

## NEVADA SURE BET PROGRAM

Offered By: NV Energy  
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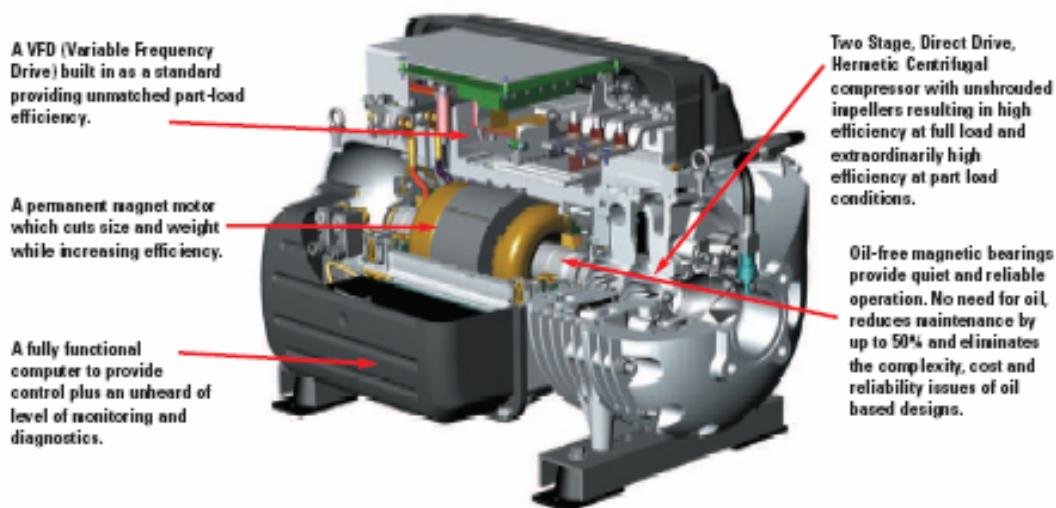
### *Turbocor Variable-Speed, Magnetic Bearing Chiller*

Clark County School District operates more than 300 schools in and around Las Vegas, Nevada. The District pays almost 40 million dollars per year in electric bills. As a result, management of energy costs receives a great deal of attention from the School District facilities - both in new school design as well as existing school operations and maintenance. In 2005, an old, noisy and inefficient air-cooled chiller at Fitzgerald Elementary School needed replacement. Through an initiative by the Energy Innovations Group, in San Diego California, a proposal from the Las Vegas McQuay dealer to install a Turbocor chiller was developed. The Turbocor is a relatively newly available high-efficiency variable-speed, oil-free centrifugal compressor. The oil-free magnetic bearings reduce friction and the losses inherent with handling and cooling lubricating oil. The compressor has exceeded efficiently estimates and operated trouble-free for more than two years. As a result, the District has proceeded with several additional installations.

## The Turbocor Family of Compressors

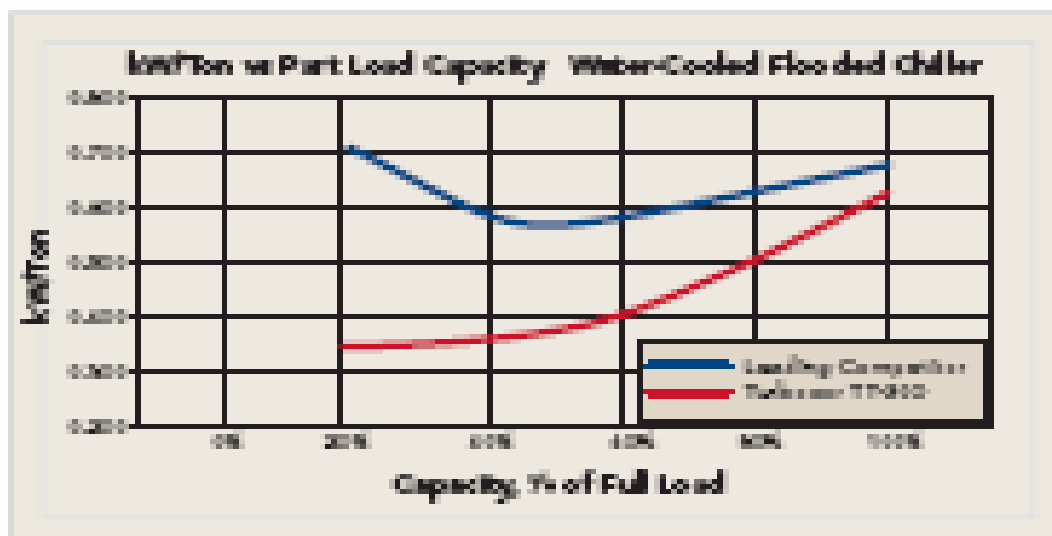
### Model TT-300

– the “Next Generation” of HVAC Mid-Range compressors



The Turbocor compressor has two characteristics which combine to make it more efficient than similarly-sized constant-speed or variable speed compressors.

- Variable Frequency Drives
  - Cooling capacity is managed by electronically varying the speed of the centrifugal compressor rather than imposing a pressure drop on the refrigerant gas with a mechanical throttling vane or valve. Like variable speed pumps and fans, the compressor input kW diminishes as the power of the reduction in speed, thus the input power per ton drops off rapidly as the cooling load decreases. The variable speed centrifugal compressor is 30-40% more efficient than the screw compressor formerly specified by the District.
- Oil-free Magnetic Bearings
  - The magnetic bearing allows the compressor drive shaft to “float” between the bearing surfaces by magnetic attraction/repulsion forces rather than rely on a film of oil (which then requires cooling). The oil free bearing eliminates the losses inherent with oil handling, oil cooling, and heat transfer. This adds up to 10 to 15 percent additional efficiency improvement – as well as the problems and costs inherent with oil handling, changing and disposal.



The Turbocor chiller is more compact and quieter than the equivalent screw or centrifugal chiller. As the part load performance of variable speed chillers is different from mechanically throttled chillers, the sequencing of the compressors is different. Although the compressors are staged such that only one is on line at extreme low loads, the second compressor comes on line at a very low loading and the compressors “track” together.

The Turbocor chiller at Fitzgerald Elementary School was fitted with sensors throughout to sense load changes and to minimize the overall power for a given load condition. The chiller was closely monitored by McQuay during the first year of operation to allow fine tuning and operational trouble shooting.

The installation of the Turbocor chiller was partially funded by the Sure Bet for Schools energy efficiency incentive program. As a result of this experience, Paul Gerner, Associate Superintendent for Facilities, has asked the District’s engineers to strongly consider specifying Turbocor or similar high-efficiency variable speed chillers for all of the District’s rehabilitation and new construction projects.

*Additional Technical Note:*

**VALUE-ENGINEERING – FLAT PLATE HEAT EXCHANGER AND VERY HIGH EFFICIENCY CHILLERS**

In Las Vegas, where wet-bulb temperatures are often far lower than dry bulb temperatures, a plate and frame heat exchanger or closed circuit tower intended to allow “water side economizer” (AKA “tower free-cooling”) is typically specified in association with all water-cooled chiller plants to provide cooling during the cooler spring and fall months. The excellent performance of the Turbocor chiller at very low loads, brings the added cost of the “free-cooling” equipment, piping, and controls into question. Experience at Fitzgerald suggests that a value engineering analysis should be carried out to determine whether BOTH a very high efficiency chiller AND water-side economizer provide a least-cost solution.

### Project Results

	<b>Total</b>
Demand Reduction	16 kW
Annual Energy Savings	51,000 kWh
Annual Energy Cost Savings	\$5,230
Project Cost (Approximate)	\$17,000
Sure Bet Incentive	\$3,130
Simple Payback Period	2.7 Years