Frictionless Compressors Getting Flack?
In-Situ Performance of Built-Up DX Rooftop Units in Commercial Buildings

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Introduction

This poster presents an engineering analysis of frictionless compressors used in retrofit applications for 50-ton to 200-ton built-up DX rooftop systems. Given the recent developments in the design and manufacture of frictionless, oil-free compressors; a new class of compressors is entering a market previously dominated by large reciprocating compressors or expensive multi-stage scroll compressor systems. Today's frictionless compressors offer quiet operation in a lightweight, compact footprint and often include an integrated variable speed drive to minimize installation problems. Other studies have evaluated this technology in larger (greater than 250-ton) chiller applications. However, the use of frictionless compressors in DX configurations is a recent advancement.

Methodology

The analysis presented by this poster is based on data collected "in-situ" at a commercial office building located in northern California. Compressor power and system "load" was monitored for each of the building's four systems. This data was used to determine each compressor's performance (measured in kW/Ton) at various load conditions. In order to capture the thermal loads being served by each system, the authors developed a novel airside load metric which incorporates the use of a "pressure rake" to monitor system airflow.

Conclusion

The results of this study are presented as a compressor part-load efficiency curve. This curve (representing measured performance) is compared against those found in manufacturer literature. It is apparent that the available manufacturer data are appropriate for larger chiller systems (where multiple compressors are typically staged to meet the cooling loads). Given the divergence of these data, particularly at low load conditions, this study presents a more accurate efficiency curve for use in estimating and evaluating energy savings where frictionless compressors are installed in DX applications.