

INNOVATIVE STAR OF ENERGY EFFICIENCY AWARD: NOMINATION FOR DANFOSS

During 2008, Danfoss introduced Apexx™, the world's first variable speed scroll compressor for rooftop and chiller air conditioning units from 12 to 80 tons. Apexx compressors are optimized for R-410A, an HFC refrigerant that is the most efficient replacement for R-22 in the US by 2010. With more than 189,000 10-50 ton units produced annually in North America alone¹, energy savings of from 10% to 20% as seen with Apexx in laboratory tests and simulations, and in independent OEM tests, would have great impact on power utility CO₂ emissions.

Air conditioning (cooling only) accounts for at least 13.5% of total energy consumption in US commercial buildings². It is estimated that 65% of those buildings could be served by variable speed scroll compressors in the 10 to 50 Ton range.³

If we apply a conservative 15% energy saving, variable speed units in commercial buildings would reduce total energy consumption by 86.7 billion kWh, and annual CO₂ emission by 11 million metric tons.⁴ If we were to include heat pump operations (for which we are unable to obtain test data), potential energy saving and CO₂ reduction potential would be significantly higher.

The number of compressor starts is significantly reduced with Danfoss variable speed scroll compressors, and drive controller logic ensures soft starts that greatly reduce inrush current, lessening power grid stress.

Danfoss Apexx technology provides additional utility savings because it reduces inductive losses in the grid by maintaining a power factor above 0.90 regardless of the system load. This compares very favorably with the fixed-speed systems commonly used today, which typically operate with a power factor from 0.5 to 0.8, depending on the load. For example, a system operating at a power factor of 0.5 will draw 30% more current than a system with a power factor of 0.9 with equal power consumption.

Built-in Apexx diagnostics prevent sensitivity to power grid events, preventing high current draw during low grid voltage. On the other hand, fixed speed compressors stall and pull high locked rotor current for the duration of low voltage conditions, a well-recognized utility industry issue for power utilities.

At the same time, because it provides continuous load matching, Apexx offers enhanced comfort, with quieter operation, tighter temperature control, and better dehumidification.

Development of Apexx called upon Danfoss technological competencies in refrigeration and air conditioning; compressors; variable frequency drives; and electronics.

Apexx development is the newest achievement for a company that already provides variable speed compressors for household appliances, for refrigeration, and for large compressor systems with Danfoss-Turbocor, the industry's only magnetic bearing oil-free centrifugal compressor.

Today, the majority of light commercial air conditioning systems perform far below the energy efficiency levels that could be achieved with variable speed. A Star of Energy Award would emphasize to air conditioning manufacturers and to consumers that solutions are available now to bring efficiency to a new level.

Note 1: ARI (Air Conditioning & Refrigeration Institute) data extended by Danfoss simulations.

Note 2: Office of Energy Markets and End Use, Form EIA-871 A, C, and E, Table 3A, 2003 Commercial Buildings Energy Consumption Survey.

Note 3: same source as Note 1.

Note 4: Derived from data in EIA report "Emissions of Greenhouse Gases in the United States 2006, DOE/EIA-0573(2006) November 2007)