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AC drive controlled scroll compressor improves efficiency by 15%

A chiller unit utilising a scroll compressor is set to generate 15% lower energy consumption than models with a traditional compressor design.

The unit has been produced by air conditioning manufacturer Rhoss, using an ABB standard drive.

Scroll compressors pressurise the refrigerant between two interleaved spirals or scrolls, resulting in a design with fewer moving parts, less noise and reduced vibrations compared to other compressor types. Variation of output is traditionally provided by mechanical means, for instance by splitting the cooling capacity of the chiller into several circuits. However, by using the ABB standard drive, Rhoss has achieved better performance while using a simple design with a single circuit.

The chiller unit has been designed to provide the best energy performance across the seasons. Chillers only need to run at full capacity for short periods during the summer, yet most equipment of this type is designed for operation at full load only, resulting in oversupply for most parts of the year. Rhoss used the ABB standard drive to raise the unit's efficiency at part load, improving the seasonally adjusted energy efficiency.

Speed matched to cooling load
Scroll compressors are favoured in HVAC applications as they are very compact, smooth running, quiet and reliable.

The ABB standard drive matches the compressor speed to the cooling load, reducing input power. In addition, the reduced speed results in lower flow through the condensers, giving the same effect as if the condensers were oversized and further improves the efficiency. This leads to up to 15% lower energy consumption overall, compared to standard scroll compressor systems with on/off control.
Variable speed control of the compressor also enables more accurate control of the discharge water temperature, to ±0.5°C. Step-less capacity control of the compressor gives a wide operating range and reduces the number of on/off switching cycles, limiting compressor wear. The unit draws extremely low starting current, as the ABB standard drive also acts as a soft-starting device.

Fruitful cooperation
"The ABB standard drive offers all the features we need in a compact package," says Simonetta Lena, product manager at Rhoss. "The result has been a very innovative and robust chiller unit. It has been severely tested in our R&D laboratory and we are very pleased with the result – in fact, the equipment has performed better than expected. The very fruitful cooperation between ABB and Rhoss has produced a chiller unit with outstanding performance."

The new innovative chiller unit has a nominal cooling capacity of 48 kW. It uses a scroll compressor especially designed for variable speed operation, an 18.5 kW ABB standard drive and a motor dimensioned to work above 50 Hz. The output frequency of the drive varies between 35 and 90 Hz. The compressor uses R407, a modern refrigerant with low global warming potential.

The market response has been very positive, with units sold both for commercial and industrial applications. In the light of the success, Rhoss has decided to continue designing future product generations of chillers with scroll compressors using variable speed drives.

Tackling air conditioning energy use – a rising priority
Reducing the energy consumption of air conditioning systems is becoming increasingly important. Studies by the EU indicate that demand for air conditioning is expected to rise substantially, especially in southern Europe, which has been suffering from frequent heat waves in recent years. This will lead to increased consumption of electricity and higher load on electricity distribution systems. Using variable speed drives is an effective way to reduce the electricity consumption and mitigate the negative effects of increased air conditioning use.

Rhoss is an international OEM manufacturing air conditioning systems for export, based in north-eastern Italy.

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Caption: A chiller unit utilising a scroll compressor is set to generate 15% lower energy consumption than models with a traditional compressor design.

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