AFT Fathom™ Provides Accuracy and Confidence at Ameren Missouri

CASE STUDY

Gravity Drain System

Power Generation Industry

Ameren Missouri
St. Louis, Missouri, USA
Platinum Pipe Award Winner - Correlation to Test/Field Data

Jeff Shelton, performance engineer at Ameren Missouri, used AFT Fathom to model the gravity drain systems from the lowest pressure heaters at two coal-fired power plants, Rush Island and Labadie. Drain line configuration changes were being considered for the Labadie plant.

In order to have confidence in the AFT Fathom results, a model of the Rush Island #6 heater drain line configuration was made and the data collected was used to benchmark the model. Rush Island was chosen as the benchmark because its drain line configuration worked well and was similar to changes being considered at Labadie. The purpose of the benchmark was to compare the control valve position predicted by AFT Fathom to that observed in the plant.

> "AFT Fathom allowed us to identify a previously unknown design flaw"

AFT Fathom was used to model the normal drain line system on the lowest pressure feedwater heaters. These heaters drain to the condenser and contain a control valve that modulates to maintain a normal water level in the heater. At the Rush Island Energy Center, the drain line comes off the bottom of the heater, travels down one elevation and penetrates the condenser wall below the waterboxes.

Flow control valve position data was obtained for three load conditions; one at high load (~660 MWs), one at low load (~300 MWs), and one in between (~450 MWs) (see Table 1).

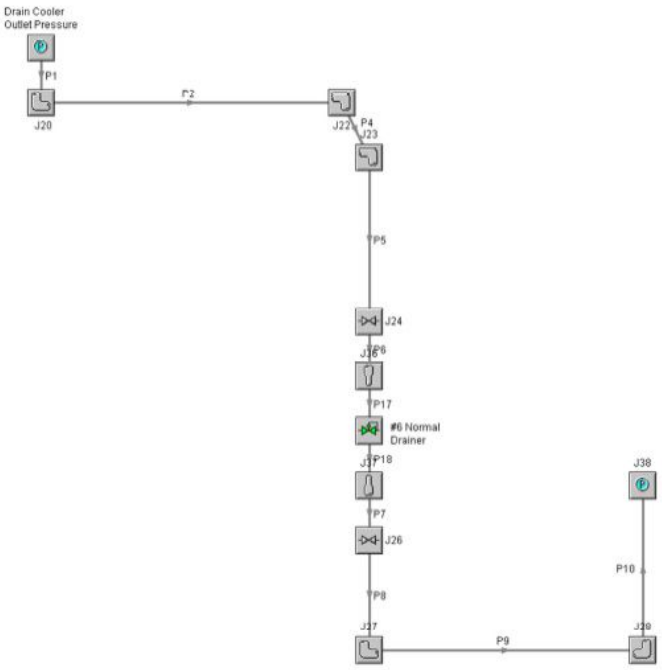
The exact configuration of the drain line inside the Rush Island condenser was not known so two different models were made. One model used a sparger design identical to that at Labadie and the other assumed a simple baffle.

Results were compared to the AFT Fathom model and were in close agreement in all cases.

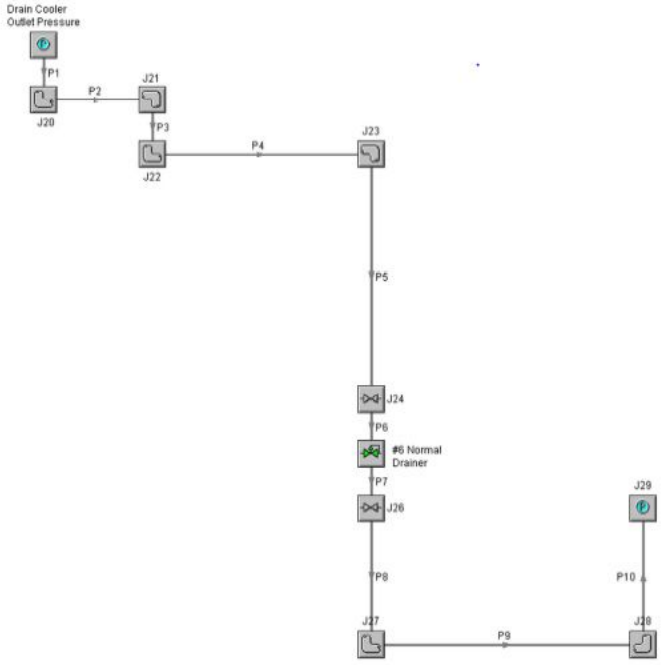
Now confident in its accuracy, Shelton used AFT Fathom to study the drain line configuration of the Labadie Plant, Units 3 and 4. The results of the analysis confirmed inadequate head in the original configuration in some conditions. These results are supported by operational data.

Shelton stated, "AFT Fathom allowed us to identify a previously unknown design flaw with the original drain line configuration of our lowest pressure heaters on Labadie Energy Center Units 3 and 4. After identifying the issue, we were able to redesign the drain line and select the appropriate control valve for our application."

Ameren companies serve 2.4 million electric customers and more than 900,000 natural gas customers across 64,000 square miles in Illinois and Missouri. Ameren Missouri is the largest electric power provider in Missouri, generating almost 10,500 megawatts of Ameren's total capacity of 16,000 megawatts. Their 4,000 employees account for more than one third of Ameren's total workforce. And they serve 1.2 million customers in Missouri, including 127,000 gas customers



Rush Island #6 FWH Drain Line Configuration



Proposed Labadie Unit 3 and 4 #6 FWH Drain Line Configuration

660 MW	Actual Plant Data	FATHOM Control Valve Prediction (Baffle Model) (%)	FATHOM Control Valve Prediction (Sparger Model) (%)
Drain Flow (KPPH)	155,000	155,000	155,000
Heater Pressure (psig) (psia)	-9.7 (4.9)	-9.7 (4.9)	-9.7 (4.9)
Condenser Pressure (in HgA)	2.5	2.5	2.5
Drain Temperature (F)	116	116	116
Valve Position (%)	41 and 38	39.17	43.77
450 MW			
Drain Flow (KPPH)	98,000	98,000	98,000
Heater Pressure (psig) (psia)	-11.0 (3.6)	-11.0 (3.6)	-11.0 (3.6)
Condenser Pressure (in HgA)	2.0	2.0	2.0
Drain Temperature (F)	105.2	105.2	105.2
Valve Position (%)	23	25.59	28.33
300 MW			
Drain Flow (KPPH)	61,000	61,000	61,000
Heater Pressure (psig) (psia)	-11.9 (2.7)	-11.9 (2.7)	-11.9 (2.7)
Condenser Pressure (in HgA)	1.8	1.8	1.8
Drain Temperature (F)	100.7	100.7	100.7
Valve Position (%)	15 and 12	16.46	18.21

Table 1 - AFT Fathom benchmark results and measured control valve position data for heater gravity drain system

The results in Table 1 show that AFT Fathom is capable of accurately predicting control valve positions under various load conditions.