



SMARTD CHILLERS

CHILLER REPLACEMENT
AT A SAN DIEGO LAB

February 6, 2006



8520 Tech Way, Suite 110
San Diego, CA 92123
Tel: 858-244-1177
Fax: 858-244-1178
Web: www.sdenergy.org

Background

Prometheus Laboratories Inc. recently moved into a pre-existing 99,000 sq ft office / lab facility in San Diego, CA. The pharmaceutical company, which focuses on the treatment, diagnosis and detection of gastrointestinal, autoimmune and inflammatory diseases and disorders, was determined to implement opportunities to reduce energy consumption.

The 14 year old chiller plant was a primary-only chilled water system served by two water cooled reciprocating chillers, two constant speed 25 hp chilled water circulation pumps, and three-way valves at the air-handlers. The condenser system consisted of two 15 hp pumps and a three cell Evapco indirect evaporative condenser. There is also an ice thermal energy storage (TES) system that had been decommissioned some time before the audit was conducted. The TES system was served by one water-cooled 50-ton reciprocating chiller, a 560 ton-hour ice tank, two 3 hp glycol circulation pumps, and a plate and frame heat exchanger.



Figure 1: Pre-existing chillers, 165-ton, Manufactured 1991



Figure 2: Prometheus Lab's new SMARTD chillers

Central Plant Energy Assessment

A comprehensive energy assessment was performed on the 99,000 sq ft facility. Based on the analysis, the pre-retrofit chiller plant operated at an annual wire-to-water plant efficiency of approximately 1.5 kW/ton. SDREO suggested that the plant be retrofitted with chillers using oil-less compressors and that variable frequency drives (VFDs) be installed on all condenser water pumps, chilled water pumps, and cooling tower fans. Analysis shows that with the all-variable speed configuration and Turbocor compressors, the average annual overall chiller plant operating kW/ton will be reduced to about 0.50 kW/ton. Table 1 below outlines the estimated savings and costs from the retrofit.

Table 1: Estimated energy savings from Lab central plant retrofit.

ECO	Idea	Est. Annual Load (ton-hrs)	Est. Eff (kW/ton)	Est. Annual Electrical Usage (kWh)	Total Energy Costs (\$/yr)	Est. Implementation Cost (\$)	Est. SDG&E Incentive (\$)	Final cost after rebate (\$)	Simple Payback (yrs)
Current System Unchanged (2 Reciprocating Water-Cooled Chillers)									
N/A	Operate chilled water plant as is (two water-cooled recip chillers)	648,200	1.50	972,300	\$121,298	N/A	N/A	N/A	N/A
All Variable Speed Plant with new Turbocor Chillers									
1	Install Hartman LOOP and new chillers	648,200	0.50	324,100	\$40,433	\$500,000	\$103,712	\$396,288	4.90
Savings Analysis			1.00	648,200	\$80,865	\$500,000	\$103,712	\$396,288	4.9



Figure 3: The two new 180-ton SMARTDT Turbocor chillers installed

Chiller Performance

Table 2 below shows the operating conditions of the installed Turbocor chillers with 44°F leaving chilled water temperature and 80°F entering condenser water. Data was provided by Jeremy Ouellette of SMARDT Cooling, Inc.

Table 2: Manufacturer's Data – Operating conditions of SWC180FMAX Water-Cooled Chiller

Capacity	IPLV	75% Load	50% Load	25% Load	Evaporator		Condenser	
Tons	kW/Ton	kW/Ton	kW/Ton	kW/Ton	Ft PD	Temp in	Ft PD	Temp Out
180	0.36	0.48	0.32	0.28	8.8	54	13.6	95

Conclusion

Benefits and points of interest include:

- Maintenance was greatly reduced. Oil management problems were eliminated.
- Variable speed through the evaporator and condenser is easily accomplished.
- Environmentally friendly R-134a is used in chillers (reducing environmental impact)
- Oil-less chillers reduce our dependency on foreign oil while increasing the efficiency of the machines.
- Noise was greatly reduced – the new units are rated for 75 dBA at three meters.

For more information about this retrofit please contact Ben Erpelding, P.E. (SDREO's Engineering Manager) at 858-244-1177.