

CASE STUDY / **CENTRAL HEATING AND REFRIGERATION PLANT UPGRADE**

# MIDWAY INTERNATIONAL AIRPORT KEEPS ITS COOL

A major renovation to Midway's central heating and refrigeration plant offers increased energy efficiency while maintaining its robustness and reliability. These improvements leverage the current electrical rate structure and available chiller technologies.



# NEW PLANT INCORPORATES REDUNDANCY

By oversizing the chillers and cooling towers, the plant can maintain operations in multiple emergency conditions.

## PROJECT STATS

### CLIENT

Chicago Department of Aviation

### LOCATION

Chicago, Illinois

### COMPLETION DATE

March 2021

# 43

PRECONDITIONED AIR  
UNITS REPLACED

# 700

VAV BOXES CONVERTED

# 4.7K

TONS PEAK CHRP CAPACITY

## CHALLENGE

Chicago's Midway International Airport (MDW) has seen significant growth and evolution since it opened in 1927. In the early 2000s, MDW completed a large expansion, which included a new central heating and refrigeration plant (CHRP) to satisfy the increased cooling and heating needs of the new concourses.

The initial operations at the CHRP were designed to balance fluctuating electrical rates in the Illinois power market. Today, there is little differential between peak and off-peak electrical rates, meaning the original configuration of the CHRP was no longer fiscally efficient.

In 2018, MDW began an airport modernization project to add a new Transportation Security Administration area that bridges over Cicero Avenue. This expansion required additional

cooling capacity, which the initial CHRP did not have the excess capacity to provide. Therefore, the Chicago Department of Aviation (CDA) decided to upgrade the CHRP as part of this modernization project. This would allow the CHRP operations to better utilize the current lower electrical rate structure and upgrade key systems with modern technologies.

## SOLUTION

The Burns & McDonnell team was engaged as the designer of record to Hill Mechanical Group for this design-build project, responsible for completing the mechanical, electrical and structural engineering for the CHRP upgrade and other major tasks:

- Upgrade the CHRP by adding new chillers in a series arrangement to the two existing chillers to maintain 36° F water supply to the airport.







- Upgrade air handling units by replacing the existing supply and return fan inlet guide vanes, to be replaced with new variable frequency with new variable frequency drive (VFDs) and VFD rated motors.
- Upgrade the fire protection in three computer re-equipment rooms, removing the existing water-based system and replacing with a new gas-based system.
- Convert approximately 700 variable air volume (VAV) boxes from pneumatic controls to electric direct digital controls (DDCs).

- Replace 43 glycol water-based preconditioned air units with larger, 30-ton direct expansion (DX) units.
- Upgrade the lighting control panels at 28 areas to newer units.

## RESULTS

The new CHRP layout incorporates redundancy by oversizing the chillers and cooling towers and selecting the equipment to maintain operation in multiple emergency conditions. The new chillers were oversized so that any chiller, new or existing, could be lost and still satisfy the peak capacity. Three operating conditions were developed to see that the equipment was sized adequately so the CHRP could sustain a peak capacity of 4,700 tons.

The chilled water portion of the plant was completed in April 2020 and the last cooling towers and condenser water piping were phased into the plant in early 2021.

The upgraded CHRP offers increased energy efficiency to MDW by tailoring the equipment selection and configuration to the current electrical rates, while maintaining the original plant robustness and reliability to provide peak cooling capacity during multiple modes of equipment failure.

