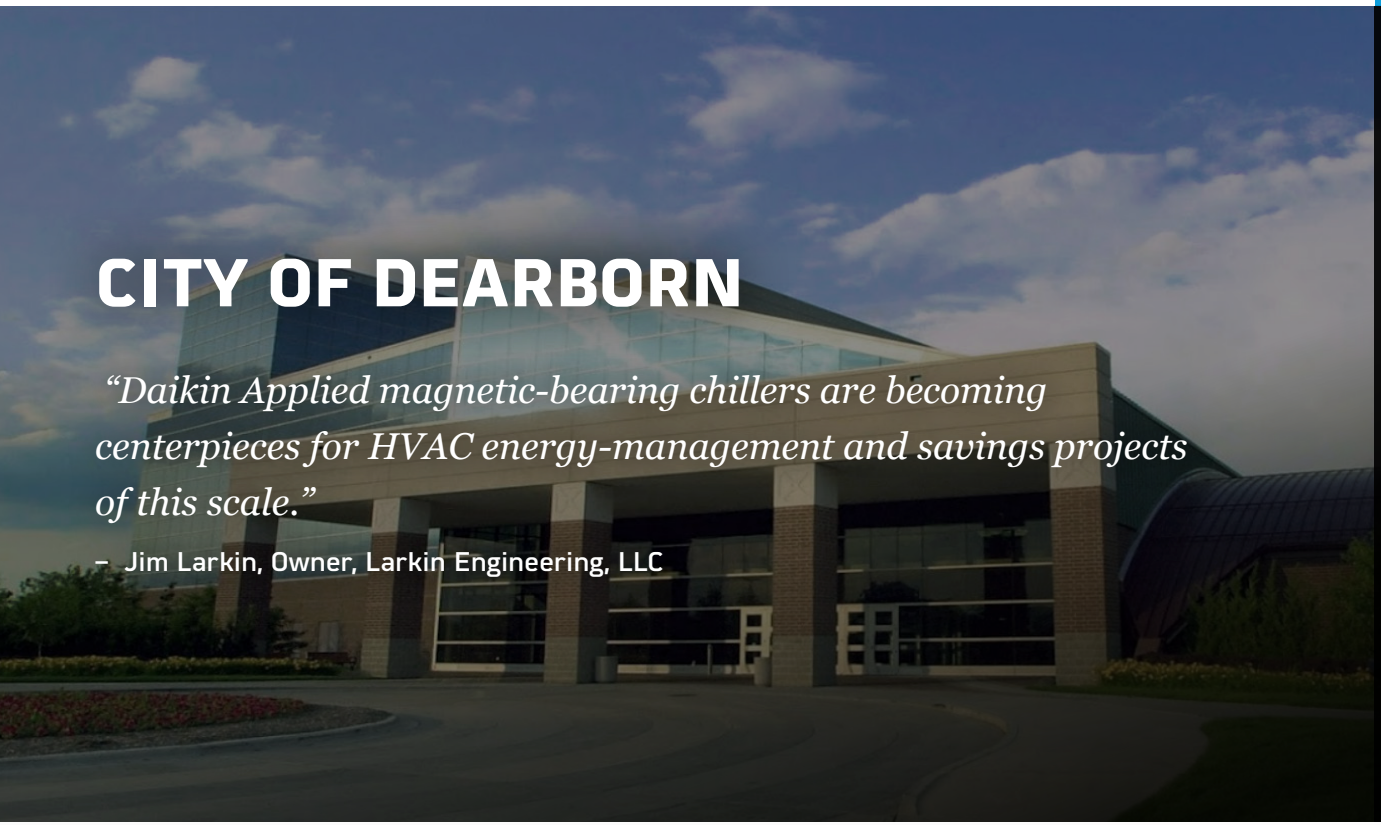
DAIKIN

CASE STUDY



CITY OF DEARBORN

"Daikin Applied magnetic-bearing chillers are becoming centerpieces for HVAC energy-management and savings projects of this scale."

– Jim Larkin, Owner, Larkin Engineering, LLC

Overview:

The City of Dearborn was facing a challenge: Its 1960s-era HVAC infrastructure was at the end of its lifecycle and the related utility costs were becoming an increasing financial burden — over $1M annually. City leadership saw it as an opportunity to initiate a comprehensive infrastructure project to design and install HVAC and electrical solutions that would bring it to the forefront of municipal energy management. It wanted reliable equipment that would operate effectively for years, with minimal maintenance costs. Accordingly, the city contracted with Millenium Energy Company to develop a long-range energy-savings infrastructure plan. Millenium started by conducting a complete HVAC and energy assessment of Dearborn's six-building campus. Following the energy assessment, Millenium allied with Larkin Engineering, CSM Mechanical and ThermalNetics, Daikin Applied's local representative, to define plan specifics.

LOCATION:

City of Dearborn

Dearborn, MI, USA

AREA SERVED:

500,000 square feet

6 Buildings
80-Acre Campus

CHALLENGE:

Replace aging HVAC infrastructure to increase energy efficiency and reduce annual HVAC maintenance costs

SOLUTION:

Daikin Magnitude® magnetic-bearing centrifugal chillers and Skyline® air handling units

Daikin Applied high-efficiency cooling equipment helps city reduce electric demand by over 1.2 MW

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Solution:

The heart of the HVAC solution includes two Daikin WME700 Magnitude® magnetic-bearing chillers, housed in a completely remodeled central cooling plant. Magnetic bearing technology eliminates oil, mechanical seals, wear surfaces and gears for longer machine life and increased reliability. Using direct-drive technology, variable-frequency drives, and ozone-friendly refrigerant, the Magnitude chiller is up to 40% more efficient than standard centrifugal chillers. The variable drives respond according to cooling demand rather than operating at a constant rate. Further, the chillers operate quietly and reliably.

To help streamline the project and provide exceptional value, Daikin's representative, Cory Petersen, combined forces with Daikin Applied Service. The chiller part of the overall HVAC solution became a turnkey project (product and installation) supplied by Daikin Applied Service, under the auspices of a GSA contract. The GSA contract allows state and local agencies to leverage the buying power of the federal government and streamline the purchasing process.

Complementing and leveraging the full- and part-load efficiency attributes of the Daikin chillers is Millenium's patented "E~Flow" variable-flow distribution system. E-Flow is a patented mathematical algorithm that uses building energy demand rather than pressure as the primary control variable to slow down or speed up a hydronic pump, thereby increasing or decreasing volume flow.

Daikin also replaced the city's direct expansion (DX) rooftop systems with high efficiency Daikin Skyline® air-handling units, that included electronically commutated motor (ECM) fan arrays. The high electrical loads of the existing, inefficient 1.4kW per-ton DX air-cooled rooftop units (RTUs) in outlying buildings have been replaced by water-cooled RTUs served by the new chillers.

Designed with a modular construction platform, the Skyline units feature variable dimensioning in two-inch increments. This gave Larkin Engineering the flexibility it needed to fit the solution into the dedicated space. The inherent dimensional flexibility of the Skyline product is enhanced by an ECM fan array. The fans are driven directly by the ECMs for a compact design that eliminates almost three-feet of cabinet space — 46% narrower than other models with direct-drive motors and 52% narrower than models with belt-drive fans. Direct-drive, variable-speed ECM fan motors use less energy, especially at light-load conditions because they respond according to demand. Patented construction provides high thermal efficiencies and low leak rates — and the equipment is incredibly quiet.

Finally, the addition of Skyline roof-mounted air handlers to the Community Center resulted in shifting 450 kW of DX cooling load, operating at approximately 1.4kW/ton, to the new chillers operating at .33kW/ton. Despite adding approximately 500 kW of cooling demand to the Daikin chillers, initial reports show a net decrease in peak cooling demand.

Outcome:

While increasing occupant comfort, the new HVAC infrastructure reduces energy use and the related carbon footprint. It is estimated that the total campus electric demand reduction will exceed (-400) kW of power, largely due to the innovative load shifting of the new water-cooled chiller plant.. The high-efficiency Daikin Magnitude chillers in combination with the Skyline air handlers were instrumental in helping trim the campus electric demand by over 1.2 MW thus far. State-of-the-art energy controls enhance the entire system. The resulting energy cost savings are estimated at 50% of the base year energy cost and HVAC-specific maintenance costs were reduced by $75,000. The E-Flow system was also a key part of the energy-reduction strategy, as were other energy-saving measures.

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Magnitude chiller unit being lowered on site with additional crane rigging for assistance

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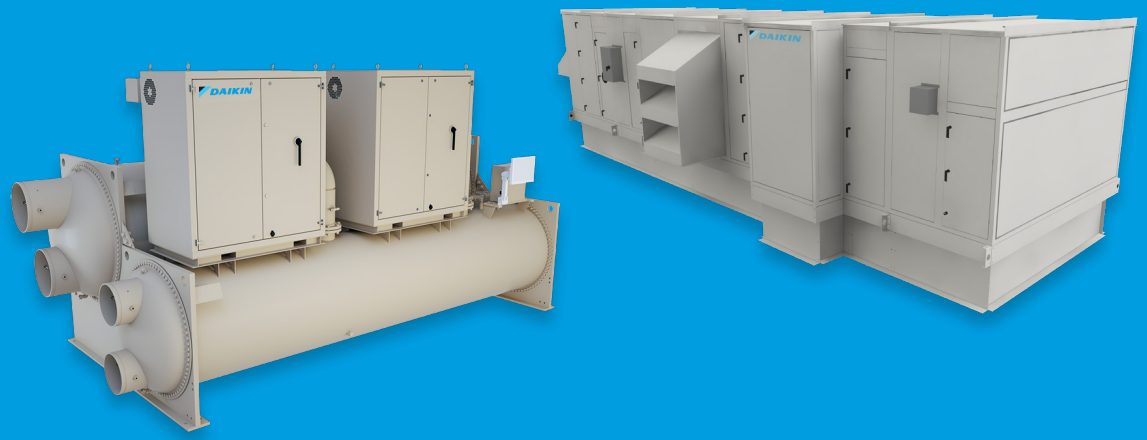
Outcome Continued:

To add to the energy savings, the entire project benefited from a number of other efficiencies. According to Craig Mortz, "CSM Mechanical and CSM Energy Solutions are proud to have been an integral partner in the implementation of the HVAC infrastructure energy project for the City of Dearborn, alongside Daikin and ThermalNetics. The ease and utilization of GSA contracting streamlined the engineering requirements, the equipment delivery times and the overall ease of contract negotiations with our mutual customer. The result was an extremely successful HVAC implementation project with a very focused energy reduction requirement that was completed within a stringent timeline, resulting in an on-time deliverable."

The American Public Works Association chose the Dearborn initiative as its Project of the Year in Michigan. The project could qualify for as much as $200,000 in energy incentives from DTE Energy, the local utility, under the state's Clean and Renewable Energy and Energy Waste Reduction Act.

Larkin Engineering owner, Jim Larkin, was responsible for the entirety of the complex, five-year project. Larkin noted, "The Daikin Applied magnetic-bearing chillers are becoming centerpieces for HVAC energy-management and savings projects of this scale. The turnkey purchasing and installation process overseen by Daikin Applied Service, in association with the GSA contract, saved a lot of headaches for us and money for the customer. It was a great team effort."



Magnitude chiller unit after being positioned in the central cooling plant facility

Magnitude chiller after the successfully completed installation