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on the cover

Today's on-site power generation systems are more efficient than ever, and packaged systems for heat recovery offer overall efficiencies approaching 90%. Courtesy: Caterpillar.

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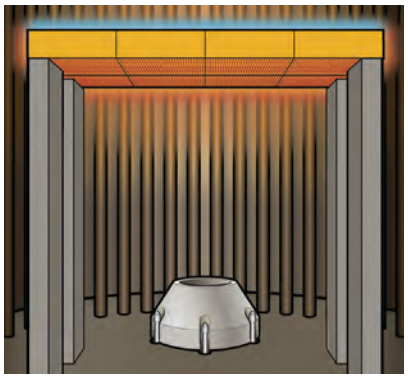

ENGINES OF CHANGE

CHP Engine Sets Powered by Natural Gas

FOR MANY INDUSTRIAL energy users, natural gas-powered engine generation represents an ideal source for site electric power, plus it offers significant byproduct heat from the engine for a wide range of thermal applications. Today's advanced engine-generators, in sizes to 5 MWe and beyond, have efficiencies undreamed of a few decades ago. Further, factory cogeneration packages matched to the engines are now available to capture the thermal output. Taken together, these systems provide overall efficiencies of more than 85%. Combined heat and power (CHP) systems are making many new friends.

Add Efficiency and Reliability

Michael Turwit is President and CEO of 2G CENERGY® Power Systems Technologies Inc. He was recently a presenter at a Technology & Market Assessment Forum (TMAF) sponsored by the Energy Solutions Center. He noted, "Many North American companies are starting to understand the outstanding value a CHP system can provide for their operations."

From better fuel utilization to reduced emissions, much lower energy costs, and grid independence, the benefits are virtually limitless. Turwit indicates that the modern age of CHP was initiated in the 1980s, when the European energy industry began a transition from custom-built to modular pre-manufactured CHP systems, simplifying design, installation and operation.

Key is System Optimization

In designing a CHP installation, it is important to know the daily electrical and thermal needs of the facility. In the past it was generally the approach to design the system for the thermal load, and to purchase supplemental electric power from the grid as necessary. In many regions today, it can make even more sense to design for the peak electrical load and at facility off-peak hours to sell surplus electric energy to the central station utility. The sizing decision will be based on buyback rates, and the ability to use all of the thermal capacity provided at peak generation.

Rooftop enclosures for CHP systems, such as this one on the One Penn Plaza Building in New York, simplify maintenance and security, and protect equipment from inclement weather. Courtesy: Caterpillar.

Minimal Site Re-Engineering

2G CENERGY is one of the major suppliers of packaged engine CHP units in sizes from 500 kWe to 3MWe. Turwit emphasizes the importance of pre-engineering and being able to fit these packages into existing mechanical spaces with minimal site re-engineering. Alternatively the units can be located outdoors or in a factory enclosure adjacent to an existing building and connected to building electrical and thermal loads. For larger site loads, multiple units can be installed.

An example of a modular unit installation cited by Turwit in his presentation is a manufacturing plant in Massachusetts. This company installed three fully containerized 600 kWe units to meet plant electrical requirements, and uses the hot water generated for heating and to supply an absorption chiller for plant cooling. To meet strict local emission requirements, three fully integrated packaged SCR units are matched with the engines.

Winning the Efficiency Game

A major part of the growing interest in CHP is the increased efficiency of newer engines, especially when combined with thermal utilization. Caterpillar is another of the major providers of CHP systems. According to Nick Kelsch from that company, in the 500 kWe to 5 MWe range Caterpillar today offers electrical efficiencies up to 44.7%. He notes, "Larger medium speed engines (720-1,000 rpm) and larger advanced

With use of multiple CHP units, systems can be sized for larger industrial loads. Unit redundancy enhances reliability and assures available capacity during times of unit overhaul. Courtesy: Caterpillar.

high speed engines (1,500 – 1,800 rpm) have the advantage of higher electric efficiencies. But the great news is that total system efficiencies can be as high as 90% across the entire range of product offerings with Caterpillar's standard heat recovery module."

Kelsch adds, "Therefore, any user that has a need for both electricity and heating or cooling on a seasonal or year-round basis can enjoy the economic and efficiency benefits associated with a natural gas CHP system." He notes that Caterpillar is seeing these systems increasingly being adopted for industrial and institutional users, including hospitals, manufacturing plants, high-rise office buildings, district energy facilities, resorts and other applications.

Longer Service Intervals

Another reason for the growing attractiveness of engine generation is the extended service intervals. Kelsch points out, "We see major service (top end overhauls) in the range of 15,000 to 25,000 hours depending on the application, the fuel used, preventive maintenance diligence, and environmental conditions." He emphasizes that a conscientiously applied maintenance program is important. "There are a lot of things that the system owner/operators can do to significantly extend service intervals and minimize costs of maintaining their generator and CHP systems." As an example he cites Snowbird Ski Resort in Utah where engines have operated for over 200,000 hours. The key to this success is a durable design and diligent maintenance practices.

Capturing the Heat

Generally, a modern engine can produce as much heat in thermal kilowatts as it produces in electric kilowatts. Typically engine heat is produced at temperatures of 190° F, though the exhaust waste heat alone is at a higher temperature and can be used for hot water or even for saturated steam. Kelsch points out that Caterpillar has developed modular CHP skids that bolt directly to the base frame of any Caterpillar engine set. The company also offers outdoor enclosures, fuel train packages and other related components.

Dresser-Rand is another source for engine-generators in the scale suitable for industrial and institutional applications. According to company spokesman Matthew Parry, the company offers its Guascor series in sizes from 250 kWe to 1.3 MWe, and multiple units are easily paralleled for larger energy requirements.

Growing Interest in CHP

Parry indicates that the company has noted growing interest in utilizing the byproduct heat from engine generation for a variety of reasons. These include increasing acceptance and awareness of distributed generation by utilities, growing availability and moderate price of domestic natural gas, recent CHP-friendly legislation by various states, incentive programs, and growing awareness of the environmental benefits and energy efficiency by many different market segments.

Parry points to possible applications including hospitals, commercial buildings, waste water treatment, greenhouses, injection molding, general manufacturing, waste processing and educational facilities. He notes, "Any facility with high thermal demands

may benefit from the use of reciprocating engines with the recovery of waste heat."

CHP Packaged Systems

Dresser-Rand offers packaged CHP systems, including the engine, heat recovery equipment, and controls. The company notes, "Packaging provides peace of mind for end-users, because they know that all components were designed and tested to work as a system before the power plant is installed." The systems can be integrated into existing plant systems using standardized control and reporting communication protocols.

The Guascor engine series utilizes the Miller cycle for combustion. This cycle is an advanced method of extracting energy more efficiently in the fuel compression phase, while limiting the creation of NOx and other potential pollutants in the exhaust. This advanced technology is incorporated into the cylinder heads, valves, camshafts, and turbochargers. These advanced components make this series of engines one of the most effective, robust engine lines available today.

Do a Rigorous Evaluation

Equipment providers and engineers experienced in engine CHP applications emphasize the importance of accurately characterizing both the electrical energy and demand requirements of the site, and the potential applications for the large volume of by-product heat produced by the engines. It is also important to evaluate this information in the context of present and future grid electric rates, including energy buyback possibilities. If you haven't run the numbers lately, it might be time to do them again, using current efficiencies and considering the benefits of modular CHP systems. **GT**

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2G CENERGY
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DRESSER-REND/GUASCOR
http://www.dresser-rand.com/guascor.php

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http://www.understandingchp.com

GENERAL ELECTRIC/DISTRIBUTED POWER
https://www.ge-distributedpower.com

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Caterpillar has developed modular CHP skids that bolt directly to the base frame of the generator set. The company can tailor customize pumps, flanges, and electrical systems so as to be compliant with different global standards.

Gas Cooling Grows Up

Advantages Have Become Significant

WITH THE GROWING attractiveness of natural gas as a primary energy fuel, it's time to take a new look at the natural gas cooling option. Whether it's engine-driven chillers, gas heat pumps or absorption chillers, owners are taking a fresh consideration of these options. In many cases, they take the step to gas cooling. Let's review the choices and discuss why they make more sense than ever.

A Widening Gap

In recent years we've seen a growing advantage to natural gas as a primary energy source over central-station electric power. Electric energy and demand charges are on the upswing, while in most areas delivered natural gas prices are low and stable. According to the EIA, this advantage is expected to continue far into the future, and even to widen. If you last looked at natural gas cooling ten years ago, you are overdue for a fresh look.

The Absorption Chiller Option

Perhaps the most traditional choice is the absorption chiller. These use a tested technology to absorb heat by a thermal-powered change of state from liquid to vapor. These chillers have been around for many decades, but today's absorption chiller is exceptionally reliable, durable, and is capable of providing tons of cooling capacity from hot water, steam or other thermal sources. One of the most exciting options is using absorption chillers with hot water or steam from manufacturing processes or electric generation byproduct heat. Another article in this issue touches on waste heat utilization as a potential absorption thermal source.

Broad USA is part of the global Broad Group and specializes in absorption chillers. Doug Davis from this organization was recently a presenter at a Technology & Marketing Assessment Forum (TMAF) sponsored by the Energy Solutions Center. According to Davis, the future is bright for absorption. He observes, "Without a doubt this new shale gas market in North America is making the economics of gas-fired cooling viable in many more markets than it was in the past. Already this year we are starting units in Florida, Delaware and Maryland. All of these are combined cooling, heating and power (CCHP) applications due to the attractive spark spread on natural gas vs. central-station electric."

Using Existing Thermal Loops

Davis indicates that strong markets for absorption continue to be hospitals, universities and industrial applications. "This is due to their having large existing steam or hot water loops. Many of the old coal smokestacks are giving way to clean natural gas. Smart owners are using byproduct heat much more efficiently with absorbers, whether the source is steam, hot water or exhaust heat."

Davis points out that modern absorption is very different from the units that were sold going back to the 1960's. "Potential owners are relieved to learn that operation of a vacuum pump is no longer part of the normal operation of our chillers. They are designed to a much higher vacuum standard." Further, he explains, "Modern PLC controls have transformed and demystified the operation of units. Owners and our service engineers are able to see what is happening in the mechanical room by use of their Smart Phones. Units are monitored 24/365 via the Internet, making operation as simple as their centrifugal cousins, but with lower operating costs and no moving parts to require maintenance."

He notes that customers can get help in evaluating their potential for absorption savings by working with a mechanical engineer who is familiar with the technology. For possible CHP applications, it is especially important to get experienced guidance on system design and sizing.

Absorption chillers provide reliable and economical chilled water for larger facilities and for industrial cooling applications. Courtesy: Broad USA.

Engine-Powered Chillers

Another option for chilled water generation is the use of engine-driven centrifugal or reciprocating chillers to reduce high electric demand and energy changes. Recent years have shown significant increases in these charges by local electric utilities. Owners look for ways to reduce this operating expense yet continue to have reliable production of chilled water. The answer frequently is engine-driven chillers.

One well-known provider of these systems is Tecogen, with their TECOCHILL® gas engine chiller package. Jeff Glick from Tecogen was also a recent presenter at a TMAF event, and he pointed out the advantages of this approach. He noted that in many situations, the operating cost is significantly lower because of reduced electric energy and demand charges. Other benefits include the availability of high quality waste heat, a reduced carbon footprint, and reduced reliance on the electric grid. This last point can be a major benefit in areas that have a history of electric supply unreliability.

Glick also noted that because the peak use season for electricity is the summer months, this is commonly when electric demand charges are highest and power curtailments are most likely. This compares with natural gas usage, which normally peaks in the winter months and may be available at even more attractive prices in the summer.

A slightly different approach for engine-powered gas cooling is the use of reliable gas engine-generators on the site to drive a conventional electric centrifugal chiller. This approach allows a "dual fuel" system, where the chiller can be shifted between grid electric power and the natural gas-powered engine generation at the owner's choice. Again, with this option the owner can take advantage of attractive byproduct heat from the engine-generator when it is in operation.

Gas Heat Pump Option

For comfort cooling for smaller facilities, and where modular units might be ideal, another interesting option is the gas heat pump. Rather than an electric-driven compressor, the gas heat pump (GHP) uses a high-reliability reciprocating engine. One important provider of these is IntelliChoice Energy, a Las Vegas-based company that has experience working with natural gas cooling solutions, and is the exclusive North American representative of NextAire GHP units.

These products are offered in sizes of 8 and 15 tons and are designed for multizone distribution of chilled water. Like conventional air-source heat pumps, they use the refrigeration cycle to extract building heat and discharge it to the atmosphere. The NextAir product features three-cylinder and four-cylinder engines designed and built by Toyota exclusively for natural gas.

Evaluating Options

Decisions to change from electric cooling to a natural gas-powered supplemental or complete system are complex. It is necessary to gather information on current electric energy and demand charges for the cooling season, and to make a reasonable projection of these into the future. It's also important to understand what your present and future cooling needs might be. Further, you may wish to evaluate potential benefits from utilizing existing waste heat for absorption, or using heat generated by engine generation. Get help from a qualified energy engineer, and from equipment providers. Now is the time to get started with this evaluation. **GT**

Engine-driven chillers provide cooling for many mid-size applications, such as this New York high school. Courtesy: Tecogen.

Ideal in the Hot Southwest

John Cole from IntelliChoice was also recently a presenter at a TMAF, sponsored by the Energy Solutions Center. He emphasizes that these units are especially attractive in hot, southwestern U.S. climates that have long cooling seasons and high electric energy and demand charges. He notes that the engines operate at relatively low speeds and have long service lives and proven reliability. Multiple units are frequently installed to give maximum efficiency and redundancy.

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Better Furnace Burners Enhance Capacity

Increase Throughput While Meeting Standards

FURNACES, PARTICULARLY IN THE METALLURGICAL INDUSTRIES, can have a very long life. For many owners, a common challenge is getting more furnace throughput while being faced with tightening emissions standards. Yet replacing an existing furnace is a costly operation. One step increasingly being taken is to replace original furnace burners with advanced designs that have more thermal capacity while continuing to allow owners to meet regional emissions standards.

Tightened NO_x Standards Pose Problems

Natural gas-fired industrial furnaces are major workhorses for the metallurgical, glass and other industries. Yet a growing number of regions in the U.S. are classified as NO_x non-attainment areas. Regional NO_x emission standards are being set that represent a major challenge to existing industries. Many feel that expansion of furnace-based operations is no longer practical because increases in NO_x emissions are not permissible. Other owners are concerned about the efficiency of older furnaces that still have original burners.

Bloom Engineering is one of the leaders in helping owners solve emission, efficiency and production problems with furnaces. According to Dave Toocheck from Bloom, many industrial furnaces have very long operating lives. "We've even done work on furnaces that date to the 1960s. Twenty to thirty years is quite usual." Toocheck indicates that the solution for increasing production capacity while continuing to meet emission standards is often burner replacement. Bloom provides advanced design burners suitable for retrofit in existing furnaces.

Toocheck points out that most NO_x emission restrictions are local or regional in nature, and often prevent owners of existing equipment from increasing site emissions, thereby potentially limiting production expansion. However, if the existing furnace can be increased in efficiency while reducing emissions, expansion is still possible.

Know the Standards

"It's important that you have a clear understanding of local standards, and the contribution of individual pieces of your plant equipment to the site emissions. Often the largest site emitters are furnaces." Toocheck explains that four furnace variables influence NO_x production. "These are flame temperature, amount of excess air in combustion, air temperature, and wall-to-port radiation." All of these are considered in current burner designs.

Determinants of NO_x Production

- Flame Temperature
- Amount of Excess Air in Combustion
- Air Temperature
- Wall-to-Port Radiation

He points out that increased burner efficiency alone is a major opportunity to reduce emissions. "Typically you use ten units of combustion air for each unit of fuel. You need enough air for complete combustion. By adding large quantities of excess air, energy is wasted." He adds, "Another key step is to preheat the combustion air with furnace heat that otherwise would be wasted. For that you want a regenerative or recuperative burner design." He notes that Bloom has developed dual regenerative burners that alternately collect heat from exhaust gases and use that heat to preheat combustion air. With these, furnace efficiency increases significantly."

Today's burners are designed for an even flame temperature and optimized mixing of air and fuel in the proportions for peak efficiency and minimal NO_x generation.

Even Flame Temperature Critical for NO_x Control

"Another key to efficiency and reduced NO_x emissions is burner designs that maintain an even flame temperature from burner tip to flame tail. Avoiding flame hot spots is critical to keeping NO_x production minimal." To achieve this, he points out that the best modern burners stage the fuel and air portions very pre-

cisely, with primary, secondary and even tertiary combustion areas in the furnace designed to optimize heat transfer while avoiding hot spots.

In upgrading a furnace for increased production and minimal emissions, it is best if the owner's engineer works both with the original furnace manufacturer and a provider of high-efficiency burners. According to Toocheck, companies like Bloom Engineering have a long history of collaboration with furnace manufacturers. "When owners are contemplating a burner upgrade, it is best for us to work closely with the owner's engineer and the furnace manufacturer. We want access to detailed drawings of the furnace so we can design the exact burner arrangement needed for peak efficiency and lowest emissions."

New Concept for Furnace Optimization

Recently a new concept for industrial furnace or boiler optimization was introduced by ClearSign Combustion Corporation. This Seattle-based company has developed a system called Duplex™ technology that uses electric fields to optimize flame shape and thereby improve combustion efficiency and reduce emissions. The company was recently a presenter at a Technology & Market Assessment Forum sponsored by the Energy Solutions Center.

Geoff Osler, Chief Marketing Officer for the company explains the system. "The technology places a honeycomb tile downstream of the burner. Modifications to the burner proper tend to be minimal." The system uses custom algorithms to shape the flame for the specific application and furnace. Osler notes, "Duplex technology not only improves energy efficiency through increased radiance, reduced excess air and more even heat distribution, but because it eliminates dangerous flame impingement on process tubes, it improves safety while simultaneously increasing furnace firing capacity."

Attractive Paybacks from Efficiency Improvement

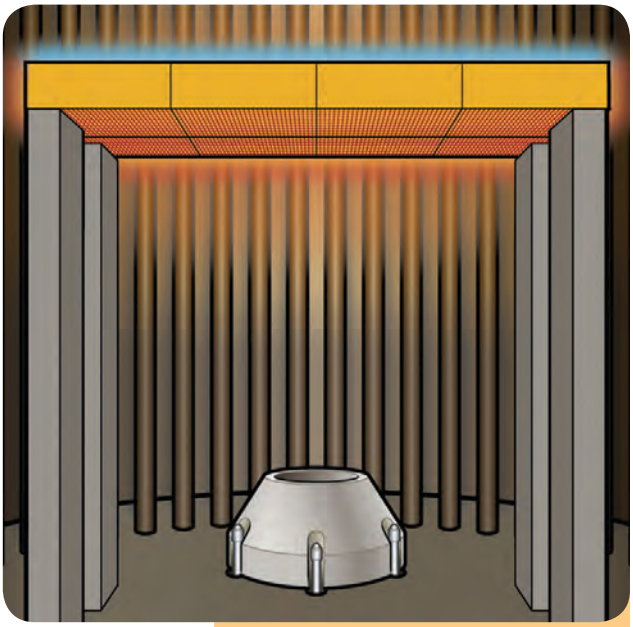
Osler indicates that ClearSign believes that an owner could expect to break even from their investment in Duplex technology in 12 to 24 months. This would be the result of improved energy efficiency, increased process throughput, and increased times between scheduled maintenance. The technology reduces NO_x emissions by reducing the time for NO_x formation chemistry, increasing the mixing time before combustion and reducing the flame temperature by radiating heat more uniformly.

The company says that the system has been documented to show <5 ppm NO_x results in systems ranging in size from 0.1 million Btu/h to over 5 million Btu/h. They feel these results can be achieved over a wide range of operating conditions and with excellent turndown characteristics. Osler indicates, "We estimate system energy efficiency improvements of up to 20% to 30% are possible."

He explains that the technology has been demonstrated successfully to customers at the 5 MMBtu/h scale, and will be commercially available by 2015. Osler says, "We believe the technology lends itself to rapid commercialization because it is inherently robust, reliable and will be easy to install."

Your Furnace Has a Future

Even in the face of tightening NO_x standards, many natural gas-fired industrial furnaces can continue to operate, and in fact can be increased in their capacity. The solution is often choosing the right replacement burner technology. The options for burner upgrades continue to expand. This is a step that might pay for itself for many owners. Take some time to study your options. **GT**



The ClearSign Duplex™ technology can be installed over an existing burner and uses sophisticated design and operation algorithms to optimize burner combustion efficiency. Courtesy: ClearSign Combustion.

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BLOOM ENGINEERING
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CLEARSIGN COMBUSTION CORPORATION
http://www.clearsign.com

DOE INFORMATION ON IMPROVING FURNACE EFFICIENCY
https://www1.eere.energy.gov/manufacturing/tech_assistance/pdfs/42110.pdf

NEW POSSIBILITIES IN HEAT RECOVERY

Systems Offer Improved Efficiency

FOR MANY YEARS we've understood that too much of the energy from industrial processes is lost as waste heat. Whether heat goes up the stack, out the cooling tower, or into the atmosphere as heat loss, the result is the same: energy bought and paid for is being wasted. Today, we add to that the concern that these process inefficiencies also result in excess emissions, including greenhouse gases.

New Solutions Being Developed

To be sure, methods for some types of heat recovery have been around a long time. Examples include boiler economizers and air heaters, waste heat boilers and upgrades such as improved insulation. These reduce heat loss and improve process efficiency. Options are now becoming available to make heat recovery even more effective, more affordable and capable of recovering heat from lower temperature streams. Let's look at a few of these new opportunities.

Advanced Economizers

Economizers capture waste heat from boiler and furnace exhausts and use it to heat boiler or process steam and liquid streams. Today's economizers are optimized for the particular volume and temperature of the exhaust stream, and feature digital process monitoring and controls. An exciting advance is the condensing economizer, which extracts heat down through the condensing point of the water vapor in the exhaust stream, maximizing heat recovery.

Because of their exposure to sometimes acidic condensate, these economizers are built with corrosion resistant metals. Systems can provide up to 100% of the plant hot water requirements. Typical requisite downtime for this type of installation on an existing boiler is a matter of hours.

Air-to-Air Heat Exchangers

Today, manufacturers offer a wide range of air-to-air heat exchangers to capture a major portion of heat from building exhausts, and reuse it for other plant processes. As an example, the Exothermics division of Eclipse Inc. offers a wide range of heat exchangers, including both power and in-line type, and tubular and dimpled-plate designs, to match a variety of heated exhausts.

Industrial thermal exhausts may have temperatures up to 1500° F, and heat recovery may be installed in line either before or after emission abatement equipment. Thus it is important to clearly characterize the exhaust stream in selecting the appropriate heat exchanger. An experienced industrial engineer should work closely with the product manufacturer in selecting equipment for maximum efficiency, long life, and suitability for the space available.

Ventilation Air Heat Recovery

Occupational health standards have driven the need for increased building ventilation rates. In the past, ventilation automatically meant winter heat loss, and additional summer load on building cooling equipment. Today air-to-air heat exchangers can capture waste heat (or cooling) from building exhaust ducts, and use it to condition the building return air stream. Because of the large volumes of the air streams, such heat exchangers are necessarily large, and are located on rooftops or in building HVAC mechanical rooms.

Economizers are a time-honored method of extracting useful waste heat from exhausts of boilers, gas turbines and industrial furnaces. Newer designs include condensing economizers and hybrid designs with both condensing and non-condensing sections. Courtesy: Condex.

Another potentially important source for recovered heat is liquid-to-liquid or liquid-to-air heat exchangers. These capture heat from process fluids, boiler blowdown, and waste washdown water for reuse in a variety of applications. Liquid-to-liquid applications can include boiler feedwater, domestic hot water, and pre-heating for process fluids. Liquid-to-air applications can include space heating, boiler or furnace combustion air, or product drying applications.

Waste Heat to Electric Power

Not all industries can use the entire volume of waste heat for boiler or process inputs. Another option is becoming increasingly popular – electric generation. One traditional way of accomplishing this is with a waste heat boiler to provide steam to a turbo-generator. Common installations are with a high-temperature oven or furnace exhaust, or by capturing waste heat from one or more gas turbines.

When used with gas turbines, these are termed "combined-

cycle systems" and are increasingly being used by electric utilities and large private turbine users to increase overall plant efficiency. Use will necessitate a program for boiler feedwater conditioning, and use of a condenser cooling system such as a cooling tower. Typically, a turbo-generator powered by a gas turbine increases the overall output by about 50%, and can increase the overall thermal efficiency from 35% to over 50%.

Advanced Cycles for Electric Generation

Another interesting option for generation of electricity from waste heat is systems that use the Organic Rankine Cycle (ORC). The attraction to this process is the use of a working fluid that is an organic material and has a lower material that has a lower temperature liquid-vapor phase (boiling point) than water. This makes it a more viable option for conversion of waste heat to electricity at lower temperatures. One provider of such systems is Ormat Technologies, Inc. Colin Duncan of this firm was a recent presenter at a TMAF sponsored by the Energy Solutions Center.

He described opportunities for this system, noting that the company already has 160 MW of ORC generation in place using waste heat sources. He described the advantages of this system, including avoiding adding CO_2 emissions, its small footprint, its rapid deployment, and its suitability for a variety of industries including paper, chemicals, refineries, glass furnaces and steel mills.

CO_2 as Working Fluid

A novel cycle for direct electric generation from byproduct heat has been advanced by Echogen Power Systems, LLC of Akron, Ohio. This system uses the Brayton cycle (similar to the conventional gas turbine), but uses waste heat as the energy source and carbon dioxide as the working fluid. According to Echogen CEO Philip Brennan, a variety of heat sources can be used. "We do concentrate on those industrial processes that provide a heat source in the optimum range. That includes paper mills, glass manufacturing and certain chemical plants. Our application engineers run individualized heat analyses for any potential project." Brennan indicates that the maximum heat temperature is 1200° F, but higher temperatures can be tempered to meet this requirement.

One intriguing option nearing commercialization is a heat recovery module by Echogen that uses CO_2 as a working fluid to extract a high proportion of heat from industrial and utility exhaust streams. The system is skid-mounted and operates in the range from 500° F to 1200° F. Courtesy: Echogen.

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CONDEX CONDENSING ECONOMIZERS

http://www.condexenergy.com

ECHOGEN POWER SYSTEMS

http://www.echogen.com

EXOTHERMICS

http://www.eclipsenet.com/products/exothermics

ORMAT TECHNOLOGIES, INC.

http://www.ormat.com

RESOURCE RECOVERY COMPANY

http://www.maximizersystems.com

SIDEL SYSTEMS USA INC

http://www.sidelsystems.com

Brennan explains, "Our early focus has been on any process that uses natural gas combustion, such as gas turbines, gas-driven reciprocating engines, reheat furnaces at steel mills, cement kiln exhaust, etc. The initial 7.3 MWe unit is currently being run through its paces at our partner Dresser-Rand's test facility in Olean, New York. We are currently taking commercial orders with about a 12 month lead time to delivery onsite." He indicates they plan to deploy a number of systems in 2015.

According to Brennan, when used with temperatures below 650° F, this cycle offers efficiencies better than steam cycles. Another advantage is the relatively compact size of the modular unit. The need for treatment of water for the working cycle is eliminated, and with an air-cooled condenser, no cooling water is required. When operating at higher temperatures, evaporative cooling is needed.

Time to Reevaluate

Thus, with technologies ranging from very traditional to very advanced and novel, industrial heat recovery is increasingly being deployed. Correct systems will increase plant efficiency, reduce energy costs, and minimize emissions. Unless you've done a heat recovery study recently, it's time to revisit this important area. GT

More than Compliance

Burner Safety through Professional Inspection

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CEC COMBUSTION SAFETY
http://www.combustionsafety.com

IT'S TOO EASY to conclude that because industrial natural gas combustion equipment was designed to meet code, any concerns about combustion safety end there. In fact, owners urgently need to appreciate the importance of installation inspection, regular follow-up inspections, and system upgrades as needed to maintain equipment safety. A rigorous inspection program will also help assure peak operating efficiency and minimal emissions.

Regular inspection by trained employees or contractors will spot a wide range of burner problems, such as this severely corroded burner. Often the problems may be more subtle, such as wiring or control deficiencies or outdated control software. Courtesy: CEC Combustion Safety.

Going Beyond Minimum

Fuel-fired equipment has interlocks to provide for safe startup, operation and shutdowns. Systems typically have redundant elements to provide safety in depth. But these systems require annual testing to continue to meet codes, and as a sound operating practice. Inspection and testing of safety devices prevents fire, explosion, or unexpected downtime. A trained inspector can also spot potential equipment failure, and opportunities to increase combustion efficiency and reduce emissions.

Often these inspections are best done by a third-party organization. One firm that performs these services is CEC Combustion Safety, a division of Eclipse Inc. Burner and fuel train inspections are conducted using manufacturer-approved checklists and service recommendations. Bryan Baesel from that company says, "Each facility is very different but most often we find that staff want to do the right thing but often have not received the proper resources or guidance to do this successfully. Due to the reduction of maintenance staff or turnover, they are not able to focus on combustion safety. We can solve this by providing the service until they are able to get their processes back in place or to help raise the awareness of the problem."

Must Be Lifetime Commitment

Baesel emphasizes that the need for evaluation and maintenance of combustion systems continues for the life of the equipment. "Many safety devices on a combustion system can fail in an unsafe and undetectable manner. Only through proper testing and simulation of unsafe conditions can these defects be identified. Just because the system performs reliably does not mean it is safe."

According to Baesel, it is a common misunderstanding that validation of the combustion safety systems is part of the government or insurance inspection of the facility. "These provide a valuable service but they do not physically check the operation of combustion safety systems. Boiler inspectors are primarily concerned with the pressure vessel operation. Even maintenance contracts with service providers often exclude combustion safety system validation. Without a focus on this area, it is not being completed."

Keeping the Systems Current

In conducting this service, the specialist will assure that all applicable codes are being met. In many cases it will be appropriate to review operating practices with the plant staff to assure a complete understanding of safety elements. The auditor will complete visual examination of existing firing controls and will review records of maintenance work. Another valuable element is that this review will include updates on newer technology and revised maintenance practices. This assures that even older equipment is safe and reliable by current standards.

Getting Started

It is important to make combustion safety system testing and validation key parts of your maintenance practice. Unless your staff has been specifically trained to do this correctly, it's time to look for qualified help. Make this step a standard part of your facility practices. GT