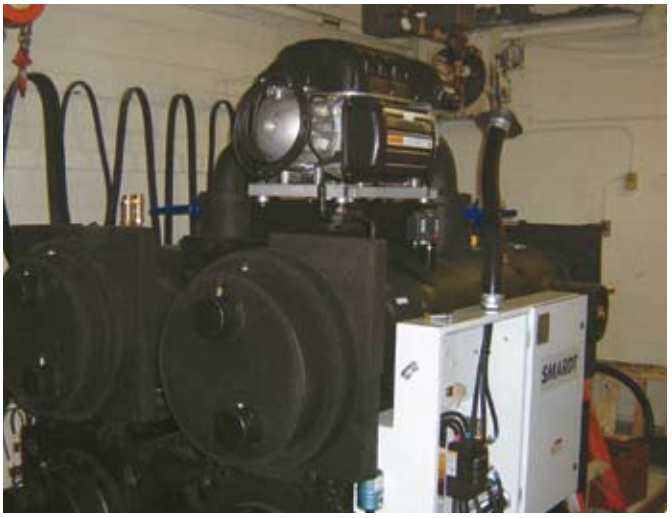
West Nippissing General Hospital

The Best Solution



Situation

West Nippissing General Hospital currently has 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 is that the water-cooled chiller is more than 30 years old, putting it past the normal expected lifespan for a chiller of this size. It has become unreliable and expensive to maintain. The water-cooled chiller has lost capacity through plugged tubes, scale build-up, and problems with the cooling tower. This drives up energy costs, as the chiller has to work harder, and decreases building cooling capacity, causing the outside chiller to be run more often to pick up the slack. The government is pushing to have the refrigerant used in the existing chiller (CFC 11) phased out over the next few years. This means that the existing chiller will have to be either converted to run on approved refrigerant or replaced.

Two years ago, 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.

Options

The hospital hired Hydro Energy Technology, a consultant, to review all the options. This included conversion of the existing unit, replacement with a new Carrier Screw chiller or replacement with a Smardt chiller using Turbocor compressor technology. The following table illustrates the key comparison features.

OPTION	REBUILD EXISTING CHILLER	NEW CARRIER 30HXC186 CHILLER	NEW SMARDT 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 flaws	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 added 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 by cooling tower and pump loops	180 tons but restricted to 148 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 kilowatts	150 kilowatts	115 kilowatts
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 vibrations from chiller
Load On Cooling Tower	Slightly more than existing	Slightly less 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 & 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	$261,525	$275,726
Incremental Cost	$0	$41,525	$55,726
Payback: Net Cost	N/A	22.95 Years	9.50 Years
Payback: Incremental	N/A	3.64 Years	1.92 Years

Conclusion

After review of all available options, the consultant recommended the Smardt chillers. The overall life cycle costs savings were greatest with the Smardt 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 Smardt chiller, there were going to be additional costs to take apart the screw chiller to get into the site. The Smardt modular chiller design allowed the chillers to be brought in without major disassembly taking place on site. The new chiller is also quieter and produces less vibration than the old unit. Savings in energy efficiency have been noticeable.

The chillers were installed in November 2006 and have been running well. The hospital staff is very pleased with the new Smardt chiller.