



Daikin chillers in the central plant

## CASE STUDY

### Higher Education

#### Facility at a glance

##### Name

Education City

##### Location

Doha, State of Qatar

##### Facility size

7,000,000 m<sup>2</sup> total area

##### Issue

Provide equipment and service for the air conditioning in the entire Education City complex

##### Solution

11 Daikin water-cooled centrifugal chillers

## Qatar's Education City Chooses Daikin Chillers

The Qatar Foundation is an independent, private, non-profit, chartered organization. It was inspired, initiated, funded and founded in 1995 by His Highness Sheikh Hamad Bin Khalifa Al Thani, the Emir of the State of Qatar. Her Highness Sheikha Mozah Bint Nasser Al Missned, Consort of H.H. the Emir, serves as the chairperson of Qatar Foundation (QF). The vision and mission of QF is to create the prototypical 21st century university, focusing on the collaboration and integration of research and higher education programs.

QF today aims at establishing a new private university as a multi-institutional campus with the world's top universities. Known as Education City, the campus in the Qatar capital of Doha will have a total area of 7,000,000 sq. m. Though scheduled for completion by the end of 2008, it is already flourishing with buildings which currently house Qatar Academy, Virginia University-Qatar, The Academic Bridge, Weill Cornell Medical College in Qatar, Texas A&M University at Qatar, The Learning Centre, and the administrative offices of the Qatar Foundation.



Education City, a comprehensive center of world-class teaching and learning, will be home to more than 30 buildings.



Being a comprehensive center of world-class teaching and learning, it will be home to more than 30 buildings among which will be a museum, a conference and exhibition center, sports facilities, a shopping center, a mosque, plus residential and recreation facilities for students and staff. The Education City will include a host of facilities ranging from kindergarten, through junior, secondary and special learning levels of education to graduate, post graduate and research programs. In tandem, there will be a wide range of administrative, communal, and medical facilities, including a specialized teaching hospital plus science and technology park.

Daikin was fortunate to have TRAGS Electrical Engineering and Air Conditioning Company WLL as part of the team that installed and commissioned the system, as TRAGS played an important role in the success of this installation Daikin is proud to be associated with QF and has provided equipment and service for the air conditioning in the entire Education City complex. The central plant of the project houses eleven Daikin water-cooled centrifugal chillers which use ozone-safe R-134a refrigerant and provide 11,000 tons of refrigeration.

Distinguished features of the product made the choice of the right machines easier for QF.

## Positive Pressure R-134a Design

The positive pressure design of the Daikin centrifugal chiller eliminates the leakage of moisture or air into the chiller providing efficient performance that is sustainable for the life of the chiller. The chiller uses environmentally friendly R-134a refrigerant, which has no scheduled phase-out date and no ozone-depletion potential.

## Operator Interface Touchscreen

Daikin's 10-inch super VGA touchscreen is truly operator friendly. All important unit operating data is clearly displayed and selectable at a touch of the screen. Setpoint changes are easy to accomplish and monitor to reduce any chance of error. Trend data of important parameters can be downloaded from an on-board floppy drive.

## Gear Drive Advantage

A gear-driven compressor runs at higher impeller rotational speeds, but tends to have less vibration, and therefore less noise, than the larger, much heavier, direct drive units. Unique hydraulic bearings extend compressor durability.

## Easy BAS Integration & Chiller Plant Manager (CPM)

Daikin's exclusive Protocol Selectability™ feature offers factory-installed communication modules for BACnet®, LONWORKS® or Modbus® networks. QF selected BACnet communications for control and monitoring information to be sent to the BAS. This was accomplished without the need for costly gateways. The CPM offered by Daikin controls the primary chilled water pumps, condenser water pumps and cooling tower VFD, besides controlling the chiller plant.

## Power Loss Damage Protection

With the higher rotational speeds and much lighter running components compared to direct drive units, efficient hydrodynamic bearings are used. The shafts are supported on a film of lubricant, rather than running with metal-to-metal contact, typical of rolling element bearings. Under normal circumstances, the design life of the Daikin bearings is much longer than that of rolling element bearings. During the coast-down period, a compressed spring provides pressurized lubricant to the bearings. The compressors decelerate quickly due to low inertia. This is extremely useful while the compressor shuts down due to accidental power loss.

## Unloading to 10% Capacity

Daikin's centrifugal chillers offer unloading to 10% of full load for a single compressor chiller, without using inefficient hot gas bypass. This unloading capability, unique in the industry, provides improved stability of the chilled water temperature and less harmful cycling of compressors in installations subject to operation at low cooling loads. There are significant reasons for this beneficial operating characteristic, including:

- **Movable Diffuser:** Daikin has pioneered the use of movable discharge geometry to lower the surge point of centrifugal compressors. The point at which the compressor enters a stall or surge condition generally limits compressor unloading. At low loads, low gas velocity through a fixed discharge area results in low gas velocities and the gas can stall or surge in the impeller. When in a stall condition, the refrigerant gas is unable to enter the volute due to its low velocity, and it remains stalled in the impeller. In a surge condition the gas rapidly reverses direction in the impeller, causing excessive vibration and heat. Daikin compressors reduce the discharge area as load decreases to maintain gas velocity and greatly reduce the tendency to stall or surge.
- **Thermal Expansion Valves:** There are three refrigerant control devices used in the industry: expansion valves, fixed orifices, and float systems. Of the three, only pilot operated thermostatic expansion valves, as used by Daikin, offer good refrigerant management throughout the entire chiller operating range. Expansion valves help the Daikin chillers achieve their industry leading capacity reduction capability.
- **Liquid Injection:** A small amount of liquid refrigerant is taken from the condenser and injected into the compressor discharge area. The liquid droplets absorb sound energy and reduce the compressor's overall sound level. The droplets evaporate and reduce discharge superheat.



Cooling towers