

The Best Solution at West Nippissing General Hospital

Case Study: Hospital

Benefits of SMARTD:

- **Lowest Operating Costs**
- **Reduced Electricity Consumption**
- **Lower Maintenance Costs**
- **Reduced Noise Levels**
- **Built in Redundancy**

Situation:

West Nippissing General Hospital currently had a single 150 ton low pressure Trane water-cooled chiller. In 2003, a second air-cooled chiller was installed outside the kitchen area to provide added capacity and a backup system. The main issue was that the water-cooled chiller was more than 30 years old, putting it past the normal expected lifespan for a chiller of this size. It had become unreliable and expensive to maintain. The water-cooled chiller had lost capacity through plugged tubes, scale build-up, and problems with the cooling tower. This drove up energy costs, as the chiller had to work harder, it decreased building cooling capacity, and it caused the outside chiller to be run more often to pick up the slack. Also, the government was pushing to have the refrigerant used in the existing chiller (CFC 11) phased out over the next few years, which meant that the existing chiller would have to be either converted to run on approved refrigerant or replaced.

The hospital received a quote from Honeywell to replace the old chiller with a similar new model. Honeywell offered a payment plan whereby the hospital could pay for the new chiller through a "lease to own" style program. Although this replacement was not carried out, staff began putting money in the budget for a new chiller. Installing a new standard chiller would reduce operating costs by \$4,900 per year as the new unit would be more efficient than the existing model and would not have the same maintenance problems.

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Options:

The hospital hired Hydro Energy Technology, a consultancy, to review all the options. This included conversion of the existing unit, replacement with a new Carrier screw chiller or replacement with a SMARTD chiller using TurboCor compressor technology. The following table illustrates the key comparison features:

Option	Rebuild Existing Chiller	New Carrier 30HXC186 Chiller	New SMARTD Chiller
Main Advantage	Lowest Initial Expense	Design has been around for half a century	Lowest operating costs for next 25 to 35 years
Main Disadvantage	Portions of unit will still be 25+ years old so subject to hidden flows	Fairly expensive to purchase and produces minimal savings	Slightly higher capital expense. Single manufacturer
Capacity Control	Volume Inlet Dampers (motor runs full speed while restrictor valve is opened or closed)	Volume inlet dampers. Variable speed drive add on available, at additional cost	Variable speed drive built in
Capacity Range	40% to 100%	40% to 100%	25% to 100%
Cooling Capacity (existing unit is 150 tons)	120 tons. Slight reduction due to new refrigerant character	177 tons but restricted to 140 tons by cooling tower and pump loops	180 tons but restricted to 148 tons by cooling tower and pump loops (23% increase in heat removed from building)
Redundancy	Any fault can shut down entire system. Have to rely on outside chiller for backup	Any fault can shut down entire system. Have to rely on outside chiller for backup	Most faults will only shut down half of system. Air cooled chiller will pick up rest of load if required
Cooling Capacity for Possible Future Expansion of Building	Have to replace with new unit or add complete second system	Can provide 177 tons if replace cooling tower and pump systems	Can provide 180 tons if replace cooling tower and pump systems. Room for 2 more stages in existing floor space
Max. Running Electric Load	220 to 240 kW	150 kW	115 kW
Initial Starting Load Maximum	600 kW (can cause brief voltage drop until up to speed)	630 kW (can cause brief voltage drop until up to speed)	4 kW (no affect on electrical system)
Noise Produced	Hearing protection recommended	Hearing protection recommended	Normal conversations can be carried out (68 db)
Vibration	Can affect adjoining areas	Can affect adjoining areas	No vibration from chiller
Load On Cooling Tower	Slightly more than existing	Slightly more than existing	More efficient motor so less heat to be removed
Room Access for Installation	Parts come through existing doors	May have to remove door and part of wall	May have to remove frame on door to roof
Estimated Energy Cost	\$39,296/Year	\$28,900/Year	\$14,270/Year
Contract Maintenance	\$8,000/Year	\$7,000/Year	\$4,000/Year
Annual Savings	\$0/Year	\$11,396/Year	\$29,026/Year
Estimated Cost	\$220,000/Year	\$261,525/Year	\$275,726/Year
Incremental Cost	\$0	\$41,525/Year	\$55,726/Year
Payback: Net Cost	N/A	22.95 Years	9.50 Years
Payback: Incremental	N/A	3.64 Years	1.92 Years

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Conclusion:

After review of all available options, the consultancy recommended the SMARTD chillers. The overall life cycle cost savings were greatest with the SMARTD chillers when considering energy costs, repair costs, and maintenance costs over the life of the chiller. Although the initial cost of the new Carrier chiller was lower than the SMARTD chiller, there were going to be additional costs to take apart the screw chiller to get into the site. The SMARTD modular chiller design allowed the chillers to be brought in without major disassembly taking place on site, the new chiller is also quieter, produces less vibration than the old unit, energy efficiency has been enhanced, and cost savings achieved.



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