

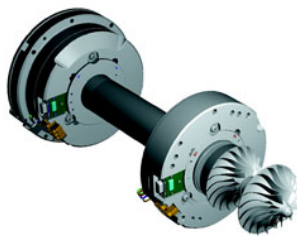


NEVADA SURE BET PROGRAM

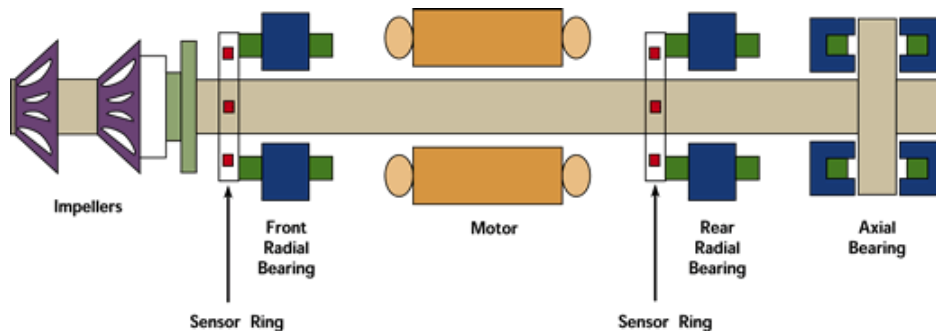
Sierra Pacific Power Company and Nevada Power Company

High Efficiency Technologies that Save Energy Costs: Magnetic Bearing Variable Speed Compressor for Chillers

The future of 21st century compressor technology may very well lie with the innovations used in the Magnetic Bearing Compressor. According to the manufacturer, it is “the world’s first totally oil-free compressor specifically designed for the heating, ventilation, air conditioning and refrigeration industry.” The compressor is totally oil free, very energy efficient and operates at variable speed. Currently, designs are available in the 60 to 150 ton capacity range and can be used in a new or retrofit application.



Magnetic bearing technology, as opposed to oil-lubricated bearings, reduces friction losses, maintenance and extra cooling associated with oil in the system. The magnetic bearing compressor has one moving assembly, the rotor shaft and impellers. The rotor shaft is levitated during rotation by a digitally controlled magnetic bearing system consisting of one axial and two radial bearings. Positioning sensors at each magnetic bearing automatically measure and adjust the shaft position 120 times per revolution, ensuring constantly centered rotation. Onboard digital electronics enable the compressor to be totally self-correcting, and allow non-destructive slow-down in the event of power loss.



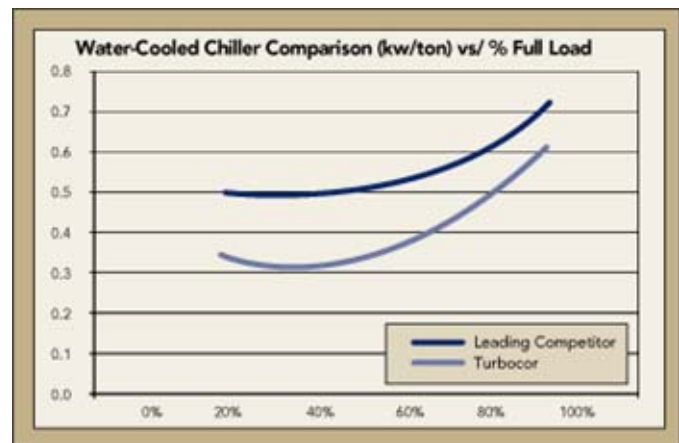
Unique Features

Oil-Free Operation:

Because no oil is needed to lubricate metal-to-metal wearing surfaces, it does not have to be maintained and more importantly, it does not migrate to the evaporator either (in a flooded evaporator chiller design) to foul heat transfer surfaces. Oil in the evaporator eventually leads to loss of heat transfer and chiller efficiency. Although many modern chillers have designs that minimize this loss, the best way to make sure it does not occur is to eliminate oil in the system. No oil also means no parasitic oil losses, no oil pump or oil heater as well. Eliminating the energy losses for oil cooling improves the thermal performance of the compressor by 15 to 25%.

Energy Efficiency:

Digitally controlled frictionless (oil free) two-stage centrifugal compression and a variable speed drive used in the magnetic bearing compressor have shown substantial reductions in operating costs. The integrated part load values (IPLV) have shown to be 30% better as compared to a typical oil-flooded screw compressor on a 75-ton water cooled chiller – 0.41 kW/ton vs. 0.63 kW/ton, respectively. A magnetic bearing compressor uses less energy to do the same work as a standard oil lubricated, constant speed compressor. As the chiller plant typically uses 15 to 30 % of the building's energy and the high performance compressor might save 20 to 40 % over a standard compressor system, the savings should range from 3 to 12 % of a building's total energy use.



Typical water-cooled chiller operating cost savings calculation

	Turbocor	Screw Compressor	Savings
IPLV kW/TR	0.41	0.63	0.22
Tons capacity	75	75	—
kW	30.75	47.25	16.5
Annual operating days	180	180	—
Operating hours per day	10	10	—
Total annual kWh	55,350	85,050	35,640
Power cost (\$/kWh)	\$0.10	\$0.10	—
Annual operating cost	\$5,535.00	\$8,505.00	\$2,970.00
2-year savings			\$5,940.00
3-year savings			\$8,910.00

Variable-Speed Drive Centrifugal Compression:

The compressor uses a high-speed, two-stage centrifugal compression and an integral variable-speed drive. As the condensing temperature and/or heat load is reduced, the compressor speed is also reduced. Compressor speed automatically adjusts to load requirements. This optimizes energy performance through the operating range from 100% to less than 20% of rated capacity.

The innovative technology used in magnetic bearing compressors may well be the energy saving option that many facilities have been searching for to optimize energy efficiency and compressor performance. Two manufacturers that currently use this technology are Turbocor (www.turbocor.com) and Smardt (www.smartd.com).

For more information on the Nevada Sure Bet Program, please contact the Sure Bet Team at 800-342-6335. You can also send an email to either surebet@sierrapacific.com or surebet@nevadapower.com.

*Tables and illustrations from Turbocor's website (www.turbocor.com)

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