

Energy Solutions ESC Energy Solutions Center for Commercial Buildings

Going Green with Natural Gas

Natural gas systems promise high energy efficiency for high-performance buildings.

Natural Gas Is a Natural

for Green Buildings... and Green-Loving Business Owners



AT A GLANCE

- ▶ Natural gas can provide energy efficiency and good air quality in “green” buildings
- ▶ Installing high-efficiency gas furnaces and boilers is a good first step
- ▶ Natural gas cooling saves money and decreases demand on the electric grid
- ▶ Power generation with gas reduces greenhouse gas emissions
- ▶ Desiccant dehumidification reduces cooling costs

By replacing old heating equipment with high efficiency natural gas boilers, the 594,000-sq.-ft. Standard Life complex has become a model for reducing greenhouse gas emissions.

Among the many roles that natural gas can play in green buildings are improving air quality with natural gas-regenerated desiccant dehumidification, generating on-site power while producing heat that can be used to make hot water or steam, and fueling tankless water heaters in order to prevent standby energy losses from tank-style water heaters. It can reduce or eliminate the need to sanitize dishes with chemical cleaners in restaurants, and replace high-carbon-emission fuels such as coal and oil. And, naturally, it can supply the basics: highly efficient space cooling and heating, as well as water heating.

These improvements in energy efficiency also keep more “green” in the pockets of building owners.

GO GREEN WITH GAS HEATING

While heating and cooling systems and cutting-edge technologies such as fuel cells and microturbines tend to get the most attention, the first step in any effort to improve

When people think of “green” buildings, they usually expect them to operate with solar or wind power. However, natural gas is a true natural fuel, readily available to offer high energy efficiency for both green and everyday structures.

Natural gas can play a key role in promoting energy efficiency and good air quality in many of the buildings certified as LEED (Leadership in Energy and Environmental Design) by the U.S. Green Building Council. The LEED Green Building Rating System™ is the nationally accepted benchmark for the design, construction and operation of high-performance green buildings.



On the cover: Buildings that employ natural gas to drive HVAC and on-site power generation systems have chosen smart options environmentally... and economically.

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the energy performance of an existing building starts with the building envelope. Ensuring optimum insulation levels and controlling air infiltration are the critical foundations upon which energy efficiency is based. These types of investments tend to cost the least yet provide the biggest returns, both financially and environmentally.

But once the fundamentals have been addressed in terms of insulation, air infiltration and high-efficiency lighting, where does natural gas fit into the “green” equation? Upgrading to high-efficiency gas furnaces and boilers is one of the easiest ways to begin saving energy with natural gas as an energy source, according to John Gordon, General Energy Consultant for National Fuel Gas Distribution Corporation, a natural gas utility serving western New York State and northwestern Pennsylvania.

“If you’re incorporating a green approach within your building, installing a state-of-the-art high-efficiency natural gas heating system would be one of the first steps,” he says. “When combined with heat recovery equipment to capture and reuse exhaust heat within a well-insulated, tight building with high-performance windows and doors, controlled ventilation, high-efficiency lighting, and natural gas water heating, you have an integrated building system that is very energy efficient. You have to look at the package as a whole and at how each component interacts and impacts the other. Natural gas is an important part of the equation.”

In Canada, where the government strongly promotes efforts to reduce greenhouse gas emissions, the 594,000-sq.-ft. Standard Life complex in Toronto is now heated with high-efficiency RayPak boilers designed to cut operating costs by \$125,000 a year.

Standard Life is a multi-use structure with two commercial office towers, the Shepard Centre retail mall, and one of Toronto’s largest parking garages. It is served by a single central heating plant with 10 natural



Natural gas can warm (or cool) our homes and businesses, provide hot water, cook our food, dry our clothes, generate clean power, and fuel our industries, all without destroying our environment. It does so economically, with proven and reliable technology and it is produced right here in North America... all of which makes natural gas the fuel of choice.” — *John Gordon, General Energy Consultant for National Fuel Gas Distribution Corporation*

gas-fired boilers that supply 24 million Btus of hot water for space heating at 87% efficiency. These replaced an aging, oversized gas boiler system that was only 65% efficient. It was costing \$50,000 a year to maintain the older boilers. The new boilers, installed in early 2007, will pay for themselves in three years.

The insurance and real estate firm had already upgraded the complex by installing efficient lighting and making other energy-saving improvements, according to Norman Almeida, Technical and Construction Manager for Central Canada Property Management, Standard Life Real Estate Service Inc.

“We pay incentives for customers to reduce their gas consumption through high efficiency equipment,” says Bill Chihata, Program Manager, Commercial Sector, for Enbridge Gas Distribution Inc., the natural gas utility that serves Toronto. “Enbridge is one of the pioneer utilities in Canada in promoting energy conservation to their customers, leading to substantial reductions in greenhouse gas emissions.”

GREEN POWER, GREEN COOLING

When building owners decide to take their conservation efforts a step further, it’s time to explore power generation and cooling.

One of the hottest topics in the energy business is the use of natural gas for on-site electric generation in order to curtail construction of new electric generating plants. Such plants are costly to construct, resulting in higher power costs for all ratepayers. They also release large

amounts of carbon dioxide, fine particulates and other emissions that negatively impact air quality.

Natural gas is very low in carbon. When burned, it releases carbon dioxide as a byproduct, but not as much carbon as other fossil fuels.

Reducing a building’s dependence on power obtained from less efficient electric generating plants benefits both the environment and the bottom line.

“By utilizing natural gas equipment instead of electric equipment, you are eliminating the need for additional generating capacity,” says Gordon. “Generating plants are costly

NATURAL GAS CAN “GREEN” A BUILDING BY:

- Providing the fuel for high-efficiency space cooling and heating, as well as water heating
- Replacing high-emission fuels such as coal and oil that release greenhouse gases
- Eliminating by gas cooling the use of CFCs that damage the earth’s ozone layer
- Generating electric power onsite, thereby reducing demand on power plants
- Cutting carbon emissions from electric generating plants
- Lessening the need to build new generating plants
- Regenerating desiccant dehumidifiers to maintain proper indoor air quality and ventilation and prevent “sick building syndrome
- Reducing the size requirements for conventional air conditioning systems
- Decreasing the need for chemical cleaners by means of booster water heaters
- Preventing energy waste and heat loss from hot water pipes by replacing tank-style water heaters with tankless natural gas water heaters



Ten RayPak HiDelta Phase 2 natural gas-fired boilers operating at 87% efficiency are expected to shave \$125,000 per year from heating costs at the Standard Life complex in Toronto.

to build. It's more cost effective to eliminate demand than to build new generating plants. It's also more benign from an environmental perspective, by reducing greenhouse gas emissions, smog and acid rain."

True energy efficiency should consider not only the site appliance efficiency but the full-cycle efficiency, including all energy losses from the fuel source through conversion and consumption. Natural gas in its original state is piped from the well directly to the customers, typically losing less than 10% of its original source energy value, as compared to more than 70% lost, mostly in electric generation, but also through transmission and distribution. Electricity is not a naturally occurring energy source. Its source fuels – coal, oil, natural gas, and plutonium – must go through an inefficient conversion process that depletes the original energy value and, in the case of coal or oil, produces higher emissions.

Consider a typical 40-gallon electric water heater requiring 4.5 kW to operate. For 100,000 water heaters, a 450 MW power plant would be needed. At \$1,000 per kW, that plant would cost ratepayers \$450 million to build.

Using direct-fired natural gas technologies to reduce electric kilowatt demand is an important strategy to efficiently utilize natural energy resources while reducing carbon dioxide and other greenhouse gases that have detrimental environmental impacts, says Steve Lisk, Technical Services Engineer with Piedmont Natural Gas of Charlotte, North Carolina. When building a new generating plant costs \$1,000 per kilowatt, he says

lowering power demand is a necessity. "This benefits all of us ratepayers," Lisk says.

The heat recovered from power generation can be converted to air conditioning through absorption chillers. Absorption chillers use heat instead of mechanical energy to cool air. When added to a cogeneration system, an absorption chiller turns it into a "trigeneration" power plant with up to 90% system efficiency.

SAVE WITH MOISTURE CONTROL

Natural gas-regenerated desiccant dehumidification systems, which remove moisture from air with adsorbent materials, can vastly reduce the amount of electric power needed to cool buildings. When excess moisture is removed from indoor air, building occupants can feel comfortable at higher temperatures. For every degree that a thermostat's cooling set point is raised, it is possible to significantly lower electric use while reducing demand on the overstrained power grid.

Some building operators overcool buildings in an attempt to control excess moisture. This can result in condensation problems, freezing occupants and high power bills. The problem can easily be rectified with desiccant dehumidification. Optimum moisture levels also prevent growth of molds and bacteria that contribute to "sick" buildings.

"These (desiccant) systems also help meet green building requirements," says Ed Berger, CEM, Project Engineer, Marketing, for UGI Utilities, Inc., of Reading, Pennsylvania. "First, they

guarantee relative humidity in the building. Second, by saving money using gas versus electricity, you have a lower overall operating cost."

Natural gas can harmonize with other energy sources such as solar power to provide optimum efficiency, according to Gordon. He cites Clarion University of Pennsylvania, a public university with plans to install a hybrid power generation system that blends a solar photovoltaic system with a microturbine fueled by natural gas. The microturbine will offset a portion of the building's electrical energy, supplemented by solar-generated electricity. The exhaust heat from the microturbine will be used to reduce the heating and dehumidification loads.

"We see some synergy in that," Gordon says. "It's important to remind ourselves that natural gas is largely a North American resource – as opposed to foreign oil. It's good for the nation from a public policy perspective. Natural gas is the fuel of choice in our evolving transition to a future where renewable energy will play a greater role."

At night there is far less power demand on campus, making it possible to employ the microturbine at very high efficiency levels. With heat recovery for pool heating, space heating and domestic hot water, the microturbine's overall energy efficiency can reach up to 80%.

"Natural gas can warm (or cool) our homes and businesses, provide hot water, cook our food, dry our clothes, generate clean power, and fuel our industries, all without destroying our environment," says Gordon. "It does so economically, with proven and reliable technology, and it is produced right here in North America... all of which makes natural gas the fuel of choice."

MORE INFORMATION

COMBINED HEAT AND POWER	www.poweronsite.org
GAS AIR CONDITIONING	www.gasairconditioning.org
U.S. GREEN BUILDING COUNCIL	www.usgbc.org

Natural Gas Heat Delivers Quiet Comfort

AT A GLANCE

- ▶ Natural gas heat offers indoor comfort for apartment residents
- ▶ Installing PTAC (Packaged Terminal Air Conditioner) units that both heat and cool generally costs less than replacing an aging boiler
- ▶ Tenants like individual thermostat controls
- ▶ The PTACs are easy to maintain and help save energy

Natural gas can greatly enhance the comfort level for those living in high-rise apartment buildings.

The residents in two senior citizen apartment buildings in Millville, New Jersey enjoy the quiet, steady warmth supplied by individually controlled Fedders Islandaire PTAC (Packaged Terminal Air Conditioner) units with natural gas-fired heating. These units were installed to replace a central boiler system that supplied hot water to baseboards in each apartment.

Reaction to the new heating system has been positive.

“Tenants like them, overall,” explains James B. Hertig, Director of Maintenance and Capital Protects for the Millville Housing Authority. “They’re quiet, and a lot quicker to yield heat than the baseboards.”

Millville is a rural community in southern New Jersey, located 45 minutes from Cape May, Atlantic City and Philadelphia.

The Millville Housing Authority, which manages the two high-rise buildings along with a third structure that is all-electric, installed 300 wall heating/cooling units in 2004. To repair the existing, aging, central boiler system that was beginning to spring leaks would have been prohibitively expen-



Tenants like (PTACs), overall. They’re quiet, and a lot quicker to yield heat than the baseboards.” — James B. Hertig, Director of Maintenance and Capital Protects for the Millville Housing Authority

sive. Replacing it with another one would have required opening up building walls and undertaking an asbestos abatement program while disrupting the residents, states Hertig. Instead to augment gas service already available to each apartment for cooking, new larger gas pipes were added outside the building and run along the balconies and in through wall panels to supply the PTACs, then camouflaged with paint to match the building’s façade. The PTACs are also plugged into conventional 110 volt electricity.

Millville Housing Authority Executive Director Dale Gravett had long sought a method to combine efficient, metered delivery of utilities with a way to give residents reliable, individual control of their heating and cooling. The old baseboard system made it difficult to control heat, and tenants often opened windows to cool off during the winter.

The PTACs also deliver ventilation to the apartments and make it possible for tenants to enjoy air conditioning during the summer months. Previously, only those apartments that had tenant-purchased window units were air conditioned.

ENERGY SAVINGS ADD UP

Energy efficiency is yet another reason for this installation. An energy services contractor had already upgraded the lighting in the buildings to reduce electricity costs. Electric heating units would have been far more expensive to operate. Tenants in the housing



Fedders Islandaire PTAC

authority’s all-electric apartment building pay an average \$89 a month for heating, cooking, lighting, refrigeration, and hot water. By contrast, it only costs residents of the Authority’s East building, which has PTACs, \$68 a month for the same amenities. Tenants receive a utility allowance and can keep any money left over after paying the bill. This creates motivation to conserve energy. The Housing Authority is currently re-analyzing the total amount of savings.

“We go for the most efficient green systems we can,” says Hertig. “We’ve stayed on top of anything that can save energy and money. We’re a housing authority and HUD (the U.S. Department of Housing and Urban Development) has continually reduced our funding over the last 15 years.”

The housing authority also finds the PTACs easier and less costly to maintain. In past winters, each building required 24/7 monitoring of boilers. Now, general maintenance staff can remove units and send them to the shop. They slide them out, put them on a cart and install replacements while the original ones are being repaired, says Hertig.

For more information, visit the Fedders Islandaire, Inc. website at www.islandaire.com.

Large or Small, Retailers

Reap Savings by Controlling Moisture

AT A GLANCE

- ▶ Controlling indoor moisture works for both large and small retailers and restaurants
- ▶ Customers are more comfortable in humidity-controlled environments
- ▶ Lowering humidity makes it possible to raise thermostats, saving energy
- ▶ Desiccant dehumidification units can prevent damage to buildings and furnishings by stopping condensation

By getting rid of excess indoor moisture, both large retail stores and small fast food restaurants are finding it possible to improve customer comfort.

In fact, any retail operation, regardless of size, that is located in a humid climate, can benefit from a natural gas-regenerated desiccant dehumidification system that pulls excess moisture out of indoor air while bringing in the high levels of fresh air needed for a healthful building. Providing comfortable indoor environments can encourage

Lowe's in Spartanburg, South Carolina controls moisture with desiccant dehumidification.



customers to spend more time making purchases, or order that extra dessert.

Desiccant dehumidification can achieve substantial savings for retailers as well. Controlling excessive indoor moisture can keep employees comfortable, reduce slippage hazards by helping to quickly dry just-cleaned floors, and prevent deterioration of building amenities such as ceiling tiles and seat cushions.

One of the greatest savings, however, comes from being able to raise the indoor temperature by two or more degrees during the summer cooling season, while continuing to provide a comfortable shopping, dining or working environment.

COOL SAVINGS POSSIBLE

"For each degree you raise a thermostat, ASHRAE (the American Society of Heating, Refrigerating and Air-Conditioning Engineers) says you can save 6-8% on your cooling bill," says Ralph Terrell, Manager, Technology

Development, Teco Peoples Energy, a Florida natural gas utility.

Restaurants and other businesses in hot, humid locations tend to overcool indoor environments in an attempt to control excess moisture. This can make diners so uncomfortable that they leave after finishing their entrées, not taking time to linger over coffee and pie.



The SEMCO Revolution® natural gas desiccant dehumidification/air conditioning unit delivers comfort and savings at Lowe's.

But when that moisture is controlled at the optimum range of 45-55% relative humidity (RH), it becomes possible to set the thermostat higher and avoid overchilling patrons.

"When you dry out the air, you feel more comfortable at a higher temperature," Terrell says. "The restaurants we've put [desiccant dehumidification systems] in have been able to increase the indoor temperature from 72° to 75-76°F and everyone still feels comfortable."

The same principle applies to large format retailers such as the home improvement company Lowe's, as demonstrated during a test of a SEMCO Revolution® desiccant dehumidification/air conditioning hybrid rooftop unit regenerated with natural gas, at a store in Spartanburg, South Carolina. Lowe's operates more than 1,425 home improvement stores in 49 states.

BIG RETAILER SEEKS COMFORT, SAVINGS

Lowe's was looking for a way to maintain comfort inside the store while saving energy during the cooling season by raising the space thermostat set point and operating fewer tons of conventional air conditioning equipment.

"When you improve the humidity, you can increase the temperature set point and get



At Lowe's, an existing concentric curb air distribution plenum is now served by the desiccant dehumidification/air conditioning unit.

similar comfort with a higher temperature,” explains Charles Martin, Energy Manager for Lowe’s. “We do have to lower our temps to maintain comfortable conditions in our stores and we were looking for alternatives to doing that.”

The Revolution® system was installed on the store’s roof, replacing an existing vapor compression rooftop unit. Designed to sense indoor temperature and humidity conditions, it delivers a high volume of fresh air at the temperature and dew point needed to control the space as near to 75°F and 50% RH as possible. Conditions inside the store were closely monitored from mid-2006 through January 2007 for the U.S. Department of Energy (DOE), and continue to be monitored by Lowe’s and SEMCO.

“The operating efficiency of the Revolution® unit was continuously monitored and found to be very high during both the cooling/dehumidification season as well as during the

This Applebee’s restaurant in Florida offers a comfortable indoor environment for patrons despite the humid climate, thanks to two NovelAire® compact desiccant-based dehumidifiers.



heating season,” explains John Fischer, Director of Research and Development for SEMCO. “Lowe’s places a very high priority on their customer comfort experience. They want to maintain a comfortable environment within their stores, and do so in an energy efficient manner. The current design uses approximately 300 tons of conventional HVAC equipment and this new approach should enable them to get more efficient humidity control with approximately 40 fewer refrigeration tons installed on their roof.”

For Lowe’s, the results show promise.

“We have been able to run that store at two degrees higher than the two other stores that are similar in design in the Spartanburg market,” says Martin. “We think it’s having a positive effect in the store.”

He adds that desiccant dehumidification can also reduce excess humidity that builds up in the store during the cooler night hours, when stocking is done.

“We believe there’s potential there for improved comfort and energy savings,” he says.

SMALL DEHUMIDIFIERS AID RESTAURANTS

For smaller retailers such as fast food restaurants, moisture control has now become possible through the NovelAire® ComfortDry 400, a compact desiccant-based dehumidifier designed for residential and light commercial use. It operates on the same principle as large commercial desiccant dehumidification units, employing a rotating desiccant wheel that adsorbs moisture from the air. The wheel is dried with a natural gas burner, and the moisture exits the building through the exhaust air.

The NovelAire became commercially available in 2006 after five years of development, and has been installed in more than 40 homes and a number of small restaurants, mostly in humid Florida. The restaurants range in size from under 2,000 sq. ft. to nearly 8,000 sq. ft., and require one to two ComfortDry units.

“There is a potential for a restaurant to save energy if they’ve been running real cold and raise their set point, but restaurant



Technicians install a NovelAire® compact desiccant-based dehumidifier under the ceiling tiles at a restaurant.

owners benefit primarily from maintenance savings and improved patron comfort,” says Scott Janke, Vice President of NovelAire Technologies in Baton Rouge, Louisiana. The company’s restaurant installations include Applebee’s, Waffle House and Chili’s locations in Florida.

“For a retrofit, NovelAire is the way to go,” says Terrell, of Teco Peoples Gas. “This is an inexpensive alternative to larger humidity control systems.”

The units are small enough that they can be installed in the space above the tiles in a dropped ceiling. A typical restaurant installation is completed quickly.

“We start (installation) work at 7 a.m. By the time the restaurant opens at 11 a.m., they’re installed and ready to go,” Terrell says.

The dehumidification units prevent humidity damage and maintenance problems, such as cash registers and windows dripping with condensation.

“One restaurant we installed was a Chili’s in Ft. Myers,” recalls Terrell. “They had to replace their ceiling tiles because they were becoming warped due to excess humidity. It helps protect the carpets, wallpaper and any fabric. They’ll last much longer if you keep the humidity under control.”

“The feedback we’ve gotten so far is that there is improvement in patron comfort and maintenance issues,” says Janke. “A lot of people go to restaurants and freeze. This creates a more comfortable dining experience.”

MORE INFORMATION

CONCEPTS AND DESIGNS	www.conceptsanddesignsms.com
NOVELAIRE	www.novelaire.com
SEMCO, INC.	www.semcoinc.com
MUNTERS CORPORATION	www.munters.com

ADDITIONAL INFORMATION IS ALSO AVAILABLE AT:
www.gasairconditioning.org

Natural Gas Offers Key

to Reducing Electric Demand

AT A GLANCE

- ▶ Both large and small energy savings are possible with natural gas equipment
- ▶ A Texas school found quick savings with a natural gas-fired booster water heater
- ▶ A Canadian natural gas utility company cuts energy consumption by 30% in its headquarters
- ▶ A second building under construction will reduce energy use by 35%

Lowering your electric bill is a great idea in many ways. It puts money back in your pocket, and it's good for the environment. Reducing electricity use during peak demand periods saves even more money by allowing customers to trim or even eliminate the heavy surcharges power companies impose during the daytime hours when use is at its highest.

Cutting back on power use can be accomplished in small steps that yield fast results. It can also be achieved by retrofitting a building with energy-efficient heating, cooling and power-generating systems for a much larger payback over the long term.

The Rockwall Independent School District in Rockwall, Texas, found a quick way to cut \$150 to \$200 from the monthly electric bill at one of its schools by installing a tankless booster water heater in the cafeteria. The natural gas-fired PrecisionTemp™ PT 200 delivers sanitizing 180°F final rinse water to the cafeteria's dishwasher, resulting in cleaner dishes and significant savings.

COOLING ENERGY SAVINGS POSSIBLE

Union Gas Ltd. in Chatham, Ontario, retrofitted the entire cooling system in its 200,000-sq.-ft. administrative headquarters for significant energy savings. It is also constructing three new buildings in accordance

with the LEED Green Building Rating System™, a widely acknowledged benchmark for the design, construction and operation of high-performance green buildings, to use far less energy than traditional buildings.

By replacing aging electric chillers with a hybrid system that runs partly on natural gas, installing automated controls, and replacing pumps controlled by variable frequency drive (VFD) and a high efficiency cooling tower, Union Gas has reduced the cooling system's electricity consumption by 30%.

The centerpiece of the new cooling system is a 200-ton natural gas-fired, engine-driven Tecochill® CH-200x Chiller from Tecogen, Inc., that makes it possible to reduce the building's electric demand during peak periods, according to Bart Bond, Facility Manager for all 63 buildings owned by Union Gas. It is teamed with a 250-ton Trane electric centrifugal chiller and automated controls that determine which chiller to operate at any given time period for maximum savings by taking advantage of optimal fuel rates.

"What that does is give us the opportunity to decide on the deployment on any given day of any combination of electricity or gas, depending on the need," Bonds explains. "If the building needs 200 tons of cooling,

it will determine which chiller to run, based on outdoor temperature, which translates to fuel rates."

Also installed was a 1.8-MW mixed fuel natural gas/diesel-fired Harper Detroit electric generator from Harper Power Products, Inc., that makes it possible to shift the entire building off the electrical grid. Closed transition controls make the shift seamless, with no flickers that could otherwise disrupt the operation of the building's massive data center or the work of more than 850 employees. The building has run solely on its own generated power on a number of occasions, once for as much as 8 days.

COGENERATION REDUCES DEMAND ON GRID

Greater energy savings are anticipated when a new 20,000-sq.-ft. Union Gas administration/service building in Burlington, Ontario is scheduled to open during the spring of 2008. Currently under construction, the building will incorporate a wide variety of features that are expected to lead to Gold LEED certification.

Four 65-kW ICHP (Integrated Combined Heat and Power) Capstone microturbines will generate all of the building's

Union Gas Ltd., has implemented energy-saving measures at its administrative headquarters in Chatham, Ontario.



Rockwall, Texas schools replaced an inefficient electric water heater (right) with a PrecisionTemp™ natural gas booster heater (inset) to save energy and lower operating costs.

electricity. Heat from the generating process will be captured and used for space heating through a radiant floor system. When the microturbines shut down for the night, the heat they made will be stored in an underground hydronic sump for use the following morning. Bond says Union Gas is also examining the possibility of selling excess electricity from the microturbines to the regional power grid.

“We expect to reduce energy consumption by more than 35%,” says Bond, adding that two other similar buildings are planned in Kingston and Windsor, Ontario.

The buildings will also provide a showcase of potential energy savings for owners of other commercial structures.

LESSENING THE NEED FOR NEW GENERATING PLANTS

Installing high-efficiency natural gas equipment such as booster hot water heaters not only lowers electric demand on overstrained power companies, but also lessens the need for constructing additional generating plants. Significant monetary savings are possible as well.

Commercial users such as schools pay demand rates based on their maximum electric usage. Although utility prices vary from one area to another, some places that install booster hot water heaters achieve payback in as little as four months, depending on usage, rates and other factors. Other places may take as long as 1½ to 2 years to recoup their costs.

In Rockwall, Texas, the school cafeteria staff previously used a 54-kW electric booster heater, which ran during the day when electric demand is highest. The new PrecisionTemp™ natural gas booster heater uses only half a kilowatt, reducing peak demand charges and reducing the overall electric bill.

“That’s 53 fewer kilowatts showing up on their demand billing,” says Greg Anderson, Commercial Marketing Manager for Atmos Energy, a natural gas utility serving portions of Texas and 11 other states. He says schools are occupied during hours when

electric demand on the utility is at its maximum.

Rockwall took advantage of new kilowatt-reduction incentives from the power company to finance the initial booster installation, according to Julie Farris, Child Nutrition Director for the school system. Her department is in charge of school cafeteria operations. The Texas legislature has mandated that electric utilities develop demand-side management programs to remove kilowatts from the power grid; as a result, rebates covered close to 80% of the equipment cost. Some additional costs were covered by Atmos Energy.

“We pretty much get back the cost of putting in the booster heater,” says Farris. “You can’t beat that.” She says similar booster hot water heaters have been installed in two new elementary schools that open this fall, as well as in an existing high school as a retrofit.

“I thought it would be a viable solution to save energy,” she explains. “We tested and evaluated at one campus for two months. We found cost savings, and a short return on investment with the incentives.”

Farris says she also likes the fact that the boosters operate on demand instead of maintaining super-hot water all day long. Hot water from the school’s main boiler enters the dishwasher at 110°F; the dishwasher internally heats that water to 160°F. State law requires that final rinse water be 180°F, which is where the booster heaters come in.

HOT WATER ELIMINATES CHEMICAL CLEANERS

The extra-hot water not only provides cleaner dishes, silverware and trays, but also makes it possible to achieve this level of sanitation without costly sanitizing chemicals. Farris says that the next step will be to retrofit the five schools that use chemical dishwashing, replacing the chemicals with booster water heaters for even greater savings.

“You avoid chemicals, use less water, have lower sewerage



charges, and get much better results,” says Gerry Wolter, President of Cincinnati-based PrecisionTemp.

The first thing Wolter does in a restaurant is examine the dishes, glassware and silverware. “I can tell instantly if they’re low-temp or high-temp” for dishwashing, he says. With a lower-temperature chemical wash, the spots are a dead giveaway. One of the many advantages of using a natural gas-fired booster water heater is spotless dishes.

The dishes also dry faster because they are hotter, and there’s less water dripping on the floor, resulting in fewer slips and falls. A high-temperature final rinse can dissolve tough proteins such as eggs or cheese, and even remove lipstick from glasses.

“With low temp there’s a very high rewash rate, which involves more chemicals, more water, more electricity,” says Wolter. In addition, having a booster water heater means the main boiler can be set lower to prevent scalding and save energy. Potential scalding is a serious issue for places like schools and nursing homes. Lowering boiler temperature also greatly increases the life of the equipment and lets the boiler run more efficiently.

But above all, Wolter extols the monetary savings that result from boosting the temperature of dishwashing water. Savings like this add up, and help not only a building owner’s bottom line, but also reduce pressure on a country’s generating capacity.

MORE INFORMATION

**CAPSTONE TURBINE CORPORATION
HARPER POWER PRODUCTS, INC.
PRECISIONTEMP™
TECOGEN, INC.
UNION GAS**

www.capstoneturbine.com
www.harperpowerproducts.com
www.precisiontemp.com
www.tecogen.com
www.uniongas.com

ADDITIONAL INFORMATION IS ALSO AVAILABLE AT:

www.gasairconditioning.org
www.gfen.info
www.poweronsite.org

Natural Gas Helps Define Luxury

in New Upscale Condominiums

AT A GLANCE

- ▶ Natural gas defined as a luxury amenity
- ▶ Professional-style cooking attracts buyers
- ▶ Endless hot water enhances spa experience

Natural gas is increasingly being promoted as a resource for luxurious living. It offers precision control for cooking, an endless supply of hot water for in-suite spas and outdoor pools and the lovely ambience created by the flickering flames of gas lights and gas fire pits.

In Houston, Texas, awareness of the benefits of natural gas in high-end condominium developments has led several prominent developers to sign on as participants in the Luxury on Demand program offered by CenterPoint Energy. These developers understand that natural gas appliances such as professional-caliber cook tops, ovens and gas water heaters enhance the overall comfort, elegance and marketability of their designs.

“If you were purchasing a million dollar-plus home, naturally you would expect that home to feature the finest amenities and the best high-end appliances,” says Steve Landrum, Manager, Marketing Communications, for CenterPoint Energy. “The same is true for purchasers of mid- or high-rise luxury condominiums. These condominium developments define luxury. And part of that definition of luxury is high-end gas amenities and appliances.”

LUXURY ON DEMAND CONCEPT AIMED AT HIGH-END REAL ESTATE

Luxury on Demand is a way to showcase the attributes of natural gas that play so well to an audience demanding the finest in high-rise living, according to Landrum. “More and more people are moving into downtown and the Inner Loop of Houston,” Landrum says. Many of these prospective buyers of condominium homes are empty nesters from the Houston suburbs — couples who want to be closer to cultural events, museums, sporting venues, and the other attractions a big city offers. “They are coming out of very nice homes where they have used natural gas for cooking, heating and water heating. Because they have



already developed preferences for natural gas, these condo shoppers have high expectations that will not be satisfied by the slow recovery of electric water heaters or imprecise electric cooking.” The natural gas products in Houston’s finest new Luxury on Demand residential properties fit the very definition of luxury.

These include such amenities as:

- ▶ Professional-quality natural gas cooking equipment – the type used by top chefs around the world
- ▶ Gas water heating to supply extra-large tubs with continuous hot water for a spa-like experience.

“To create the luxury experience, you need renowned brands of cooking equipment such as Viking, Dacor and Miele. And you need ample hot water with no worries about it running out,” explains Landrum.

The Sonoma, a 210-unit condo for Houston’s Rice University area, will feature luxury amenities, powered by natural gas.



**Top: Spa living in each bath.
Below: Professional-line cooking in each kitchen.**

Luxury on Demand properties in Houston use environmentally-friendly natural gas water heating via central boiler systems or tankless water heaters. Several developers use Teal System™, a preferred vendor whose large natural gas-fired central hot water plant delivers an unlimited supply of hot water directly to condominium residents.

In common areas, natural gas sets a special mood with outdoor fireplaces, open-flame carriage lights and torch lights. Whirlpool spas and outdoor pools are maintained at pleasantly comfortable temperatures with natural gas pool and spa heaters. In some developments, residents can enjoy outdoor grilling on natural gas flames in common-use “summer kitchens.”

FOUR HOUSTON PROJECTS FEATURE NATURAL GAS AMENITIES

The first four Luxury on Demand developments in Houston are in various stages of design, sales and construction. All feature natural gas for cooking, water heating and common area uses.

“Gas is an amenity that buyers of our properties have come to expect,” affirms a member of the marketing team for Randall Davis Company, developer of two of the properties. One, the Sonoma, is a mid-rise condominium property with 210 residences in the upscale Rice University area. It offers top-of-the-line Viking stove cooktops and ovens as standard equipment, along with a natural gas-heated boiler system that provides instantaneous, limitless hot water.

Another Randall Davis Company project is the Cosmopolitan, an 80-unit condominium residence being developed in Uptown Houston.

“We’re providing our residents with the experience of complete relaxation through the luxury style of spa living,” said Randall Davis, in an interview describing the Cosmopolitan’s amenities. “Luxury on Demand emphasizes our standards of offering world-class kitchens, baths where you can rejuvenate in a hydro-thermo massage tub, and other features, such as the raised infinity pool and spa.”

A 30-story high-rise condominium by MDA Holdings, 2727 Kirby offers 90 residences ranging in size from 1,250 to 6,100 sq. ft. Located near Houston’s prestigious River Oaks community, residents of 2727 Kirby will enjoy gas cooking and planned innovations such as energy-efficient tankless gas water heaters in a manifold arrangement for domestic hot water and for heating comfort as part of a closed-loop water source heat pump system. 2727 Kirby also features an infinity pool looking east towards downtown, a private hot tub area, cabañas and outdoor fireplaces, and a resort-style private fitness center and spa.

The fourth project is Endeavour Parkside, a planned 146-unit residential high-rise overlooking Houston’s Clear Lake. The developer is Endeavour Holdings, Inc. Currently under construction, it will include gas cooking and hot water,



These condominium developments define luxury. And part of that definition of luxury is high-end gas amenities and appliances.”

— Steve Landrum, Manager, Marketing Communications for CenterPoint Energy

plus an on-site concierge, 24-hour fitness center, rooftop lounge and terrace, and a courtesy boat dock.

Beyond the comfort, savings and reliability of natural gas, developers and residents alike enjoy the satisfaction of knowing that they are reducing greenhouse emissions, according to Landrum.

“Heating water with natural gas is going to have far less of a carbon footprint than an electric water heater because of the greater air emissions associated with generating electricity,” he explains. In addition, using natural gas as a fuel in place of electricity results in reduced demand on power plants, and, conse-



quently, reduced need to build costly new electric generating facilities.

“People are becoming much more aware of the issue of global warming,” says Landrum. “Natural gas can help you move to lower emissions.”

For more information about Luxury on Demand, click luxurywithnaturalgas.com or call 1-877-LUX-4GAS.

MORE INFORMATION

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(TEAL SYSTEM™)**

www.tealsystem.com

DACOR, INC.

www.dacor.com

MIELE INC.

www.mieleusa.com

THE BOSCH GROUP

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VIKING RANGE CORPORATION

www.vikingrange.com

Increased Fresh Air in Schools

Creates Healthier Learning Environment

School districts around the nation need to increase classroom ventilation in order to provide healthful environments for working and learning.

Experts say adequate ventilation can solve the majority of indoor air quality (IAQ) problems that affect buildings such as schools.

Insufficient ventilation has been linked to increased indoor concentrations of volatile organic compounds and CO₂. Poor IAQ can lead to drowsiness, headaches and a lack of concentration, all of which are undesirable in a school. Allergies, asthma and colds may also worsen in bad IAQ situations. Studies show absenteeism is higher in schools with poor IAQ.

ASHRAE (the American Society of Heating, Refrigeration and Air-Conditioning Engineers) prescribes ventilation rates for acceptable IAQ. Moving large quantities of fresh air into schools and other buildings is essential for good IAQ, but in warmer, more humid regions, this can lead to unacceptably high indoor moisture levels.

"A typical HVAC system has no problem cooling both sensible (heat) and latent (moisture) loads, but when you get into scenarios like classrooms with high percentages of ventilation, HVAC can't perform the total cooling required," says Ed Berger, CEM, Project Engineer, Marketing, for UGI Utilities, Inc., of eastern Pennsylvania.

When incoming moisture gets out of control, it leads to condensation and damage in building materials, furnishings and even library books. In the worst cases, it can foster the growth of molds and other pathogens.

Indoor moisture problems can be found in many schools in the United States, from Georgia and Alabama to Minnesota. In

northeastern Pennsylvania, three schools recently installed natural gas-regenerated Munters desiccant dehumidification systems that increased ventilation, stabilized indoor humidity levels and improved indoor air quality while yielding lower energy bills, decreased maintenance and, in one instance, significant savings from scaling down the cooling system during construction.

GOOD AIR QUALITY CAN PAY FOR ITSELF: ENTHALPY

Properly conditioning incoming fresh air can increase a school's total energy bill. But using an air-to-air energy-recovery device, such as an enthalpy wheel, can reduce both energy use and peak loads. An enthalpy wheel transfers heat and moisture from one air stream to another. During the summer, enthalpy wheels keep schools cool and dry by transferring sensible and latent energy from the ventilation air to the exhaust air, lowering both the temperature and relative humidity of the incoming air. They can cool incoming air to about 67°F wet bulb, reducing the amount of standard cooling required.

At Westwood Elementary School in the Elk River Area School District of Minnesota, energy recovery wheels helped the building become the state's first school to earn LEED certification. The school's energy recovery wheels transfer as much as 80% of the sensible and latent energy, greatly reducing energy costs.

GOOD AIR QUALITY CAN PAY FOR ITSELF: DESICCANT DEHUMIDIFICATION

John Fischer, Director of Research for SEMCO, Inc., in an ASHRAE paper on cost savings and cost avoidance for schools using desiccant-based systems, concluded



A SEMCO Revolution® natural gas-fired hybrid cooling/dehumidification system supplies moisture-controlled fresh air at a Georgia school.

that the payback period associated with their providing desirable IAQ can be very short.

"Many of the benefits listed would be recognized year after year, whereas the cost associated with providing the desired IAQ is a one-time expense, if desiccant-based recovery is used to offset the added energy requirements," Fischer stated. Projected benefits – including lower absenteeism, fewer substitute teachers and reduced health care expenses – can quickly add up to cover initial installation costs.

Berger cites other reasons for increasing ventilation and controlling moisture: "It guarantees your RH, it mitigates the possibility of mold growth, and by transferring the electric load to gas you've reduced your peak cooling demand."

MORE INFORMATION

JOHNSON CONTROLS, INC., YORK PRODUCTS GROUP	www.yorkupg.com
MCQUAY INTERNATIONAL	www.mcquay.com
MUNTERS CORPORATION	www.munters.us
SEMCO INCORPORATED	www.semcoinc.com
SG AMERICA	www.sgamerica.com
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ADDITIONAL INFORMATION IS ALSO AVAILABLE AT:
www.gasairconditioning.org