

GUE Cooling Services Solution Pilot: Major Health Care Facility – North Central US



Aerial View of Major North Central US Health Systems Facility, Showing RC/DC Building and AHU-43 on the Roof

Beneful Health is a name used to mask the identity and protect the confidentiality of a large North Central US health care system, that conducted a pilot test of GUE's ProaTEQ Cooling Services Solution in 2011. The system operated numerous Hospitals and Health Care Centers in the North Central US and employed over 25,000 workers.

Situation: In late 2011, Beneful elected to conduct a pilot test of the ProaTEQ Cooling Services Solution offered by Georgetown Utilities Enterprise, LLC (GUE). It was agreed that the pilot would involve treatment of a 9-year old, 80-Ton Mammoth (a Nortek Brand) packaged DX, evaporative condensing, cooling unit on the rooftop of a building used for specialized care including some residential care and other care functions. It was known as the RC/DC building. The photo above shows the full hospital campus, with the RC/DC building on the east side and shows the location of the treated Mammoth unit on the South rooftop of the RC/DC building. The project was done from April through August 2012.

Tasks: The project had four Tasks:

- Pre-Treatment Capacity and Power Tests
- Treatment

- Post-Treatment Capacity and Power Tests
- Analysis and Reporting

Action: The unit was subject to a pre-treatment capacity test. Airflow in CFM was measured with an anemometer. Wet-bulb and dry-bulb temperatures were measured in the supply and return air streams. Using wet-bulb temperature, specific enthalpy change across the evaporator coil was determined, and then using air-flow, total heat extraction, from the air stream, e.g., cooling capacity, was computed using ASHRAE methods. The pre-treatment capacity measurement was 54.6 Tons, indicating noticeable capacity degradation due to oil fouling and potentially other factors.

The ProaTEQ treatment was applied, and after an hour wait for coating of metal components, the Post-Treatment Capacity and power measurements were made.

The Post-treatment capacity was 76.7 Tons, indicating significant level of capacity recovery.

The pre- and post- voltage measurements showed an average of 460v across all three legs both before and after. The amperage measurements showed a small current reduction after treatment, consistent with the lubricity improvement also achieved by ProaTEQ treatment. A power factor of 86% was assumed for kW computations.

The Energy Analysis of the building was done using an Equivalent Full Load Cooling Hour approach, taking account that the site was in operation 24x7x365, totaling 8,760 hours, site staff said it required “some cooling” in all 12 months, and based on experience with the ratio of full load cooling hours to hours requiring any cooling, GUE assumed 2,000 full load cooling hours for the analysis. This value was confirmed as conservative by our cooling system consultants. In addition, an adjustment was made between energy savings as indicated by capacity improvement; and likely actual realized energy savings. See below.

The financial analysis was performed two ways, one scenario using the local utility company’s Large General Service Rate, which required an assumption about the facility load factor to compute a bundled rate.

Results: The key technical results are shown below:

	Units	OEM Nominal Capacity 80 Tons		
		Pre-Treat-ment Values	Post-Treat-ment Values	Change
Capacity				
Capacity	Tons	54.6	76.7	22.1
Capacity Loss from Nominal	Tons	25.4	3.3	
Capacity Loss vs. Nominal	%	32%	4%	
Capacity Recovery of Lost	Tons			22.1
Capacity Recovery of Lost	%			87%
Performance				
Full Load Power Draw (est)	kW	55.0	53.5	-1.5
Full Load Power Reduction	%			-2.7%
Performance	kW/Ton	1.01	0.70	-0.31
Performance Improvement (kW/Ton Reduction)	%			-31%
Annual Energy Analysis				
Estimated Full Load Hours	hr	2000	2000	
Annual Load Based on Nominal Capacity	Ton-hrs	160,000	160,000	
Run-hours at Available Capacity	hrs	2930	2086	-844
kWh Use at Current kW	kWh	161,172	111,604	-49569
kWh Use at Current kW	%			-31%
Adjustment for Realized vs. Theoretical	%			65%
Estimated Realized Savings	%	161,172	129,192	-20%

It is important to note that the difference between Realized and Theoretical Savings is as follows.

“*Theoretical*” savings would result if the unit were running at full capacity and meeting the cooling load in all hours. The capacity improvement due to

ProaTEQ treatment would lead to run time reductions proportional to the capacity change. These savings shown on the “Theoretical” line.

“*Realized*” savings accounts for the fact that the fouled unit is not meeting the load in all hours. If a unit doesn’t meet the load, that means there is baseline usage that doesn’t occur, and “savings” of that usage can’t occur either. A unit can’t save energy that isn’t used in the first place. An oil-fouled unit will run less than their baseline would dictate, because it isn’t fully meeting the load. Thus, some theoretically predicted savings are practically unavailable.

GUE experience in prior field tests indicates that about 2/3 of the theoretical savings is realized. Thus, the adjustment on the bottom of the table.

Based on the Annual Energy Simulation Analysis above, the financial analysis results are shown below.

	Units	Pre-Treat-ment Values	Post-Treat-ment Values	Change
Financial Performance				
Bundled Utility Rate (includes kW and kWh)	\$/kWh	\$ 0.093	\$ 0.093	
Unit Operating Cost at Bundled Rate	\$/yr	14,989	12,015	\$ (2,974)
Treatment Price (Full Retail)	\$		\$ 6,400	
Simple Payback Period on Treatment	yrs	-		2.15
Return on Investment (ROI)	%			46%

Summary: The ProaTEQ Cooling Services Solution was pilot tested at a Major North Central US Health Care facility, on a nominal 80-Ton, 9-year old Mammoth Evaporative Cooled Rooftop Packaged DX Unit. The test showed partial recovery of lost capacity, reduction in kW draw, improvement kW/Ton, energy and carbon footprint reductions, all within favorable economic constraints of 2.2 year SPBP and 46% ROI.

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