

# Hybrid Chiller Plants

Add Flexibility, Reduce Electric Demand



CNN Headquarters Building in Atlanta



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**W**hen CNN planned an expansion of their headquarters building in Atlanta, they went with a combination of

York electric centrifugal and York natural gas-fired engine-driven centrifugal chillers. In this way they created a hybrid

chiller plant, a combination of chillers using various energy sources to improve reliability and operating economy. It's not a new idea. But it's one that many commercial building operators are re-discovering. This solution is attractive because it adds diversity of energy sources and therefore potentially improves reliability.

## AT A GLANCE

- ▶ Hybrid plants add flexibility, reliability, energy cost savings
- ▶ For many owners, steam or hot water resources already there
- ▶ Hybrid plants improve reliability, reduce energy cost and add flexibility
- ▶ Can be steam drive, engine drive or absorption process

Further, it gives the owner more control over his/her energy selection, and permits seasonal adjustment of the energy mix depending on fuel costs, demand charges, and variable energy rates. In most cases, when you talk hybrid plants today you're discussing a combination of electric and natural gas (direct or indirectly) fueled units.

## ENERGY RESOURCES ALREADY THERE

For commercial buildings, the concept is a natural. There is usually already natural gas in the building. In some cases there is also a steam or hot water boiler with ample capacity in the heavier cooling months that could run an absorption chiller. An absorber can also be run off of the waste heat of electric generation as well. In this situation, the operating energy for the absorption chiller is free, and the dependence on electric chillers with their attendant energy and demand charges can be reduced.

## SOME ALTERNATIVES TO ELECTRIC CHILLERS

The idea behind a hybrid plant is to have more than one chiller using more than one fuel. The electric chiller may be a dominant player, but that doesn't always mean you want to run the electric before

an alternative fueled chiller. Some alternative chiller options are:

- ▶ Hot water, steam fired, or waste heat fired absorption chillers
  - ▶ Available in single-effect and double-effect. The temperature/pressure of the steam resource will determine if a more efficient double-effect unit can be used.
- ▶ Direct-fired absorption chillers using natural gas or oil.
- ▶ Engine-driven chillers using natural gas.
- ▶ Steam turbine chillers for larger commercial buildings.

A way for owners to achieve the fuel security and economic benefits of a hybrid plant is with the installation of a direct-fired or indirect-fired chiller using natural gas as the energy source. The gas cooling option is especially attractive for owners who have natural gas rates with incentives for use of gas during the cooling months, or who are seeing high electric demand charges. Simply having an absorption or engine-driven chiller can help absorb the shocks from rising electric energy and demand charges.

#### ABSORPTION

Direct-fired equipment is available from a variety of manufacturers including Trane, York, Broad USA and Thermax. Sizes range from small 3 ton units to 2,000 tons, and of course multiple units can be installed to meet various cooling requirements. Several of the suppliers also offer dual-fuel direct-fired units, which can fire either natural gas or fuel oil. The attraction of these units is that they provide owners even more fuel flexibility and redundancy.

#### ENGINE-DRIVEN CHILLERS

Another approach to the hybrid chiller plant is to use an engine-driven chiller. The York Millennium gas engine driven centrifugal chiller uses a Caterpillar engine to drive the chiller, and the entire operation is controlled by a single control panel. Similarly, Tecogen offers its TECOCHILL® natural gas engine-driven chiller in both water-cooled and air-cooled types, in sizes from 25 to 400 tons. Yet another approach is Trane's Gas-Powered Chiller (GPC) product, which is a matched electric centrifugal chiller and a Waukesha engine that supplies electric power to the chiller. With this system, additional flexibility also comes from the availability of the engine for other site electric needs.

#### STEAM TURBINE DRIVEN CHILLERS

If your facility has a reliable source of favorably priced steam, that steam can alternatively be used to drive a steam turbine centrifugal chiller. York offers a range of such products for owners with a steam source who want to add to their operational flexibility.

One such installation is at Providence Hospital in Washington D.C. Here the hospital recently replaced two smaller low-pressure absorption chillers with two 1200-ton York steam-turbine-drive centrifugal chillers operating with high-pressure steam from the hospital boilers. These accompany a 1200-ton electric centrifugal chiller. New cooling towers and condensate-water pumps were included in the project. The chillers immediately began saving energy because of their higher operating efficiency and their

microprocessor based variable-speed controls, which regulate the turbine speed to achieve the optimum operating point for each chiller.

#### MATCHING HOSPITAL LOAD

Hospital engineering manager Andy Fox explains that the hospital also saves energy because of the chillers' ability to handle 55°F entering condenser water. He adds, "We can run just one chiller, when before we'd bring a second chiller on-line to get the 200 to 300 tons of additional cooling." Providence Hospital's continuing commitment to a hybrid chiller plant is testimony to the value of this approach.

The key to evaluating a possible hybrid chiller installation is for the planning engineer to make sure to include all of the feasible energy source options and chiller technology types in the evaluation. The economics of various hybrid chiller plant schemes vary with energy rates, usage patterns and the comfort of the owner with operating multiple system types. In all cases, it is an option that should be considered.

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