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STRATEGIES FOR STEAM CONSERVATION

SAVING STEAM

ESC
Energy Solutions Center

on the cover

Steam system efficiency is advanced with tools such as ultrasonic steam trap station testing, as shown here. Photo courtesy Swagelok Energy Advisors.

ESC Energy Solutions Center

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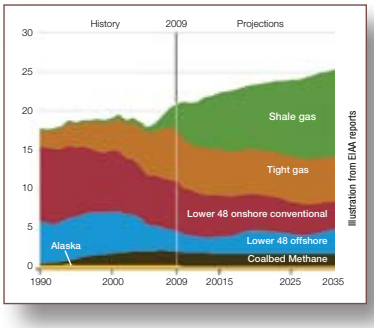
inside



SMARTENING UP YOUR Steam System

New Technologies Complement Traditional Fixes

STEAM SYSTEMS PROVIDE heating, cooling, humidification, water heating and process heat for hundreds of different industrial activities. According to the DOE, 45% of all the energy purchased by U.S. manufacturers is used to produce steam. These systems are reliable and often operate adequately with minimal attention. That's why owners may be incurring major energy losses and drops in system effectiveness without knowing it.

The solution is to install modern equipment for steam system monitoring, and to intensify basic plant maintenance procedures. Help is available for you to get a better grip on your system. Doing this will assure trouble-free, efficient operation.

The Boiler, and Beyond

Kelly Paffel, a Technical Manager from Swagelok Energy Advisors, recently made a presentation at a Technology & Market Assessment Forum sponsored by the Energy Solutions Center. His topic was "Steam System Thermal Cycle Efficiency." In a recent extensively monitored example installation, total energy losses in the boiler were measured as 18.6%. Steam distribution losses were measured at 14.5%. Only a limited number of steps were available to reduce boiler energy losses, so the major opportunities for system efficiency improvements were at the distribution and energy use end.

According to Paffel, 3.8% of the energy loss was in condensate energy not reclaimed, 4.4% in uninsulated lines and equipment, plus 7.4% in steam leaks and losses to the atmosphere. Paffel indicated that before thorough steam management programs are initiated, 44.3% of the energy provided to the boiler did not result in useful steam. By implementing appropriate steam management improvements, this could be reduced to 25.6%.

Start with the Basics

Often owners install new, high-efficiency boilers, and then are disappointed that energy bills continue to be surprisingly high. The reason may be that the plant downstream from the boiler isn't providing maximum efficiency. The elements of steam system energy improvement include thermal insulation of piping and equipment, improving the condensate return system, assuring proper steam trap operation, and taking advantage of new tools for steam system monitoring.

Improving thermal insulation reduces system heat losses. Paffel says, "To prevent thermal losses, all devices in the steam and condensate system should be insulated, including valves, expansions joints, heat transfer components, tanks, condensate pipe and fittings. In the U.S. DOE's tip sheet on insulation for valves and fittings, insulating a 6-inch gate valve could save approximately $525 per year." Manufacturers such as Insultech offer durable fitted insulation systems for a wide range of pipes and fittings.

Steam leaks of all sizes are far too common. A thorough system inspection can identify these for correction, and can usually find many other places for steam energy savings. Photo courtesy Swagelok Energy Advisors.

The technician is using an ultrasonic method to test an Armstrong cast iron inverted bucket steam trap. Photo courtesy Armstrong International

Target Wet Insulation

Often, old insulation is no longer effective, especially if it has become saturated with condensate. It is important to eliminate sources of moisture prior to insulation replacement. Problems may include leaking steam valves, pipe leaks, or leaks from associated steam equipment. If significant insulation replacement is undertaken, it may be necessary to rebalance steam flows and delivery temperatures in the system.

Paffel indicates that to improve plant efficiency, one of the highest returns on investment is to properly return condensate to the boiler plant. He indicates, "Condensate can contain as much as 16% of the total energy in the steam vapor, depending on steam pressures. Because condensate also contains boiler treatment chemicals transferred during steam generation, improving condensate return also reduces chemical costs, make-up water costs and sewer system disposal costs. All of this adds up."

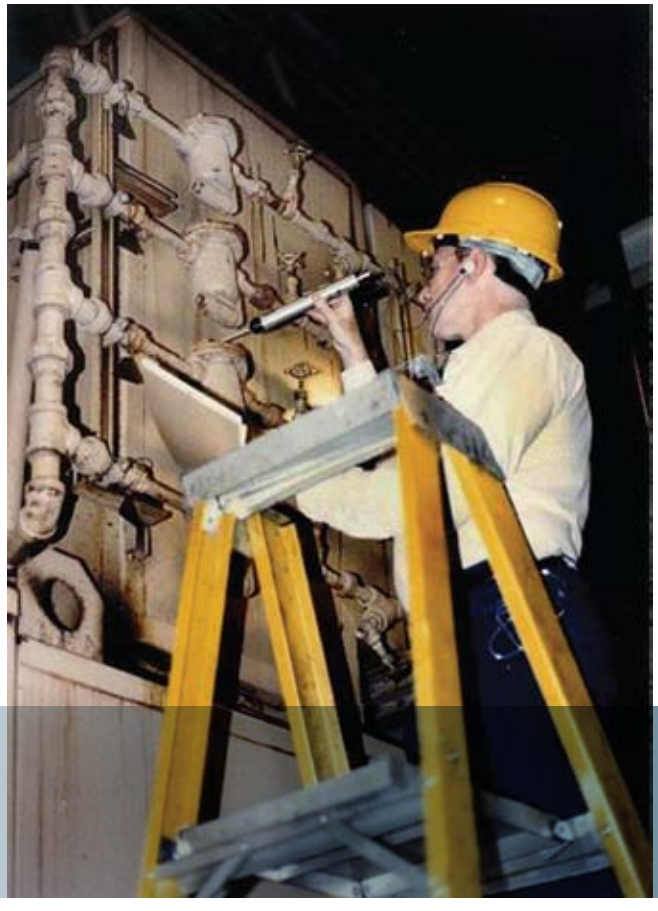
Extend Condensate Return System

Owners should ensure that condensate piping extends to as many condensate sources as possible and is adequately sized. It has to accommodate both liquid and vapor. Condensate piping that is sized for the liquid portion only will be undersized. Ask your engineer or contractor to evaluate the feasibility of extending condensate return piping to all parts of the system. Just like steam lines, condensate lines should be insulated to minimize energy losses.

Steam Trap Evaluation

The purpose of a steam trap is to return accumulated condensate and remove non-condensable gases while allowing the free passage of steam. Steam traps come in a wide variety of types and sizes, but have in common the need to be regularly checked to assure proper operation. The difficulty is that many traps are located in areas where access is difficult or even dangerous. Too often these steam traps are not inspected with sufficient frequency, and where they are not functioning correctly, repair or replacement is too often postponed.

Paffel points out that plant operators need to look at steam trap stations, not just the singular steam trap components. "A station consists of isolation valves, strainer, strainer blowdown valve, universal connector and in some cases, a check valve. The steam trap station should be free of threaded connections, which are prone to failure." He says that the two biggest culprits for steam trap station



Accessibility is often a deterrent to a good inspection and problem correction program. By using a qualified inspection firm, every trap and other piece of steam regulation equipment can be checked. Installation of a wireless remote monitoring program reduces this challenge in the future. Photo courtesy Armstrong International.

> "The solution is to install modern equipment for steam system monitoring, and to intensify basic plant maintenance procedures."

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www.armstronginternational.com

DOE STEAM SYSTEM MANAGEMENT SOURCEBOOK
www1.eere.energy.gov/industry/bestpractices/pdfs/steamsourcebook.pdf

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failure are incorrect sizing and incorrect installation. "Incorrect sizing can negate proper steam trap design and installation and can cause condensate backup and/or steam loss. Incorrect installation can result in a faulty trap and potentially unsafe condensate conditions in the steam system."

Steam Traps Can Represent Major Losses

The U.S. DOE cites as an example of potential energy losses in steam traps a survey at a large government-owned facility. Each trap in the system was identified, and its in-service performance evaluated to determine the total cost of wasted steam energy. Of the 910 traps identified, 207 were found to be wasting a total of 4,783 lb of steam per hour at an annual cost of more than $60,000.

It is important to choose the correct type of steam trap and to install it in the right location in the system. As an example, a fixed orifice steam trap can be quite effective and is relatively inexpensive to install. However it doesn't handle fluctuating steam flows well and its orifice can be plugged, or conversely can be eroded into too large an opening. In either case, the inexpensive solution has suddenly become quite expensive.

According to T.J. Secord of Armstrong International, a recent presenter at a conference sponsored by the Energy Solutions Center, the monthly cost of a failed steam trap can range from $210 to over $1,000, depending on the size of the trap and the operating pressure of the system. Multiply this by the number of failed traps in the steam system, and the results are staggering. Armstrong offers its SteamEye™ steam trap monitoring system to provide immediate notification of a steam trap failure. The system uses various types of trap status transmitters for remote placement to detect abnormal trap operation.

The Beauty of Remote Monitoring

For example, a conductivity remote monitor is used with Armstrong bucket and inverted-bucket type traps to monitor the liquid level inside the trap. An ultrasonic monitor is used with other types of traps including fixed orifice traps to detect improper operation. All transmitters communicate via a wireless link to a data gateway which provides communication to a computer display showing trap status and possible alarm conditions. The system can also monitor the status of safety relief valves, liquid levels or coils.

Secord points out that this type of immediate notification of steam trap failure not only minimizes energy losses but helps a plant manager allocate labor resources effectively. The gateway unit used with the system allows users access from any computer connected to the network, and can be programmed to link with BAS and distributed control systems in manufacturing operations.

Monitoring System at Airport

An example of a successful monitoring installation is included in a case study at an airport by the University of Minnesota. It describes the installation of the SteamEye monitoring system on over 700 traps in a steam system used to generate domestic hot water and to provide air tempering. Steve Shuppert, chief engineer at the Metropolitan Airport Commission (MAC) explains, "We're restricted on personnel so we've never had the time to monitor our steam traps as often as we'd like to. We had no way of knowing if a trap failed until there was noise in the line or people complained about the temperature."

After learning about SteamEye at a workshop sponsored by its gas supplier, CenterPoint Energy, MAC decided to pilot the system. Maintenance staff installed sensors on 66 steam traps in its energy management center and tested the system for one year. "It worked fantastic," says Shuppert. The MAC then installed the complete trap monitoring system at the airport in three phases. Shuppert estimates MAC's system has a 2.5 year payback.

Bring in an Expert

Swagelok Energy Advisors, Armstrong International, and similar firms can do a complete steam system evaluation, including insulation, condensate return, and steam trap station monitoring. Paffel from Swagelok indicates their customers have obtained energy savings of up to 22% and steam cost reductions up to 16%. Payback on the cost of such an evaluation averages less than 40 days. Recommendations are classified to assist owners in prioritizing improvement projects at each facility. Suggested improvements range from safety and/or code issues requiring immediate fixes, to longer-term system improvement projects.

If your steam system isn't living up to the potential of your boiler plant, now is the time to have an evaluation done and get started on improvements that will pay for themselves in short order. Both the hardware and the consulting help are out there to get you on the right track. **GT**

Industrial Humidification Solutions

Holding the Ideal Level

IN OUR HOMES we recognize when humidity levels are too low. We may have respiration problems, dry or cracked skin, and have those annoying static electricity snaps as we touch household objects. In older times, we tried to overcome those problems by putting a pot of water on the stove. Today, we use humidifiers and vaporizers to increase room humidity. We encounter the same issues in the workplace, sometimes with more serious consequences. There are solutions.

A Sweet Spot for Humidity

In most of North America there is an annual outdoor natural humidity cycle. Humidity levels are high, often excessive in the warm months, and low in the cold months. Indoors, these levels tend to be exaggerated by cooling in the summer and especially by heating in the winter. In the northern U.S. and much of Canada, winter humidity levels as low as10-20% are not unusual. Purely for human comfort, expert recommendations range from 30% to 50%.

This packaged humidifier is mounted outdoors, with the output sent to an Armstrong HumidiPack unit for dispersion in an air handler. Photo courtesy Armstrong International

For large commercial and industrial buildings, the annual humidity cycle also prevails. Humidification requirements, however, may vary. It depends on the type of building and the sensitivity of different products and processes. Matt Nowak is North American Sales Manager for the Humidification Group of Armstrong International, a major supplier of large humidification systems. He explains possible solutions.

Comfort and Product Protection

Nowak indicates that humidification systems are installed in industrial and warehouse facilities for a variety of reasons. "The majority can be summed up in three areas of concern: electrostatic discharge (ESD), hygroscopic material protection, and health and human comfort." Nowak says that Armstrong International provides many types of units for differing applications, including various supply water qualities, as well as multiple humidifier control system types. "This includes the ability to be controlled via a building automation system (BAS)."

Eliminating ESD is important not only for worker comfort and safety, but also to protect settings and calibration on electronic devices including process controls. Hygroscopic materials including wood, paper and leather require higher ambient humidity levels to assure dimensional stability and product quality. Printing operations and paper storage require especially tight controls on humidity to prevent paper from shrinking, curling or jamming in processing equipment.

Supplementary Humidification Needed

For these facilities, optimum relative humidity levels may be as high as 60%. For certain applications, adiabatic humidifiers use a fogging unit to discharge a stream of 100% saturated air areas needing exceptionally high humidity levels. Such an area might be in the proximity of a printing press or other paper handling equipment.

Nowak notes that gas-fired humidifiers are sometimes compared to electric units. He notes, "The gas units offer two specific advantages; they typically have almost double the maximum output, and the required energy cost is less." He indicates that the trend in industry is toward energy conservation and sustainability. "With these concerns in mind, in industrial markets the types with the most potential are gas-fired and adiabatic humidifiers."

Armstrong International offers its gas-fired HumidiClean™ package humidifier for this market. Armstrong claims that this unit has an annual operating cost of about $2,700 compared with $5,000 for an electric unit. It features a low NOx burner and has an operating energy efficiency of 82%. It is available in a range of sizes for different building conditions.

This skid-mounted boiler package from Fulton Boiler Works is the type of unit that is used for dedicated service for steam humidification in an industrial facility. Photo courtesy Fulton Boiler Works

Scale Management Important

Seldom are humidifiers supplied with 100% distilled water, so management of scale from minerals in the water is important. Armstrong uses ionic bed technology in the HumidiClean to reduce mineral buildup on the heat exchanger and sides of the tank. Nowak explains, "The scale is actually attracted to bed inserts when the water approaches boiling. This allows the steam generator to operate for longer periods of time without drain cycles to flush mineral deposits, saving energy due to less wasted hot water."

The ionic beds consist of a fibrous medium that attracts solids from the water as its temperature rises, minimizing buildup of solids on the heat exchanger and inner tank walls. When the ionic beds reach their capacity of solids, a signal light indicates that it is time to change them. A new ionic bed weighs approximately 3/4 pound. When it reaches its capacity, the bed may weigh more than four pounds. Use of this technology means reduced cleaning of the tank heat exchanger and reduced water and energy consumption through fewer required tank blowdowns.

Steam Humidification

Another approach to humidification in plants that have steam boilers is direct steam injection into the air stream. According to Paul Pack, Process Steam Sales Manager from Fulton Boiler Works, many industrial and commercial humidification systems use this concept. He explains, "Longevity, low maintenance, precise control and rapid response to control signals are some of the distinct advantages of direct injection systems." He notes that correctly conditioned steam acts as a system cleaning agent to keep the humidifier components free of mineral deposits that are typical with other forms of humidification.

Use the Right Boiler

According to Pack, not all boilers are suitable for this application. "Because steam humidification systems require large amounts of make-up water, the boiler system above all other considerations must be a forgiving piece of equipment. Boilers with small diameter water tubes, thin-wall boiler tubes, low water volume, poor steam quality or high heat release are generally not suitable for these applications." He notes that the best boilers are rugged in design with a record of performance in an abusive system.

Pack points out that the boiler steam nozzle and steam piping must be properly sized to allow the highest quality of saturated steam possible. The system should account for the make-up water oxygen and mineral content without the use of boiler chemicals. The make-up water should be softened or demineralized, and the use of a tray-type deaerator rather than a standard spray deaerator is recommended.

Advantages of Direct Injection

Pack indicates that steam injection systems can be easily applied in tight spaces without causing wetting of the air ducts. He says, "As the steam is entirely a vapor, it only needs to be mixed with the air stream to satisfy the system humidification requirements."

Humidification in typical industrial and commercial buildings is controlled by the building automation system. Pack explains, "In addition to the system's DDC processor, the three main components of the control system are the air flow sensor, room humidity sensor and duct high level humidistat. The air flow sensor is located in the supply air duct and will shut down the humidifier to prevent water damage if the air flow is interrupted for any reason.

A high limit humidistat is located downstream of the steam dispersion tube and will shut down the system if the relative humidity is excessive." He indicates that large spaces, critical function areas such as museums, or areas with high make-up air requirements may have multiple sensors.

Boiler Industry Offers Help

Fulton and other steam system suppliers offer injection humidifier packages that are compatible with their systems, and can provide additional information on necessary make-up water treatment and humidification system controls. Humidifier systems can be included in new construction packages, or can be retrofitted to existing installations.

Especially with direct steam injection systems, it is important that the owner get expert help in determining whether the existing boiler and water supply is suitable. If your plant atmosphere is excessively dry during parts of the year, humidification is the answer, and natural gas-fired solutions are often the best choice. **GT**

MORE info

ARMSTRONG INTERNATIONAL
www.armstronginternational.com/humidification

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www.cleaver-brooks.com

ENERGY SOLUTIONS CENTER
www.energysolutionscenter.org/gas_solutions/humidification.aspx

FULTON BOILER WORKS
www.fulton.com

Measure It and Manage It

Flow Metering a Key to Efficiency

Flow metering has become sophisticated. Shown is a transit time ultrasonic clamp-on flow and energy meter by Racine Federated. This product features a clamp-on technique for the transducers, and includes a temperature sensor tape. Illustration courtesy Racine Federated.

VIRTUALLY EVERY INDUSTRIAL operation requires flow metering of liquids or gases. For managers with concerns about energy efficiency, just minimal levels of measurement are not enough. Today's efficient operations require extensive and precise process monitoring. Fortunately, today's remote-reading flow meters and data collection systems allow that advanced level of measurement.

Actionable Information

U.S. DOE publication titled "Metering Best Practices" emphasizes that metering is not an energy-saving tool in itself. However, accurate metering and monitoring can provide the information necessary to implement an effective energy management plan. The report notes, "Energy managers have long known the value of energy-use data. And with recent advances in energy-use metering – increased functionality at lower costs – obtaining these data in a cost-effective manner is now becoming a standard practice."

Advanced meter types have been developed with a customer or end-use focus. These have the ability to measure and record data continuously or at preset intervals and communicate that data to a central location in a format that can be easily integrated into both process and energy management programs.

On the electric side, advanced digital meters are available to deliver information not only on kWh or kW, but also can include voltage, milliamps, power factor, power quality, and power use trends. Particularly if your operation involves large motor loads or other inductive loads, or sensitive computer components, or if you are operating on a time of use demand rate, you will want much more than a simple kWh number to identify potential equipment problems or opportunities to shift loads off peak.

Of special value in any industrial plant are flow meters, which can be used on a variety of lines including steam, hot water, heated fluids, natural gas, and liquid products. Often flow data is combined with temperature and/or pressure data to give a complete picture of continuous energy usage or product delivery.

Variety of Flow Meter Systems

Flow meters are available using a wide variety of measurement systems. Mechanical meters use a propeller, paddle, disk or similar device with an analog output calibrated to match the actual flow in the pipe. Pressure-type meters use a venturi, orifice plate or pitot tube to indicate pressure differential across a constriction and give an analog or digital output.

Bob Griffin, a contractor to the Energy Solutions Center, has done extensive research and numerous presentations and papers on flow metering for the Center. According Griffin, orifice plate meters are the most common flow meter in use around the world. The standard orifice plate has a round concentric orifice which is supported by an approved flange.

Pressure Changes Indicate Flow

The basic material of the plate is usually stainless steel but may also be carbon steel or even plastic, depending on the application. As the fluid flows through the plate, its velocity increases, and its pressure decreases. Pressure taps in the pipe or flange measure the differential pressure across the ori-

fice. The pressure difference is used to calculate the flow volume or mass flow rate. More recent introductions to the flow meter field are electronic metering devices that use electromagnetic, thermal mass, optical or ultrasonic methods to calculate flow.

Griffin points out that both the accuracy and the repeatability of the measurement should be evaluated and known in a flow meter installation. He explains that for most energy management purposes, repeatability is the more important characteristic. This is because the operator needs to know trends or changes in the flow characteristics in order to identify equipment that my require adjustment or service. However in cases such as fuel mixing or ingredient mixing, accuracy is also critically important.

Understanding Accuracy Claims

Griffin notes that the flow-meter buyer needs to understand that the percent error specified by the seller may be stated in more than one way. For instance, error may be specified as a percentage of full scale reading over the calibration range, versus being specified as a percentage of actual reading over the calibration range. He uses the example of an orifice plate meter, where the accuracy of the flow reading of the primary element is specified as 2.5% of full scale reading, over the full range.

Here, if the maximum range of the orifice plate is specified as 4:1, the flow reading error at low flow would be four times that at full scale or 10% of actual reading. A meter with the same percentage error over the actual reading would be much more accurate at low flow.

Knowing Viscosity Important

Griffin also explains that for many liquid flow meter types, it is important that the viscosity of the fluid being measured is exactly specified, and that temperature corrections for variable viscosity fluids are used. Many types of meters are calibrated to operate within a specific flow range assuming a constant viscosity and density. Outside the intended range, the meter has reduced accuracy. Thus, when selecting a meter, it is valuable to have an estimated flow rate for the fluid as well as a viscosity.

Data from the meter, regardless of type, is transmitted by wire or by wireless device to a central data gateway, where it is output to the user. In some cases there is also a local readout of the data at the measurement point.

Choosing the Right Meter

The DOE publication points out that it is critically important to select both the right size and type of flow measurement system. Certain flow meters are more effective for certain applications than others. Get help from a qualified engineer or system designer. DOE also points out that it is valuable to the extent possible to use a single provider of metering equipment.

In this way you can be assured that the equipment is compatible, and that the "blame game" for system problems is minimized. Complete system training can also be done more effectively by a single provider. A further advantage to standardization is possible dollar savings through volume procurement.

Standardize Data Transmission Protocol

The DOE report also explains that electronic data transmission is done in a variety of protocols or formats, including BACnet, MODBUS, LonWorks, etc. All can be used for metering communication, but it is important that the metering equipment chosen all uses the same protocol, or can be "translated" into the standard protocol chosen. Again, choosing a minimal number of suppliers helps assure this is done correctly.

In some situations there is wide variability in flows between peak flow and a much smaller minimal flow, yet in both situations the operator needs accurate flow information. Most flow meters have a minimal flow rate, below which accurate flow information cannot be provided. The solution here is probably a compound meter, with flow metering elements for both peak and minimal flows.

Do It to Code

Metering installations must meet various codes and standards, including those from ANSI, NEC, NFPA, IEC and FCC. In addition, local authorities, utilities and specific industries may have additional requirements. A new international standard, ISO 50001, is being introduced in Europe, the U.S. and Canada in 2011. This standard will focus on both equipment and management techniques for energy management, and will consider extensively the need for effective tools for manufacturing plant energy measurement.

Digital flow meters installed at a potable water bottling plant. For this type of product metering, both accuracy and repeatability are important. Photo courtesty Badger Meter Corp.

A successful, accurate and repeatable meter reading requires a selection of the right type of meter, in a flow range appropriate to the situation. The meter must be installed in compliance with the manufacturer's specifications, as well as all applicable codes. It must be calibrated at installation, and the calibration checked and adjusted regularly, again according to the manufacturer's specifications. And the data as received should be compared with previous data for consistency. Data can then be applied to make rational energy management decisions. **GT**

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DOE METERING BEST PRACTICES
eere.pnnl.gov/building-technologies/pdf/mbpg_guide_08.pdf

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www.flowmeters.com

Infrared Systems

SUPPLY PROCESS HEAT – EFFICIENTLY

New Designs Improve Effectiveness

This compact module by Vulcan Catalytic permits rapid installation on an existing powder paint line, and can be used for pretreatment for a conventional convection oven, or for an all-infrared operation. Photo courtesy Vulcan Catalytic.

PROCESS HEAT APPLICATIONS today benefit from advanced systems for radiant infrared (IR) heat. The advantage of infrared is that it focuses heat on the target objects and not the surrounding air, thus is more efficient than pure convection heating. Further, systems can be designed for specific process needs, whether that is melting cheese, powder painting garden equipment, or drying textiles. Infrared emitters can be placed everywhere in the process line where they are needed.

Infrared Designs

The traditional design for gas infrared burners involves the flow of fuel through or adjacent to ceramic refractory infrared emitter surfaces. As combustion takes place, the ceramic surface emits a high proportion of the released energy as infrared. The ceramic emitter can be formed in a wide variety of shapes. Some newer designs use porous metallic emitters that have advanced performance characteristics.

Tom Rozek is the CEO of Red-Ray Manufacturing Company, one of the major suppliers of industrial infrared equipment in the U.S. and Canada. He was a presenter at a recent Technology & Market Assessment Forum sponsored by the Energy Solutions Center. Rozek indicates that companies now using atmospheric, convection or ribbon burners can realize gas energy savings of 50% or more by changing to gas-fired infrared burners.

New Emitter Designs

Rozek indicates that his company has introduced two new emitter designs that are even more efficient than earlier ceramic designs. One contains a metal alloy fiber matrix emitter and the other a metal foam alloy emitter. Rozek explains that the metal fiber product has a high heat flux density and the metal foam emitter has a medium flux density. "Both burners are flat faced so they can be placed 3-4 inches from the product. The effectiveness of IR is inversely proportional to the distance from the product."

Rozek points out that Red-Ray's gas impingement ceramic emitters have also been redesigned to increase their efficiency and output. As an example, he says that the aperture in the finned ceramic refractory is a slit as opposed to ported holes in earlier designs, which could become clogged. The ceramic emitters are designed in a modular style, so refractories and side plates can be replaced as needed. He indicates that modern infrared burners are very durable. "Their lifetime is dependent on the application, but is typically 5-10 years."

Food Industry Moving Toward Infrared

A large market for Red-Ray is in the processed food industries, where rapid, consistent heat is needed to put a finishing touch on foods. This includes browning snack foods, melting cheese coatings, and similar food processes. The close proximity of the emitters to the food product as

it passes below on the line allows for high heating efficiency. In these applications the all-metal, high-efficiency emitters are especially attractive.

Powder Paint an Ideal Application

Another of the rapidly growing markets for infrared heating is powder painting. Rozek explains that the switch from wet paint systems is driven by the desire to avoid the expense and environmental problems of evaporating, condensing and disposing of solvents. He adds that worker health risks are also reduced by eliminating solvent exposure.

Powder paint curing is an ideal application for infrared systems. Heat energy can be applied directly to the painted objects, and paint tunnels can be designed with heaters specifically arranged in the appropriate directions to heat the intended product flow.

Optimizing System Design

Today's infrared heat designs for powder paint allow great flexibility in adjusting the heat flux to the appropriate stage of production. Variable heat levels can be achieved as the product flows through the treatment area, adjusting heat levels by the distance of the emitter from the product flow, and by selecting emitters with various heat flux levels.

Manufacturers of industrial infrared heaters offer assistance to both equipment manufacturers and end users in assessing the thermal requirements of the design and recommending the type of heat unit that will be most efficient and effective. Rozek says that Red-Ray is accustomed to working with oven manufacturers to optimize the system.

Another major supplier of gas-fired infrared units to industry is Vulcan Catalytic Systems. Vulcan's President, Mike Chapman, indicates that the company's catalytic infrared heater is the only natural gas-fired heater that operates in the range of 400-1,000 degrees F. He points out, "The advantage to this unit is that it emits the ideal wavelength of IR that is easily absorbed by surfaces such as paint, water and plastic, and competes well with typical electric IR systems."

Apollo-Ray metal fiber burners by Red-Ray in a tortilla chip oven. The oven is about 12' high and has four passes. The first pass is IR reducing the moisture content in the corn dough from 50% to 35%. In this case, the balance of the oven uses conventional convection burners. However many major users are converting to all-infrared operations.
Photo courtesy Red-Ray.

Energy Saving Over Electric

Chapman emphasizes that retrofits from electric systems result in tremendous energy costs savings. "Additionally, it is a flameless gas technology where the catalytic reaction releases over 80% of the fuel as easily absorbed infrared. In other words, the parts being treated heat up quickly."

Chapman explains that the company's product applications focus on paint finishing, plastic thermoforming, and drying applications. "For any flat surface that needs up to 500 degrees to cure or dry, catalytic infrared is the most cost-effective heat source." One important Vulcan application is IR heaters that are used for preheating powder painted parts for 2-3 minutes before they enter a traditional paint convection oven. Chapman says, "This acts to gel the powder on the part before it hits the high velocity air in the oven, avoiding part contamination and added maintenance work on the convection oven from airborne powder paint."

Vulcan also manufactures complete catalytic infrared powder paint ovens in modular sections and ships them pre-plumbed and pre-wired for fast onsite installation. Vulcan works with the customer in designing ovens for the specific product and type of powder paint application.

Increases Quality While Saving Energy

Chapman uses as an example of the advantages of powder paint Wesco Industrial Products of Lansdale, Pennsylvania. The company had been using a water based paint system with a large curing oven. They had encountered quality problems from paint damage after products were out of the oven and being shipped. By switching to powder paint and an infrared curing oven, they virtually eliminated paint damage.

Further, they reduced their natural gas usage for paint curing by 25%. A catalytic curing oven by Vulcan was installed in modular sections and occupies only 360 square ft. as opposed to 2,500 square feet for the earlier wet paint oven. The new oven was installed to surround an existing product transport line. Chapman notes that this experience with saving space and energy and getting a better paint coat is not unusual.

Worth Considering

Whether your heating need is drying fabric, browning snack foods, curing paint or melting cheese, the infrared option needs to be considered. Systems are available for a wide range of temperatures and installation configurations. This gas-fired technology can help you compete. **GT**

MORE info

DOE POWDER PAINT OVEN CASE STUDY
www1.eere.energy.gov/industry/bestpractices

RED-RAY MANUFACTURING CO.
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Keep Growing

What It Means for Energy Markets

BY NOW, MOST INFORMED energy buyers know that new exploration and drilling tools have unlocked huge resources of petroleum and natural gas in North America that previously were classified as "unrecoverable." To that, add discovery of new conventional resources, improved deepwater drilling capabilities, and development of methods of extracting commercial natural gas equivalents from renewable resources. The result has been dramatic increases in estimated natural gas reserves.

Remarkable Increase in Resources

Michelle Bloodworth is Vice President for Business Development of America's Natural Gas Alliance and was recently a speaker at a Technology & Market Assessment Forum sponsored by the Energy Solutions Center. She pointed out how potential U.S. natural resources had grown 58% from 2004 to 2008, and since then have increased even more. This is largely a result of inclusion in the total of shale-based gas resources in numerous locations in the country, the largest currently being the Marcellus Shale formation in New England, New York, Pennsylvania and Ohio.

Where just a few decades ago, some forecasters indicated the U.S. had only a few decades of natural gas resources remaining, today it is widely believed that we have over a 100-year supply. Bloodworth further indicated that the rate of development of new resources is not a one-time event. Industrial and commercial energy buyers have taken notice and are giving natural gas increased attention in their energy plans.

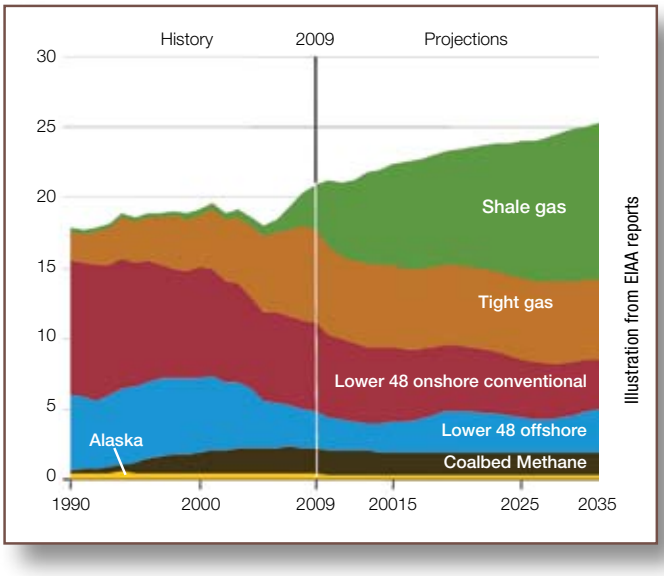
Favorable Effect on Prices

Bloodworth pointed out the potential impact of increases of resources on natural gas prices and utilization. First, she believes that newly abundant resources have reduced price volatility.Users know the resource is there and will be reliable over an extended period of time. Further, because a large portion of future gas is coming from geographically dispersed onshore shale plays, the impact of tropical storms on gas production and prices is being diminished.

Price stability from greater resources is confirmed by recent historical data and forecasts by the U.S. Energy Information Administration (EIA), which show only gradual price increases going all the way out to 2035. Annual long-term price forecasts for natural gas by EIA have been stepped down each of the last three years.

2006 a Watershed Year

Christopher McGill is Managing Director for Policy Analysis of the American Gas Association. He was a recent presenter at an ESC conference, and demonstrated how monthly total U.S. natural gas production started to sharply increase in 2006, largely as a result of shale gas production.



McGill also made the point that the enormous natural gas resources in the Marcellus Shale formation coincide with some of the most extensive interstate pipeline systems in the country, simplifying the infrastructure requirements to bring the gas to markets.

Industry Paying Attention

Industrial and commercial energy managers have not missed the attractive price and availability trends in today's natural gas market. One snapshot of that is the recent announcement by Nucor Corporation that it is building a major new direct reduction steel plant on the Mississippi River in St. James Parish, Louisiana. The direct reduction process uses natural gas and ore pellets, along with recycled steel scrap, to create high quality sheet, plate and bar steel.

Brings Domestic Jobs

The plant is the first stage in a site development where construction might total $3 billion. This first plant alone will provide 500 construction jobs, and will involve 150 permanent Nucor jobs.

Long-term availability of domestic natural gas as a fuel for industry, utilities, commerce and residential accounts is one of the true good news stories of this decade. The U.S. and Canada will have abundant natural gas to fuel our economies for a long, long time into the future. **GT**