Big Box Retailer Goes Outside the Box

Macy's recently completed a major store remodel in Walnut Creek, California that merged three (3) independent buildings into a single new facility. While the new department store looked great, the existing R-22 reciprocating compressors had become an unreliable maintenance and energy expense—negatively impacting the profitability and performance of this otherwise revitalized retail outlet. Macy's consultants proposed traditional replacement options that ranged from new rooftop package units to an expensive chilled water central plant. However, a down economy and an already tight retail market encouraged one of America's oldest, most famous retailers to explore new, cutting-edge air conditioning solutions instead.

System Variety is a Challenge

Each original building had a separate air conditioning system, and different sites had different air conditioning loads—some equipment was evaporative-cooled and some was air-cooled. The only common denominator was that all of the HVAC units were direct expansion (DX) operating on a common refrigerant. On the surface, replacement seemed to be the only available option—but the Danfoss Turbocor retrofit specialists at the American Chiller Services, from Rancho Cordova, California, knew better.

Old HVAC Systems Yield New Opportunities

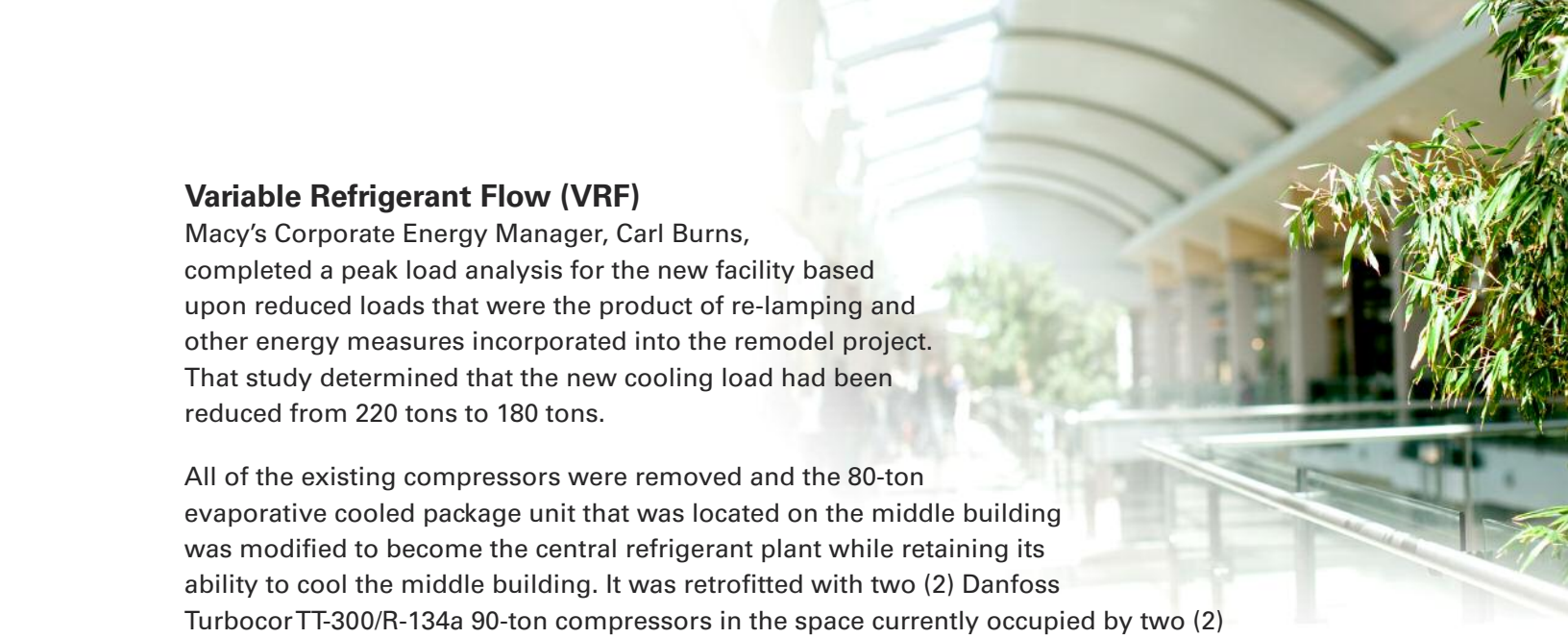
When American Chiller's design team arrived at the Walnut Creek Macy's, they found that:

- The center building was air conditioned by an 80-ton rooftop evaporative cooled DX packaged unit.
- The building to the north was air conditioned by two (2) 30-ton evaporative cooled rooftop DX packaged units.
- The south building was air conditioned by three (3) rooftop air-cooled package units totaling 80 tons.

The total installed capacity for the original equipment serving all three (3) of the sites was 220 tons. There appeared to be no conventional design approach that could merge this mixture of mismatched HVAC equipment into a single system in a cost-effective manner.

Going Outside the Box

In this instance, a down business environment and an emerging new "green economy" led to some out-of-the-box thinking. After several brainstorming sessions, a truly innovative system design began to take shape. The engineers at American Chiller Services discovered that this variety of HVAC systems could be linked using a unique retrofit design, utilizing the DX refrigeration systems common to all of the newly connected buildings, and the energy efficient Danfoss Turbocor compressor as a centerpiece. The new system would consist of a central station Variable Refrigerant Flow plant that would pump environmentally friendly R-134a refrigerant to the existing units, which could now remain in place.



Variable Refrigerant Flow (VRF)

Macy's Corporate Energy Manager, Carl Burns, completed a peak load analysis for the new facility based upon reduced loads that were the product of re-lamping and other energy measures incorporated into the remodel project. That study determined that the new cooling load had been reduced from 220 tons to 180 tons.

All of the existing compressors were removed and the 80-ton evaporative cooled package unit that was located on the middle building was modified to become the central refrigerant plant while retaining its ability to cool the middle building. It was retrofitted with two (2) Danfoss Turbocor TT-300/R-134a 90-ton compressors in the space currently occupied by two (2) 40-ton reciprocating compressors. The existing evaporative condenser was replaced with a larger 180-ton unit, while headers fashioned with stub-outs were piped to the two (2) outer buildings, which would provide refrigerant flow to the North and South air conditioning units.

All of the existing package units were modified to become DX air handling units. The existing thermal expansion valves (TXV) were converted to new-age electronic expansion valves (EXV's), to insure precise refrigerant control at the coils. All of the air handlers were fitted with new high-efficiency variable frequency drives (VFD's), compatible fan motors, and new digital controllers. Each digital controller was tied into a central energy management system (EMS) that controls the operation of the new variable refrigerant flow central plant, located on the roof of the middle building. As the air conditioning load increases or decreases, the Danfoss Turbocor compressors either increase or decrease the refrigerant flow to precisely meet the requirements of the new integrated system.

Macy's Realizes Major Savings

The new variable refrigerant flow system is being eagerly monitored by the local utility as well as several independent consultants. The retrofitted system regularly cools the entire Walnut Creek Macy's on a 95°F day using only the energy required to operate a single 90-ton Danfoss Turbocor compressor, compared to the previous 220-tons.

Creative Retrofit Provides Unique Benefits

The key ingredient in this unique retrofit prescription was the Danfoss Turbocor compressor—its oil-free design opened the door to a previously impossible retrofit solution. Some additional benefits of this project included:

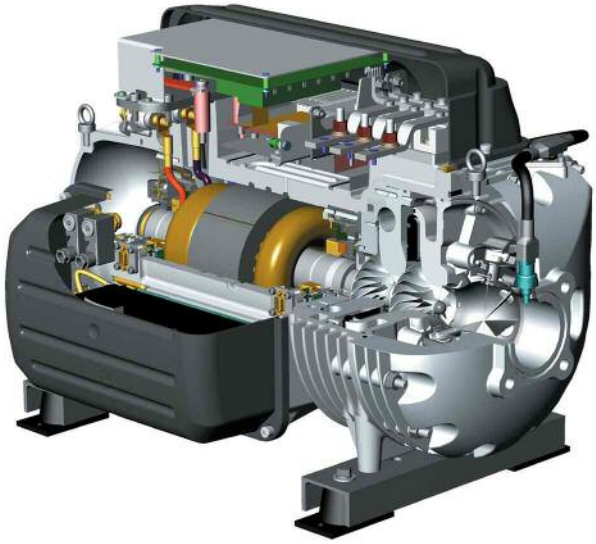
- Significant cost savings through the reuse of existing components.
- Conversion from ozone depleting R-22 to environmentally friendly R-134a.
- Successful completion of the project without major prolonged cooling disruptions.
- Substantial savings in both maintenance and repair costs due to the central plant design and the oil-less Danfoss Turbocor compressors.
- Quiet, vibration-free operation due to magnetic levitation compressor technology.
- Readily accessible operational documentation and energy savings by the Energy Management System utilizing the compressor's on-board software.

About Danfoss Turbocor Compressors

Oil-free magnetic levitation centrifugal compressors were invented, developed, and are now manufactured by Danfoss Turbocor Compressors Inc. in a state-of-the-art production facility headquartered in Tallahassee, Florida.

In the new world of deregulating energy markets and increasing environmental focus, Danfoss Turbocor's mission is to redefine lifetime operating costs for commercial HVACR applications. The enterprise is dedicated to the design, manufacture, marketing, and support of the world's most efficient commercial refrigeration compressors. The result is the world's first totally oil-free compressor specifically designed for HVACR, based on the breakthrough convergence of industrially-proven component technologies largely sourced from the aerospace industry.

Danfoss Turbocor's compressors promise new horizons in energy efficiency and lifetime operating costs for mid-range chiller and rooftop HVACR applications.



Turbocor oil-free compressor technology is highly efficient and offers a low acoustic signature.

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