

## AFT Fathom™ Instrumental in District Cooling System Planning, Development & Operation

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*NRG Thermal Corporation is one of the largest third-party steam providers in the United States with operations in five states, focusing on district heating, cooling and power.*

Among their many facilities is the District Cooling System serving downtown Minneapolis, MN. Begun in 1971 as a small chilled water plant for air conditioning, it has grown into one of the country's largest with a total capacity of more than 35,000 Tons and 80,000 gpm. The system includes 5 plants with 18 chillers and multiple distribution loops providing for extensive sectionalizing and bypassing to help assure a 99.98% reliability of chilled water supply. The system was named the "System of the Year" in 1996 by the International District Energy Association.

To assist in the planning, development and operation, an AFT Fathom model of the system was developed. Over the years of using the AFT Fathom model, a new plant, 8 chillers and several customers have been added to the system.

Directly related to the benefits of modeling this complex system with AFT Fathom is the high level of accuracy of Fathom's predictions. By investigation, NRG determined they could simplify the modeling of the many customers (buildings) to be represented by a flow control valve. This sets model flow rates to precisely match the actual system flow rates. To confirm the accuracy of the system model, inlet and differential pressures at 43 buildings were recorded in 15 minute periods over numerous iterations while the system was near peak demand.

The results? With an average inlet pressure at the 43 buildings of 132 psig, the average difference between the actual and Fathom predicted pressures was 2.3 psi, or less than a 2% difference.

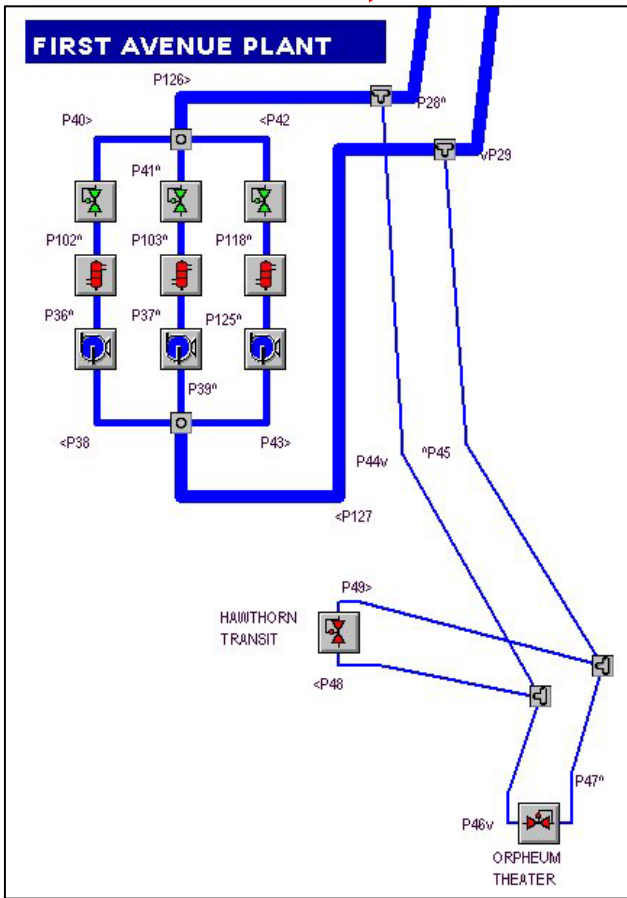
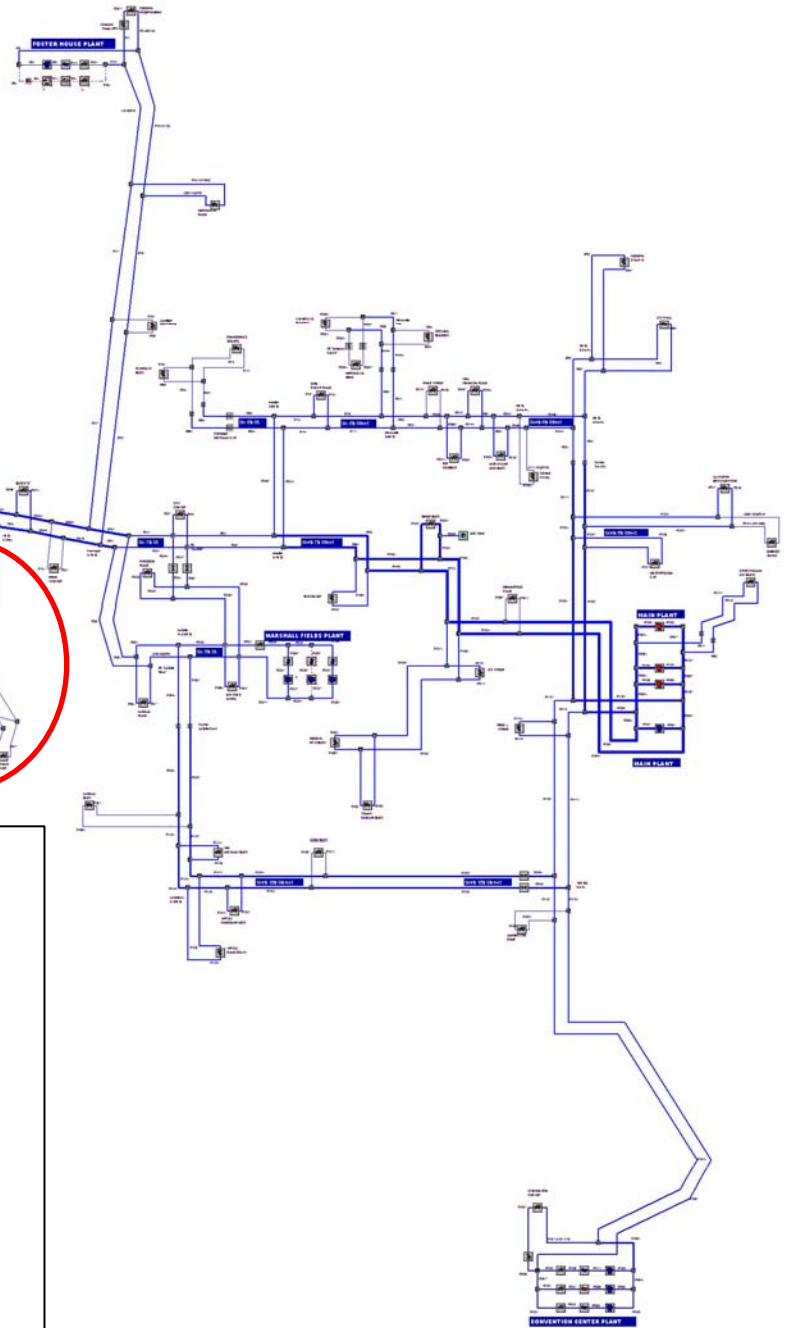
NRG Engineering Manager, Slava Prash describes several advantages of using AFT Fathom to model the District Cooling System:

- Very instrumental for planning system development and growth.
- Allows evaluating of capacity to be transferred through branches of the manifold for scheduled maintenance or emergency shutdowns and predicts limitations to individual customer loads during such periods.
- Ideal optimization tool for planning system lineup for efficient load distribution between cooling plants. Particularly important as some of the plants do not have permanent staff so use of manpower can be optimized as well.
- In emergencies, allows quick evaluation of scenarios and provides guidance to operating personnel.

**Actual 15-min Average Rounded Readings      AFT Fathom Model Output**  
**(standard operations gages/meters)**

Junction	Name	P Inlet - psig	dP - psid	P Inlet - psig	dP - psid
1	Northstart East Bldg	126	10	128	9.7
202	Federal Reserve Bank	133	14	134	15
203	Marquette Plaza	130	17	133	18
275	Federal Courts	132	20	135	22
276	City Hall	130	22	135	22
281	Rand Tower	125	9	125	9.4
284	510 Mrgtte Building	126	7	125	6.4
292	Mann Theater	139	30	137	32
294	City Center	132	17	132	17
296	Baker Bldg	146	35	146	37
298	Minneapolis Club	138	38	140	40
301	Craig Hallum [701 Bldg]	149	55	147	52
302	Metropolitain Ctr	135	35	138	34
304	TCF Tower	139	37	137	35
305	Dayton's Store	134	18	133	17
310	Orpheum Theater	135	29	140	32
312	Medical Arts Bldg	138	32	136	31
313	Young Quinlan Bldg	136	31	135	31
319	Target Plaza South	129	13	129	13
322	600 Quebeck	128	10	129	9.7

**A portion of the operating data gathered from the District Cooling System and comparative AFT Fathom predicted values.**



**Minneapolis District Cooling System AFT Fathom model.**

**Inset - detailed view of one of the several chilled water plants and two of the chilled water customers**



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*Design with intelligence. Build with confidence.*

*For more information on AFT Fathom, contact Applied Flow Technology at (800) 589-4943 or visit our website at*