

## DSM Data Center, Designed for Maximum Efficiency in Every Season

The DSM Data Center is in Des Moines, Iowa and was developed by Team Properties. Team is a Daikin/McQuay National Account with Masters as the rep assigned to Team. We first did work with them in 2007 when the MSN Data Center was developed in Fitchburg, WI. MSN used a pre-packaged chiller plant by Epsilon with three (3) McQuay WSC centrifugal chillers, each 300 tons and with variable primary pumping. DSM was to be a sister data center and similar in most ways to MSN.

When DSM was built, it had a pre-packaged Daikin/McQuay Chiller Plant with a pair of Daikin/McQuay WMC magnetic bearing, oil free centrifugal chillers. DSM also had a total of 11 Daikin/McQuay Vision and Skyline AHUs to serve the data and electrical rooms.

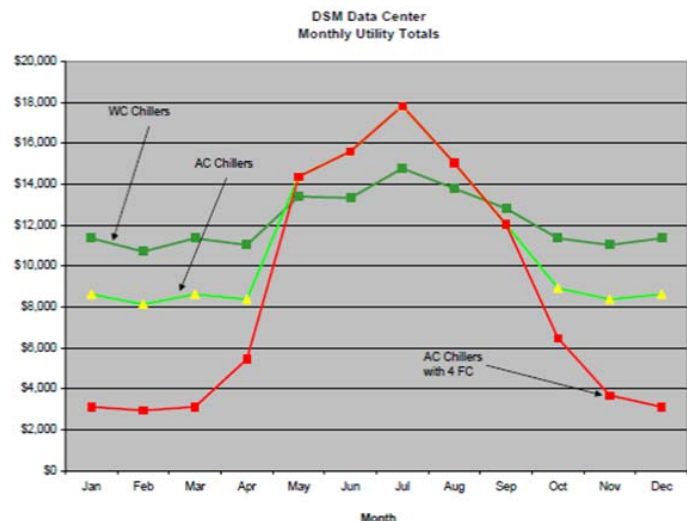


Modular Central Plant (Above)

DSM, like MSN, initially ran the centrifugal chillers year round as the initial budgets did not allow for free cooling to be included. First MSN, in 2011, and then DSM in 2012 were budgeted to add free cooling to greatly reduce maintenance and operating costs in the winter months. At DSM, a detailed study was

done to examine options for improved winter cooling operation that included options for air cooled chillers and dry coolers for free cooling. PACE was used to model the various systems:

- Original water cooled (WC) Daikin/McQuay magnetic bearing WMC chillers
- Proposed addition of air cooled (AC) Daikin/McQuay Pathfinder chillers
- Proposed addition of air cooled Pathfinders with four (4) free cooling dry coolers



As the chart from PACE shows (above), no single alternative yields the optimum operation. Instead, the free cooling dry coolers yield the lowest operating cost January through April as well as October through December; the all air cooled chiller operation is best in September while the water cooled magnetic bearing chillers are the most efficient and economical in the mid-summer months of June, July and August. This PACE modeling and

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### Appleton

3912 N Providence Ave  
Appleton, WI 54913  
Ph: (920) 997-1600  
Fax: (920) 997-1601

### Chippewa Falls / Eau Claire

4674 County Highway P  
Chippewa Falls, WI 54729  
Ph: (715) 738-1970  
Fax: (715) 738-1980

### LaCrosse

1219 Caledonia St.  
LaCrosse, WI 54603  
Ph: (608) 782-7030  
Fax (608) 782-7031

### Madison

908 Stewart Street  
Madison, WI 53713  
Ph: (608) 275-7001  
Fax: (608) 275-7002

### Milwaukee

2241 S. 116th Street  
West Allis, WI 53227  
Ph: (414) 546-5050  
Fax (414) 546-5051

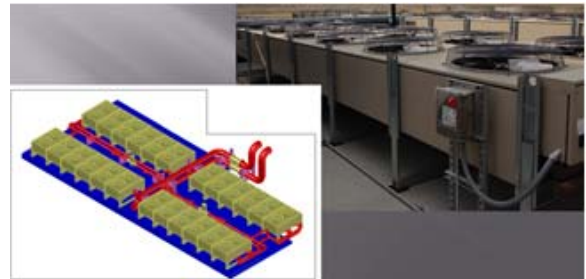
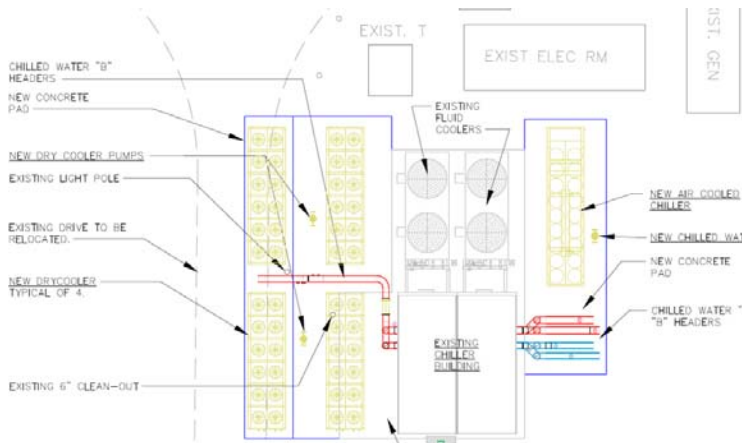


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graph indicates that the most optimum solution for Team would be a combination of the three options and that is what, in fact was done. The hybrid combination of the three options is entirely run and controlled by a Masters programmed Tridium system that determines the optimum system to use and then activates the appropriate control modes and routines to deliver that ultimate operation.



Daikin/McQuay Magnetic Bearing Chillers (Above)



Free Cooling Fluid Coolers (Above)

Masters has worked closely with Mid-American Power, the local Iowa utility, on all phases of the DSM Project. PACE simulations and other modeling tools have been used to justify in excess of \$500,000 in rebates and economic assistance to Team from Mid-American. This funding has been very important in assisting Team in their efforts to install the most efficient operation for their DSM Data Center.



Air Cooled Pathfinder Chiller (Above)

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