



# Cooling Process Facilities with Natural Gas

## AT A GLANCE

- Increasingly, processes require environmental cooling
- Absorption cooling is a logical choice for industry
- Both direct-fired and indirect-fired systems have a place
- Systems take advantage of seasonal energy rates

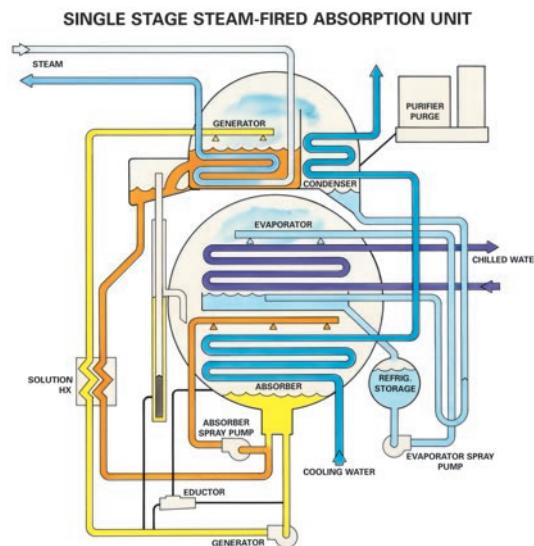
Installation of plant cooling equipment is an important trend in the world of manufacturing and processing. Gas-fired absorption cooling is a valuable tool to achieve that end. Your industrial facility may be an ideal candidate. Modern absorption cooling is more reliable and efficient than ever before.

### MANUFACTURING NOW NEEDS COOLING

The old paradigm was that manufacturing space wasn't suitable for cooling. Good ventilation was enough. That opinion is being challenged by the changing characteristics of the manufacturing process itself. Today, many products and processes simply work better in a controlled environment, and a controlled environment implies environmental cooling. Some products can only be produced in such an environment.

Much of today's process equipment is now controlled digitally. This equipment will malfunction or fail in the old, uncontrolled factory environment. Processes intended for operation in a controlled climate include printing, paper converting, packaging, pharmaceuticals, surface-treating, precision machining, advanced

## Benefits Include More Than Comfort



*This diagram illustrates the cycle used in a Trane single stage indirect fired absorption chiller. The source heat can come from plant low-pressure steam or from hot water.*

painting techniques and many others. Because many manufacturing operations are already volume natural gas users, gas cooling may be your best choice.

Such was the case at the Red Lion Road facility of Cardinal Health, in northeast Philadelphia. This facility provides contract packaging services to the pharmaceutical industry. Cardinal Health acquired the site in 1994 and totally renovated an existing building, including installing a new environmental cooling system.

### LAST MINUTE DECISION

Just days away from committing to electric chillers, Cardinal contacted their local

gas utility, Philadelphia Gas Works (PGW). PGW quickly provided information on gas cooling options, and capital/operating incentives. Within two weeks, Cardinal Health reversed its decision and installed two 300-ton York absorption chiller/heaters.

These two-stage machines are direct-fired and feature York's advanced control package to reliably deliver chilled water at 42°F, and on the heating cycle can deliver hot water at 175°F. Because the units are designed for dual fuel use, Cardinal Health was eligible to take advantage of PGW's

interruptible gas rates. Additionally, special low-cost cooling rates are offered from May through September.

### ONCE AGAIN, ABSORPTION CHOSEN

Four years after the initial building cooling system was installed, Cardinal Health added to the facility and acquired an adjacent building. Again they chose to install direct-fired absorption chillers, this time two 630-ton York Millennium™ chillers, Model YPF-DF-19G. Subsequent to that, another pair of chillers were installed to serve another facility expansion. In this case, a Trane direct-fired Horizon™ absorption chiller and a Trane electric chiller, each rated at 780 tons,

## For More Information

### Broad U.S.A.

<http://www.broad.com>

### Carrier

<http://www.global.carrier.com>

### McQuay International

<http://www.mcquay.com>

### Thermax

<http://www.thermaxindia.com/acd/maindivacd.htm>

### Trane

<http://www.trane.com>

### Yazaki Energy Systems

<http://www.yazakienergy.com>

### York International

<http://www.york.com>

were installed in a hybrid chiller plant arrangement, allowing each machine to operate at optimum times to take advantage of seasonal energy rates.

"The chillers operate year-round," says Cardinal Health's facility maintenance supervisor Ron Beyer. He indicates that because of the nature of the pharmaceuticals being packaged, environment control is critical. The chillers provide 42°F chilled water as well as hot water to the air handlers as needed.

The site's 145 air handlers serve individual primary and secondary packaging rooms, where bulk pharmaceutical products are bottled or blister-packed, then assembled in cartons. Each room has its own controls to maintain ideal conditions for the operations taking place there. Pharmaceutical manufacturers emphasize dry and cool conditions for packing products that might absorb moisture from the air.

According to Beyer, the absorption chillers were a new experience for him, but they've worked out well. He emphasizes, "We're very pleased with them. Once you understand them, they're really simple machines." He notes, "As long as recommended maintenance is performed, the machines are really very reliable." He adds that he inspects the chillers regularly and has the lithium bromide operating solution analyzed every six months.

## DIGITAL CONTROLS OPTIMIZE OPERATION

Absorption chillers are an attractive option for cooling industrial facilities. Modern absorbent chillers have digital controls that precisely manage the absorption cycle for optimum efficiency, and eliminate the risk of crystallization of the absorbent in the strong solution phase, an occasional problem with older absorbers. Because of their inherent simplicity, absorption chillers when properly maintained have an extremely long operating life.

Direct-fired absorbers can take advantage of a plant's existing rate for natural gas. Because the heaviest cooling load is usually in the summer, chiller operation can benefit from seasonally lower rates. And because the amount of electric energy needed is minor, the chiller won't elevate the facility summer peak electric demand. The same cannot be said for electric chillers, which will normally be at peak capacity on annual peak demand days.

## INDIRECT FIRED ABSORPTION USING EXISTING BOILER CAPACITY

An alternative absorption technology is steam absorption, taking advantage of existing plant gas-fired boiler capacity. Steam absorbers are available in single-stage and two-stage designs, depending on available steam pressure conditions. Because they normally use steam from an existing boiler, these machines take full advantage of existing plant resources. Absorption chillers can also run off of hot water or exhaust heat, whether from a boiler, reclaimed from a manufacturing operation, or the heat generated from a gas engine or turbine. In this way, they allow industrial users to take full advantage of the energy they are using.

In some process operations it is necessary to have a stored quantity of chilled water for periodic high volume uses. This



*The YORK model YPC absorption chiller/heater, as installed at Cardinal Health, can produce chilled water for cooling and hot water for heating.*

is sometimes the case in the manufacture of plastic containers, or in food processing. Here too, direct gas-fired absorption chillers or steam absorption machines can be very effective in chilling water for tank storage. Modern large absorption chillers can produce chilled water at 42° in volumes large enough to support these applications.

## CONFIGURING THE SYSTEM

To obtain the optimal results, plant layout and configuration should be considered before installing gas cooling. One option is a hybrid plant that includes some gas cooling combined with some electric cooling. Another possibility is the integration of the chiller, which may be configured in a series or a parallel setup. In parallel, the plant runs any of the units they wish, bringing on additional units as the demand for cooling grows. In series the first unit acts as a pre-conditioner and cools the water partway down and the second unit cools the water further, thus reaching colder temperatures than otherwise possible.

There are numerous manufacturers of absorption chiller suitable for process or industrial environmental cooling. In selecting machines, special attention should be given to the available fuel or steam resource, and the necessary chilled water characteristics. With the right selection, natural-gas powered absorption chillers add an important tool for the facility manager needing a controlled climate and hoping to achieve it with high reliability. <GT>