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Industrial energy management systems:

The tools are here



gastechology



inside



on the cover

Collect and evaluate energy usage data at the point of use, and evaluate it to find ways to reduce energy and demand charges and improve your plant processes. A moderate investment can pay huge returns. Photo courtesy: Rockwell Automation



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A3 Digital age energy management

With today's sophisticated digital metering equipment, and with wireless data transmission, it is entirely practical to evaluate complete plant energy usage patterns, opening the door for energy savings and demand charge reductions.

A6 Natural gas for today's fleet

While North America once was a laggard in using natural gas for transportation, the signs show that is changing. Very favorably priced natural gas, plus an expanding range of vehicle options, make this an option you should consider for your medium- and heavy-duty fleet operations.

A8 Ultra-low NO_x designs to meet tightened standards

Today's extremely strict NO_x standards in many areas demand boilers and burners that operate with NO_x outputs unimagined a few decades ago. Learn about the growing number of ultra-low NO_x solutions.

A10 Thermal fluid heaters – heat without the pressure

Thermal fluid heaters deliver precise levels of heat efficiently and exactly where needed in your industrial process, without the need for a pressurized boiler or steam system. Consider this option for process temperatures up to 800 F.

A12 New natural gas resources spark domestic industry

The U.S. Dept. of Energy is ramping up a program to encourage industrial energy users to make commitments for energy improvement. Several levels of programs are available for those ready to take this important step.

Digital age energy management

Find it, measure it, fix it

In implementing an industrial energy management system, it is valuable to place priority on equipment that uses large volumes of energy. This will include generators, large motors, ovens, kilns and boilers.

Today's industrial energy systems are complex and sophisticated. Necessarily, systems that monitor and optimize energy usage must also be complex and sophisticated. Too often, owners install new plant equipment or building comfort systems without consideration of how to monitor those systems' operating efficiency.

Fortunately, with tools such as digital loggers and wireless communications, we can correct for these omissions and get an accurate picture of plant energy usage patterns. It's not enough to look at monthly bills for natural gas, electricity or steam to determine if you can save energy. You need to look at where it is being used, with the ability to evaluate hourly and daily usage patterns.

Help getting started

The steps to gathering complete energy information can be complex, and it takes commitment to really make energy management work. Aaron Mason from Hawkeye Energy Solutions was a presenter at a Technology Marketing & Assessment Forum (TMAF) sponsored by the Energy Solutions Center. His firm has wide experience helping industrial firms get a grip on their energy usage.

Need management involvement

Mason points out that it is essential to get a buy-in from corporate management. He says, "A lot of energy management systems get installed with the best intentions but end up collecting dust and providing no value. Usually this happens because the goal of saving energy doesn't have a lot of support from upper management."

Management needs to understand that dollars spent on installing equipment to collect and tabulate energy data can

provide a quick payback, and will continue to provide savings as long as the system is supported and used. The payback is sometimes very short, and it's the right thing to do for other reasons as well. Energy usage information can



Today's buildings have complex energy requirements. Central energy management and monitoring is essential. Courtesy: Solar Turbines

improve manufacturing processes, sharpen product pricing, and reduce facility emissions and its carbon footprint.

Get expert help

Unless your company has an experienced energy management staff, you will want to look for help from an energy consultant. Find one that has specific experience in your industry, and is qualified to make recommendations on selecting energy data

collection and analysis tools. Mason notes that firms such as his can install and manage these systems for industrial customers.

“We try to get involved early in the process and we work to get a solid understanding of what the industrial customer needs. Some need very simple, low-cost systems with robust data collection. Others need higher-end systems that interface with existing automation systems and provide real-time analytics.”

Energy monitoring experts indicate that nearly always, the process will involve adding additional sub-metering equipment and data terminals to receive the information. Mason says, “It’s just like asking how to trim a budget without bank statements to see where you are spending money. It starts with metering.”

Get the low-hanging fruit

Your consultant will help you to identify the major energy intensive industrial processes or building comfort systems at your facilities. Obviously these are good places to start installing sub-metering, or perhaps collecting data from existing but unused data outputs. Examples might be steam or hot water boilers used for comfort or process applications, heat treating systems,

These large units usually account for a major proportion of plant energy usage. A consultant can give guidance on selecting one of several standard communications protocol to transmit data to a central data logging and processing point.

Understanding fixed and variable energy usage

In a publication titled “Improving Process Heating Performance”, the Industrial Technologies program of the U.S. DOE points out how remote sensing and energy data management can especially benefit process heating applications. These systems have both fixed and variable losses. Variable losses depend on the amount of material being heated, while fixed losses do not.

Fixed losses are incurred as long as the unit is being used regardless of the capacity at which it is operating. The report notes, “In many cases, fixed losses can be minimized by improving process scheduling, such as reducing the amount of time that systems operate far below rated capacity, and minimizing idle time between batches.” Collecting data on energy usage patterns is essential to these improvements.

cycle, utility bills can often be dramatically reduced. For this reason it is important to collect information on instantaneous and hourly usage patterns.

Some energy suppliers also offer very attractive interruptible rates if you can discontinue using energy or dramatically cut back on usage at critical times of the day or the season. By collecting information on current energy usage patterns, you can make an informed decision on whether an interruptible rate makes sense for you.

Wireless advantage

Increasingly, data collection systems take advantage of wireless data transmission. This is particularly valuable for installing sensors in existing industrial operations. Typically, the data are collected at an area wireless terminal and then transferred by conventional wire systems to the central station.

An interesting development in recent years has been the development of “conversion” sensors that can read analog devices such as gauges, convert the data to a digital signal, and transfer it wirelessly. This reduces the cost of improved central data collection and eliminates the need to interrupt electric, gas, steam or hot water lines to replace sensors.

One supplier of such equipment is Cypress EnviroSystems, which sells a broad range of industrial and HVAC data collection devices. Harry Sim from this company was also recently a presenter at a TMAF sponsored by the Energy Solutions Center.

Sim notes the suitability of the converted data for central energy management systems. “The data in digital form is shared using industry open protocols including OPC and BACnet. Also the data can be downloaded using FTP and HTTP protocols. We have been integrated with systems such as Honeywell, Emerson, Rockwell Automation, Schneider, Johnson Controls, Siemens, Trane and others.” Sim explains that the company’s Wireless Steam Trap Monitors share the same network and protocols.

Central data

With data sent to a central location, they can be tabulated and processed using a va-



large motors, engine or turbine generators, large air compressors, chillers, furnaces or ovens. In many cases, this equipment already provides a data output with information on energy usage. You may be able to identify, capture and include this output data into your complete plant energy budget for analysis.

Timing can be critical

For industrial energy users, the time of energy use can be just as critical as the total units of energy used. Electric, gas and steam suppliers often have significant demand charges or time-of-use penalties. By avoiding peak demand times, or by smoothing out the 24-hour energy usage

Cypress EnviroSystems
www.cypressenvirosystems.com

ESC Site on natural gas efficiency
www.naturalgasefficiency.org

FireBridge
www.firebridgeinc.com

Hawkeye Energy Solutions
www.hawkeye-es.com

Rockwell Automation
www.rockwellautomation.com

Many newer pieces of equipment already have data channels for energy use that can deliver data to a central system. This control area for gas turbine generation has such capabilities. Courtesy: Solar Turbines



riety of systems. In some cases, the building's comfort system has capabilities for industrial energy data collection, processing and display. Often, a dedicated system is used for this industrial energy use data. Systems from suppliers such as FireBridge specialize in data collection and process management for combustion-related processes. These processes often contribute a major part of the facility's energy usage.

Savings Potential

In his TMAF presentation, Aaron Mason from Hawkeye Energy Solutions described the potential savings from installing an energy metering system in an industrial facility. He noted that up to a 2% reduction in energy use came from the so-called "Hawthorn Effect." This is the result of simply making management and personnel aware that a process was being implemented to evaluate facility energy use. An additional 2.5% to 5.0% percent reduction came from the ability to assign energy usage information to the appropriate department or process manager.

Mason indicated that an additional 5% to 15% savings came from improved energy use awareness, the ability to make simple adjustments and improve maintenance,

and adapt to utility electric demand schedules. Finally, he said, an additional 15% to 45% savings could come from implementation of an ongoing commissioning program. Such programs make teams aware of energy consequences of equipment changes, schedule variations, and potential process and maintenance improvements. Also part of this result was increasing management attention to energy management issues.

Process improvement

Rockwell Automation is a major provider of systems to integrate all plant operations. Rockwell places emphasis on converging production disciplines into an integrated plant-wide architecture to meet key market challenges. One of those steps is to improve productivity with better utilization of assets, including energy usage. Rockwell offers systems and hardware to support that goal.

According to Mary Burgoon from Rockwell, the benefits often go beyond energy reduction. "Customers are finding that information on energy usage can lead to other significant process improvements. Processes can be streamlined, and unnecessary steps can be eliminated."

Burgoon notes that the data may already be collected, and the important effort is in organizing and evaluating it. "We know that today's industrial customers are especially interested in the topic of process improvement, and collecting energy usage data is just one step. But it is an important one."

Data may suggest changes

In some cases, information summarized with a plant energy management system may show opportunities for major plant or process changes. As an example, if it is determined that there are large and simultaneous energy requirements for electricity and steam or hot water, it might be advantageous to look into a combined heat and power plant, with on-site engine or turbine electric generation also providing significant byproduct heat for process use.

If it is demonstrated that ovens, furnaces or driers are major fuel users, it might be time to install economizers, air heaters, or other heat recovery equipment. Accurate data collection will help you calculate the payback for these kinds of energy improvements.

Key to continuing efficiency

It all begins with the commitment to improve by collecting data and studying the existing system. In almost every case, opportunities for major improvements will spring out from the data. Data analysis will verify the value of improvements. It is important to understand that energy management is not a one-time step, but rather an ongoing process. Those realities are your tools to a future of continuous improvement in your energy efficiency. **GT**

Natural gas for today's fleet

Growing range of options

Not too many years ago, the range of choices for commercial and industrial fleet vehicles powered by natural gas was narrow. Using natural gas as a transportation fuel would require conversion of existing fleet vehicles by a small number of niche conversion specialists. This is rapidly changing due to a growing range of original-equipment manufacturer (OEM) natural gas-fueled vehicles standardized conversion packages.

Further, the options for vehicle refueling continue to expand. The near future promises even further broadening of NG fleet fueling options. Natural gas is growing in applications both as liquid natural gas (LNG) which is usually used for over-the-road tractors, and compressed natural gas (CNG), which is used in local-use heavy duty trucks, and in medium-and light-duty vehicles.

Growth rate picking up

In terms of number of natural gas-powered vehicles, North America has lagged behind other areas, including Western Europe, South America and East Asia. However the perception of slow development may not represent reality. Sean Turner is Chief Operating Officer for Gladstein, Neandross & Associates, a leading consulting firm specializing in market development for low emission and alternative fuel vehicle technologies, infrastructure, and fuels.

He explains that the number of vehicles alone is not the only index of NG adoption. "While North America might lag behind the adoption curve of some other countries in terms of numbers of vehicles, natural gas usage per vehicle in North America is near the top worldwide. This is because other countries have tended to implement NGVs in light-duty applications, where North

America has concentrated more on heavy-duty vehicles that use more fuel than their light-duty brethren."

Turner adds, "Another issue is that until recently there has not been a large group of OEM natural gas vehicles available in the U.S. This has been the situation for a variety of technological, regulatory and economic reasons. The growing supply of natural gas in North America in the past decade has changed the economics of using natural gas for transportation. For that reason, we are seeing North America moving up the adoption curve now."

Expanding beyond buses and refuse trucks

Turner points out that the use of NG for fleet fueling is now also becoming more diversified. The first widespread use was for transit vehicles and refuse trucks. He notes, "A recent trend in NG fueling is toward over-the-road Class-8 tractors. This has become particularly apparent in the regional goods movement sector, where we are seeing a large influx of traditional shippers (Procter & Gamble, Lowes, Owen Corning, and others) moving to shipments via NG tractors."

In many states there are rapidly growing networks of CNG/LNG fueling stations along major routes. Here a Questar Fueling facility serves Utah fleet vehicles. Courtesy: Gladstein, Neandross & Associates.



He also indicates that new engine and power train products are expanding the potential usefulness of NG fueling for heavy-duty vehicles. "The most significant introduction of the past year was the Cummins-Westport ISX12-G heavy-duty engine. Until now the industry had been somewhat limited in heavier-duty applications because the only heavy-duty engine available was the Cummins-Westport ISL-G engine, which had a recommended gross vehicle weight of 66,000 lbs. The ISX12 engine now allows fleet operators to use natural gas to haul loads all the way up to the normal road limit of 80,000 lbs."

Turner adds that Cummins-Westport has also recently announced a development program for its ISB6.7G engine for medium-duty trucks, shuttle vehicles and vocational vehicles. This project is on a 2016 commercialization timeframe.

Multiple benefits of NG fueling

The most prominent benefit of natural gas fueling for fleets is reduced fuel cost. While prices vary, most users are seeing reductions of 40% to 60% in vehicle fuel costs, and these savings are projected to continue far into the future. Because natural gas is a fuel primarily produced in North America, it is less subject to price fluctuations caused by international economic or political instability.

Maintenance is often reduced because of the clean-burning characteristic of natural gas. Heavy vehicles using natural gas to replace diesel fuel are as much as 10 decibels quieter, and generate fewer complaints about noise, odors or smoke. Increasingly rigorous emission standards for diesel engines will likely make fuel costs higher and maintenance requirements more strenuous for conventional diesel engines. Owners, drivers and the general public appreciate the fact that natural gas engines use a North American fuel, not an imported product.

Fueling points dramatically increasing

For these reasons, Turner and others look for continuing dramatic increases in the number of fleet vehicles in all sizes moving toward natural gas. This will be

accompanied by increases in the numbers of both public and private natural gas fueling stations. To be sure, the development of fueling sites has been uneven. States like California, Oklahoma and Utah already have strong and growing networks of public-access sites. Others lag behind, but new installations are opening every month in many other states.

Nationwide, there are about 1,300 private and public-access CNG and LNG fueling stations, with an expected rate of increase of up to 20% annually for some time into the future. Natural gas fueling is not yet available everywhere, but we're seeing progress. If your fleet operates out of a fixed location, and especially if vehicles are garaged overnight, a dedicated timed-fill system may be the best choice, and you need not wait for local public-access development.

Building a network

The largest operator of public access fueling stations is Clean Energy, with over 500 stations operating in the U.S. and Canada. Clean Energy offers operators of light, medium, and heavy-duty natural gas vehicle fleets help with fuel supply services, long-term fuel contracts, fuel station design and fueling operations, plus assistance with securing grant funding and vehicle leasing.

An example of a company that has made a significant commitment to using natural gas fueling is UPS. The worldwide package delivery company recently announced that it will add 700 LNG-powered road tractors for inter-city shipping. The company is also adding four new LNG fueling points in its network. The company indicates they are currently operating LNG road tractors in ten states, with plans to expand in the future.

The company works with the DOE's Clean Cities Program, and is active in development and promotion of the LNG Corridor stretching from California through Utah. In addition, the company operates over 1,000 CNG powered package delivery vehicles in the U.S., and thousands more worldwide. Among the benefits the company claims for the LNG and CNG-powered vehicles is

lower fuel cost, lower overall emissions, and lower greenhouse gas emissions.

Manufacturers taking notice

According to the trade organization NGV America, factory-built natural gas truck options are available from the major refuse truck chassis manufacturers, most of the transit and shuttle bus builders, two of the top three school bus builders, all major street-sweeper manufacturers, and leading road tractor builders Freightliner, Peterbilt and Kenworth. Other manufacturers have indicated interest or have active factory retrofit programs started. These manufacturers have sensed the momentum in North America toward fleet vehicle natural gas fueling, and are investing significant dollars in engine development and certification to expand their natural gas options.

Maybe it's your time

Is the time right for you to adopt natural gas as the primary fuel for new fleet vehicles? Very possibly. If you are operating a fleet that puts in significant miles annually, and if you can refuel overnight at your location, or if you can use a nearby quick-fill public station, it's time to begin looking. Natural gas fueling is expanding opportunities for owners throughout North America. It's out there! **GT**

MORE info

Clean Energy Fuels
www.cleanenergyfuels.com

Cummins-Westport
www.cumminswestport.com

DOE Clean Cities Program
www.eere.energy.gov/cleancities

DOE U.S. Growth of NG Fueling
www1.eere.energy.gov/vehiclesandfuels/facts/2014_fotw816.html

Gladstein, Neandross & Associates
www.gladstein.org

Natural Gas Vehicles for America
www.ngvc.org

Reduced boiler NO_x from advanced burner designs

Meeting tightened standards with new solutions

For decades, it has been understood that man-made sources of nitrogen oxides (NO_x) can contribute to diminished air quality. In the troposphere they combine with ozone and hydrocarbon vapors to create smog. Alone or in combination with other contaminants, they can aggravate asthmatic conditions, and in high levels can damage respiratory systems of humans, animals and even plants. Sources of nitrogen oxide emissions include transportation engines, stationary engines, thermal power plants, many industrial processes, home heating units, and commercial and industrial boilers.

Tightening Levels of Emission Control

The first U.S. Clean Air Act was passed in 1963, with increasing requirements for research, monitoring and emission reductions with each amendment in 1970, 1977 and 1990. With this legislation and other legislation and rulemaking, standards were established for NO_x emissions from all major sources. The U.S. Environmental Protection Agency has given air standard-setting authority and emission enforcement responsibility to the state pollution control agencies, subject to the oversight of the EPA.

As major sources of NO_x emissions, vehicles received the first emission standard, with other NO_x emission sources subsequently being identified and limits set. It became apparent that certain districts of the country needed stricter standards because of population concentrations, meteorological conditions,

and concentrations of point source and transportation emitters. For these areas, states and the EPA established more rigorous emission standards.

In older industrial boilers, NO_x emissions were sometimes relatively high because of boiler design and burner performance characteristics. In boilers, high NO_x emissions can be a result of two issues. NO_x levels increase dramatically where temperatures in exhaust gas streams rise significantly above 2200°F. A second condition that favors creation of higher levels of NO_x is incomplete mixing of combustion air and gaseous fuel.

Significant NO_x emission reductions have been achieved by designing burners and boilers to avoid “hot spots”, where elevated temperatures can generate excess NO_x. Low-NO_x burners were designed with this in mind. Properly selected, installed and operated, these can achieve emissions

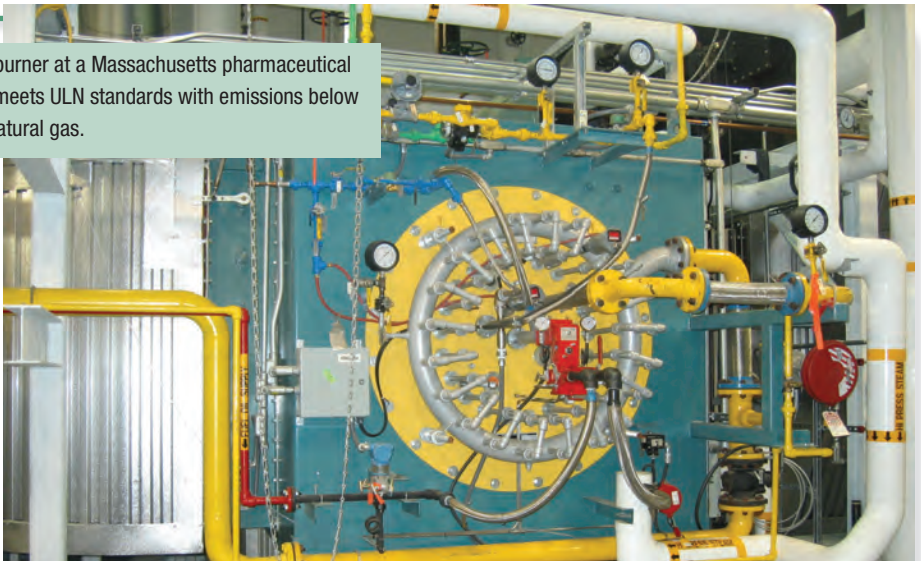
below 30 ppm NO_x with the standard 3% excess oxygen. These burners have been successfully installed in many areas in the U.S. and Canada.

However in many areas, state and federal regulators have continued to monitor ambient levels, and have used their regulatory authority to require boilers to meet even lower emissions levels. Thus, industry researchers and burner manufacturers have developed a class of so-called “ultra-low NO_x” (ULN) burners. According to Rick Fiorenze, Vice President-Sales, Burner Applications for Cleaver-Brooks Natcom group, the definition of “Ultra-Low NO_x” is not a fixed standard in the boiler industry today. He says, “ULN is generally defined by regional and local air regulation districts throughout the U.S. and Canada. Generally speaking, we consider burners achieving 15 ppm or less with reference to 3% oxygen when firing natural gas and incorporating flue gas re-



This Natcom ULN burner installation at a Michigan hospital achieves NO_x emissions below 9 ppm. All photos courtesy: Cleaver-Brooks.

A combination gas-oil burner at a Massachusetts pharmaceutical manufacturing facility meets ULN standards with emissions below 9 ppm when burning natural gas.



circulation technology (FGR) to be ULN burners.” In some cases local ULN performance requirements have been set as low as 9 ppm or even 7 ppm. Even these levels are achievable with advanced designs.

Strategies to Meet ULN requirements

Multiple strategies are used to achieve low NO_x emission targets. Burners are designed to hold combustion temperatures even-further below levels that stimulate thermal creation of NO_x. They use newer designs to thoroughly pre-mix fuel and combustion air and to swirl it for complete and clean combustion. Some burners use a concept called “Forced Internal Recirculation” (FIR) which was pioneered by the Gas Technology Institute.

FIR features a dispersed flame pattern and a metallic insert so the kinetic energy of the burner jets produces a flow of the combustion gases back to the root of the primary flames. This helps achieve complete combustion. FIR burners have achieved NO_x emissions as low as 9 ppm without external flue gas recirculation, steam injection, or high excess air.

ULN Compliance with Modular Boilers

A recent presenter at a Technology Marketing & Assessment Forum (TMAF) was Jason Smith from Miura Boilers. Miura is a manufacturer of modular fire-tube steam and hot water boilers in a wide range of sizes. The emphasis with the Miura boiler design is their suitability for modular applications, giving owners the opportunity for boiler efficiencies of 85% with multiple

units, allowing unit redundancy for reliability and service, and allowing the owner to operate only the number of units needed for seasonal or daily demand.

Smith Indicates that Miura’s LXN series of modular boilers offers NO_x emission rates below 9 ppm, as certified by a third party. Units are available in sizes of 50, 100, 150, 200 and 300 bhp. Available steam pressure ranges from 15 to 300 psi and the unit can come to steam production in less than five minutes, making it an attractive modular unit for variable steam requirements.

According to Smith, Miura has plans soon to offer a near-zero NO_x boiler into the North American market. This unit will use a proprietary catalyzer to virtually eliminate NO_x altogether. It will include a sophisticated pre-mix burner that produces a very low-temperature, “self-quenching” flame, thereby minimizing the thermal reaction that causes the formation of NO_x.

Expanding Choices

Burners for large water-tube boilers are available from several manufacturers with NO_x emission rates in the ULN range. Cleaver Brooks’ NATCOM group offers burners for both OEM use and retrofitting with NO_x emissions as low as 7 ppm. Coen and Alzeta Corporation also offer lines of both Low NO_x and Ultra-Low NO_x burners that can meet rigorous emissions standards. Burner manufacturers have used all the tools possible to meet demanding emission

requirements without significantly sacrificing efficiency.

Because buying a boiler or a boiler burner is a long-term commitment, it is necessary to not only meet current emission standards, but to try to anticipate future requirements. This is causing many industrial owners to select systems with ULN capabilities. If you are entering this market, be sure to get information on current and anticipated emission standards, and guidance in the rapidly changing area of ULN boilers and burners. You can select from an expanding array of low NO_x and ultra-low NO_x burners and boilers. **GT**

MORE info

Alzeta Corporation
www.alzeta.com/ultra-low-nox-burners

Cleaver-Brooks Natcom Boilers & Burners
www.cleaver-brooks.com

Coen Burners
www.coen.com

ESC Boiler-Burner Consortium
www.cleanboiler.org

Gas Technology Institute
www.gastechnology.org

Miura Boiler
www.miuraboiler.com

U.S. EPA information on nitrogen oxides
www.epa.gov/air/nitrogenoxides

THERMAL FLUID COULD BE A BETTER WAY

Taking the
pressure off

Thermal fluid heaters use a liquid-phase heat transfer medium to deliver heat energy for industrial processes. Thermal oil, glycol, or even water are all possible heat mediums. Fluid is heated and circulated to process points using a closed loop system. Thermal oil systems are especially attractive because of their ability to deliver fluid at temperatures up to 800 F without the need for a high-pressure design such as is required with a steam or hot water boiler.

Advantages

With pumped fluid heat transfer using oil, risks of scale formation, corrosion and frost are avoidable. Thermal fluid heaters are typically easier to operate and maintain. Also, the inherent simplicity and a wide range of heat recovery options make it possible to operate such systems at peak energy efficiency. Because these systems are generally not highly pressurized, it is usually not necessary to have a licensed operator on duty. Heaters are built with reliable automatic safety devices that allow unattended operation. Because the volume of liquid is relatively small, they can be brought up to temperature quickly after an overnight shutdown period.

Product designs

Thermal fluid heaters use an energy source to heat the fluid in a horizontal or vertical tank. Natural gas is often the fuel of choice because of its clean burning characteristics and attractive price. Units are available in a wide range of sizes, from 500,000 Btu/hour to 40 MMBtu/hour. Even larger process outputs are possible with multiple units. The working fluid is usually a high-temperature oil with a low oxidation characteristic and high heat transfer capability. In the unit design, it is important to keep the heated oil moving to avoid oxidation at the heat transfer point.

The heater itself is typically a gas-fired heat exchanger, with the circulating fluid passing through enclosed helical or serpentine coils in the combustion area. The heater is equipped with redundant temperature and pressure relays to prevent over-heating and to assure accurate delivery of the working fluid at the set temperature.

Oils for specific temperatures and applications

Thermal oils of both mineral and synthetic origin are available with a range of thermal and physical characteristics from a variety of suppliers. The fluid used must be free of suspended solids, non-toxic in the case of leaks, and stable at temperatures at least 100 degrees above the planned operating temperatures. Manufacturers of thermal fluid heaters recommend periodic analysis of the oil to assure that it is not oxidizing or picking up any contaminants. Most offer analysis services.

Because of pumping, the oil is pressurized and piping must be specified to meet this operating pressure. Heaters are equipped with systems to remove both air and moisture from the circulating fluid. Most units are completely factory-assembled and need only to be connected to a fuel supply (for exam-



Installed view of a vertical-coil thermal fluid heater. All photos courtesy: Fulton Industries.



Controls on thermal fluid heaters integrate easily with central process controls.

ple, a gas train), to exhaust venting, and to the thermal oil distribution system.

Wide range of markets

Thermal fluid heaters have found applications in a variety of markets, from asphalt processing to plastics manufacturing, from food and paper processing to the pharmaceutical industry. Ideal applications are where there is a need for controlled thermal input from

a sealed system. One leader in fluid heaters is Fulton Thermal Corporation, headquartered in Pulaski, New York. Fulton offers both horizontal and vertical tank units in a wide range of sizes.

Mike Roberts from Fulton indicates that thermal fluid heaters have thermal and combustion efficiencies about the same as similar-sized boilers. But he adds, "Where you see a gain is in the system efficiencies. With a thermal system, you don't lose efficiency by blowing down hot water or wasting heat through steam traps like you do with a steam system."

Heat recovery can add to the efficiency of systems. Typically this is achieved by use of an economizer on the heater exhaust train, with captured heat used to pre-heat returning fluid or combustion air. Fluid pre-heating can also be accomplished with other industrial energy sources such as boiler exhausts or product cooling processes.

Reduced maintenance

Roberts also points to another advantage, "With a thermal system, maintenance is much less." For owners this can translate to reduced downtime, longer production runs, reduced labor costs, and lower process startup costs. Roberts points out, "Some maintenance is required, just like any

MORE info

First Thermal Heaters
www.firstthermal.com

Fulton
www.fulton.com

Parker Boiler
www.parkerboiler.com

Thermal Fluid Systems Inc.
www.tfsheat.com

Vapor Power Systems International, LLC
www.vaporpower.com



Horizontal coil thermal fluid heater.

other fuel-fired piece of equipment. You have to maintain the combustion system. But you don't have to maintain water treatment equipment, or any steam-side components. You still have required maintenance to keep the system going." Regarding system life, Roberts indicates that well-maintained systems can have a life of 30+ years.

Getting started

Whether yours is a new industrial facility, or you are replacing an older steam, hot water or thermal system, it is important to correctly specify your needed thermal range, and the total process heat requirement. Manufacturers offer factory assistance in selecting the right size and type of system. Thermal fluid systems offer simplicity, reduced maintenance, and the ability to avoid the regulatory requirements of a steam plant. Now might be the time to consider this option. **GT**



Vertical coil thermal fluid heater

Better plants program



Making a commitment to reduce energy

Commercial and industrial buildings in the U.S. represent 50% of the country's energy at a cost of more than \$400 billion, according to the U.S. Dept. of Energy (DOE). These buildings and plants can be made much more efficient using a range of tools. To do so, it is necessary that owners be aware of possible inefficiencies and methods for eliminating them. In February 2011, President Obama announced the Better Buildings, Better Plants Initiative to make commercial and industrial buildings 20% more energy efficient in the next 10 years. This initiative is meant to accelerate private-sector investment and the commitment to energy efficiency.

Paul Lemar, Jr. from Resource Dynamics Corporation recently provided details on the program at a Technology Marketing & Assessment Forum, sponsored by the Energy Solutions Center. He noted that research shows that companies that have publicly stated goals for energy reductions implement 50% more efficiency and renewable measures than organizations without goals. Thus for industrial energy users, the government program is intended to stimulate action by encouraging companies to make commitments.

For industrial energy users, the Better Plants program asks owners to set long-term efficiency goals, to report progress once a year to the DOE, and to receive assistance and national recognition for their commitment and leadership. The program offers two levels of involvement- Program Level and Challenge Level. The broad-based Program Level currently includes over 120 companies with 1,750 plants. Since 2011, participants have identified energy efficiency improvements saving 190 trillion Btus and savings of more than \$1 billion.

Program participants receive national recognition, access to a technical account manager, in-plant training for plant staff, and opportunities to network with peers in industry and learn about steps other companies have taken. Participating compa-



A wide range of companies are participating in the Better Plants program, looking to achieve higher efficiency and better processes. Courtesy: Solar Turbines

nies take a voluntary pledge to reduce energy intensity 25% corporate-wide over the next ten years, to develop an energy use baseline to track improvements in energy efficiency, to designate a corporate energy manager, and to report progress yearly.

The Challenge Level program asks participants to announce their energy efficiency goal, along with innovations and market solutions taken along the way. They agree to establish a Showcase Project within nine months, along with a corporate plan and timetable. They further agree to share information and implementation models and energy performance annually, and provide quarterly updates on showcase projects and other milestones.

The Challenge Level program currently includes more than 100 private, public and non-profit organizations. This includes 13 Better Buildings, Better Plants participants, along with 28 commercial partners, and many education, community, financial and utility partners. On average, partners are improving by more than 2.5% per year, with identified savings of \$58 billion. Partners have showcased 49 projects. Financial partners have extended financing totaling \$1.1 billion for energy improvement projects.

The Better Buildings, Better Plants program is also a launching platform for Superior Energy Performance (SEP) Certification, and is an important tool in achieving ISO 50001, a program recently initiated in the U.S. for energy management systems. Information on all of these programs is available from the DOE. **GT**

MORE info

DOE Information on the Better Plants Program

www.eere.energy.gov/manufacturing/tech_assistance/betterplants

Information on SEP Program

http://superiorenergyperformance.energy.gov/what_is_sep.html