Winner - Operational Benefits and Sustainability

Phil Sneeringer, Tier 1 reliability engineer at Flowserve Corporation, used AFT Fathom to perform a cooling water study at an existing refinery in the Midwest, USA.

The purpose of the study was to identify the most economical scenario to run their cooling water pumps and provide a solution for the excessive erosion at the suction bell of an existing high-performing pump (Figure 1).

Operational confidence in the pump and system reliability had decreased due to equipment downtime which resulted in nine work orders totaling \$126,000. Four of those work orders included high vibrations or other substantial mechanical failure.

With reliability issues, excessive downtime, and repairs amounting to \$126,000, AFT Fathom was used to determine a new pump configuration that increases reliability and saves \$200,000 a year in energy!

Sneeringer's team was asked to monitor the system to determine why pumps were having premature suction bell erosion, and then identify the most economical way to run the cooling tower pump system.

Using wireless technology, flow and pressure data was collected throughout the system. They then used this data to model and analyze the system and tune an AFT Fathom model (Figure 2). Their AFT Fathom model predicted almost exactly what their field data showed. Sneeringer states, "the accuracy achieved was excellent."

Based on several AFT Fathom modeled scenarios, Flowserve then presented the refinery with six

recommended pump configurations that would provide the required flow and head to remove heat from the units (Figure 3).

By using AFT Fathom, the customer had the required data to change the way they ran their cooling water pumps. They were able to achieve the required cooling at the units while running with 4 pumps instead of 6 (Figure 4). This saved them \$200,000 per year in operating cost!



Figure 1 - The P-103 VTP cooling water pump and a closer look at the damage in the suction bell.

Flowserve's global team consists of more than 18,000 employees in 55 countries who put together the total solution—from project planning to lifecycle maintenance programs to some of the most proven technology on the planet. Flowserve has more than two centuries of history—and this deep experience enables them to be a go-to resource for solving the toughest challenges across all industries.

Tuned AFT Fathom Model			
Flow Measurements	Field Measured	AFT Fathom Model	Differential
Flow Meter #1	13,664 GPM	13,597 GPM	0.5%
Flow Meter #2	578 GPM	578 GPM	0.0%
Spot Check #3	5,668 GPM	5,697 GPM	0.5%
Spot Check #4	8,086 GPM	8,040 GPM	0.5%
Spot Check #5	11,920 GPM	11,895 GPM	0.2%
Spot Check #6	7,412 GPM	7,399 GPM	0.1%
Flow Calibration	47,328 GPM	47,206 GPM	0.25%

Figure 2 - Field data was used to tune an AFT Fathom Model. The AFT Fathom model was "highly accurate."

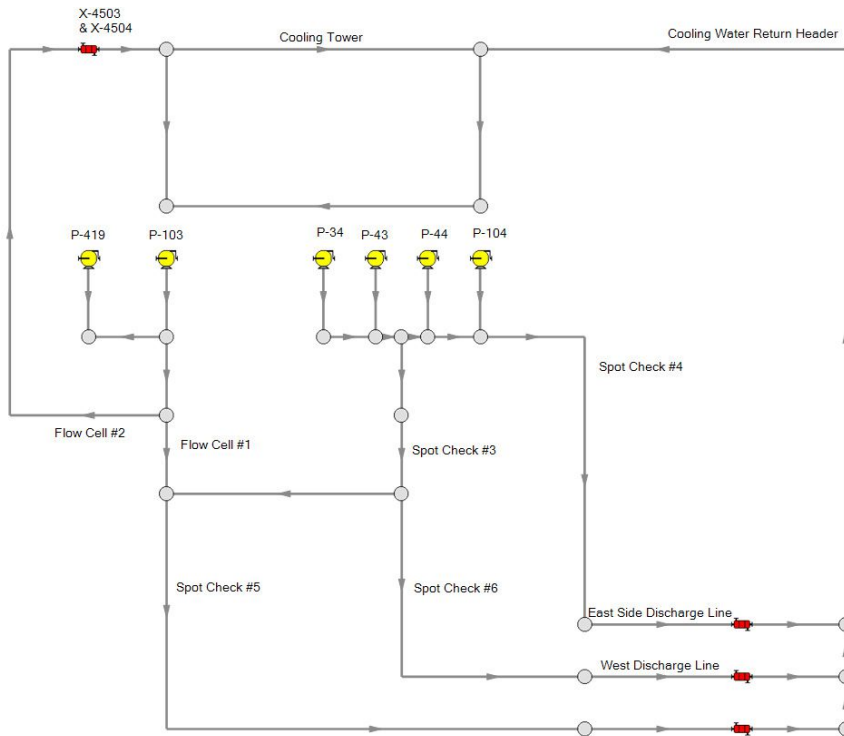


Figure 3 - AFT Fathom model of the existing system used to create new pump configuration scenarios.

Existing Pump Operation								
Pump	Flow in GPM	Head in TDH	Efficiency	% of BEP	HP	GPM / HP	NPSHA/NPSHR	Cost/Year
P-419	6,376	191	71.0%	60.0%	428.4	14.88	26.75 / NA	\$195,788.00
P-103	7,788	196	84.0%	99.0%	455.5	17.09	26.75 / 8.0	\$208,196.00
P-104	3,438	209	75.0%	73.0%	241.9	14.21	26.77 / 15.0	\$110,549.00
P-44	3,437	209	75.0%	73.0%	241.9	14.21	26.77 / 15.0	\$110,543.00
P-43	3,435	209	75.0%	73.0%	241.9	14.21	26.77 / 15.0	\$110,537.00
P-34	3,431	209	75.0%	73.0%	241.9	14.21	26.77 / 15.0	\$110,522.00
Totals	27,905				1851.5	15.07		\$846,135.00

Optimal Pump Operation Using AFT Fathom								
Pump	Flow in GPM	Head in TDH	Efficiency	% of BEP	HP	GPM / HP	NPSHA/NPSHR	Cost/Year
P-419	7,987	174	80.0%	76.0%	438.0	18.24	26.75 / NA	\$200,366.00
P-103	8,669	180	83.0%	110.0%	470.0	18.44	26.75 / 10.7	\$214,809.00
P-104	0	OFF	OFF	OFF	0.0	OFF	OFF	\$0.00
P-44	0	OFF	OFF	OFF	0.0	OFF	OFF	\$0.00
P-43	4,670	174	81.0%	99.0%	253.0	18.46	26.77 / 19.8	\$115,539.00
P-34	4,664	174	81.0%	99.0%	253.0	18.43	26.77 / 19.8	\$115,514.00
Totals	25,990				1414.0	18.38		\$646,228.00

Cost Savings

Figure 4 - Identifies the existing pump operations compared to the optimal pump operations for the cooling water pump system. The cost savings is approximately \$200,000 per year.