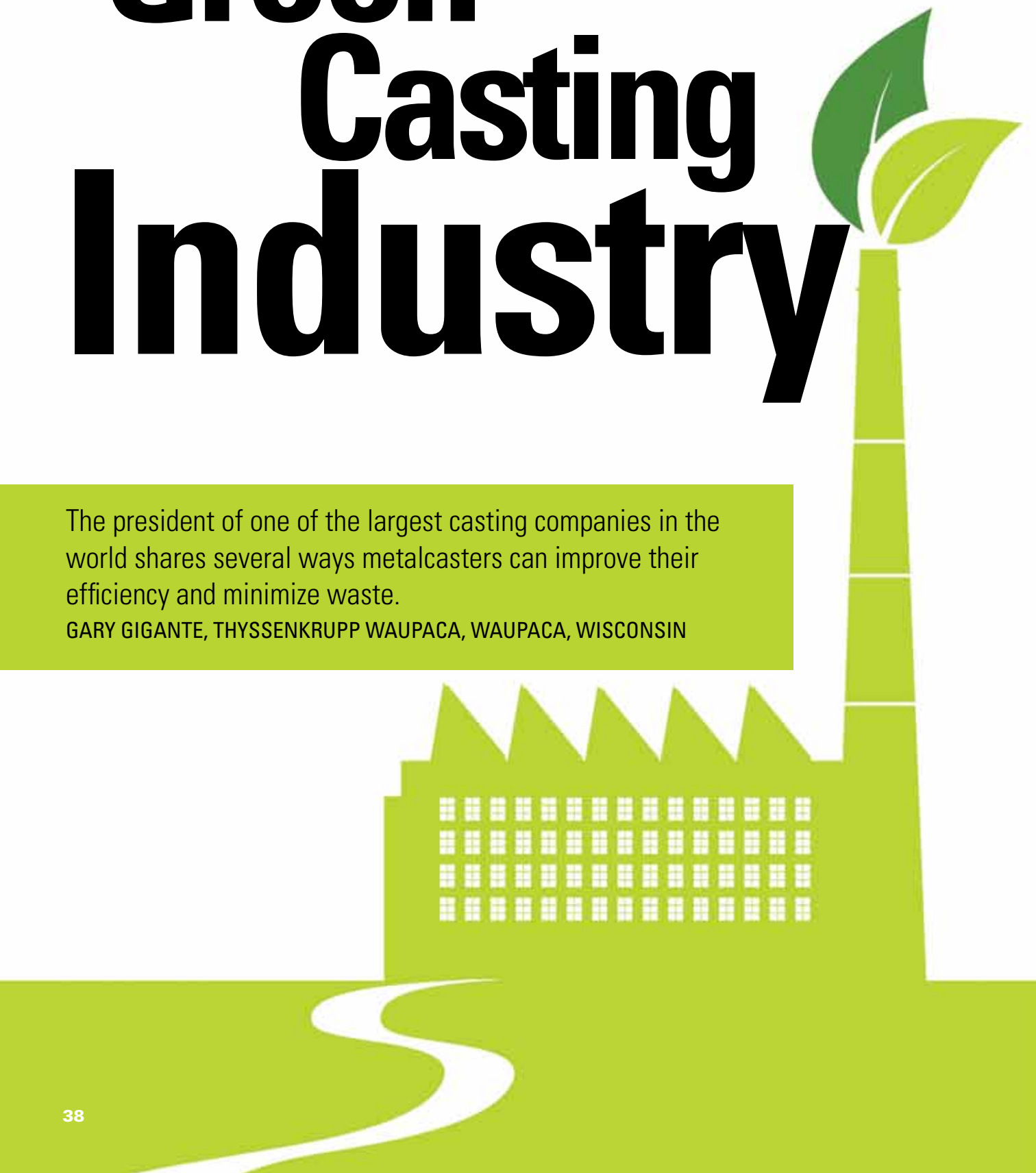
Becoming a Practical Green Casting Industry



The president of one of the largest casting companies in the world shares several ways metalcasters can improve their efficiency and minimize waste.

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As metal recyclers, metalcasting facilties have long considered themselves a part of the green movement. In reality, the industry has only scratched the surface and has yet to achieve the higher level of sustainability that the future will demand. Metalcasting is energy intensive, handles massive quantities of processed waste materials often destined for landfills and has the potential to emit a large quantity of carbon dioxide and other pollutants into the atmosphere.

Energy reductions in the manufacturing process pose significant potential improvements in total energy usage and the reduction of carbon emissions resulting from the combustion of fossil fuels. To become greener, one must find ways to increase the efficient use of energy in the complete manufacturing process and not merely shift enery use up or down the manufacturing stream.

Significant capital spending is not the only way to realize savings and improvements. Metalcasters can work within their own model to achieve results. Much of the technology to become greener exists now, and metalcasters have the resources to become increasingly sustainable in the future. Following are specific areas in metalcasting operations that yield savings.

Reuse of Waste Heat

The reuse of waste heat can net energy savings of 15-25% or more. While technologies exist for converting waste heat energy to electric power, a simple and less costly approach is to directly recover captured waste heat for use in an area that requires heat.

The simplest approach to reusing baghouse heat energy is the direct re-introduction of the exhausted-filtered air back into the plant. This is feasible if no additional gaseous waste pollutants are present in the waste air stream. Modern baghouses and the advent of broken bag detection technology have eliminated the concern of reintroduction of particulates back into the workplace. Well run dust collection equipment regularly contains a lower particulate count than what may be experienced in the general work environment.

Air Handling

Many metalcasting facilities' air capture and baghouse systems have not undergone significant redesign since their initial installation in the 1970s. The average emissions system may consume 20 to 25% of the total energy usage in the plant. Many improvements in piping, engineering, components, baghouse design and bag materials can be incorporated into an updated system.

Lighting

Plant and office lighting can be a significant source of energy savings, although some capital costs will be required. Today's lighting fixture designs drive light deeper into the plant and provide truer colors for better employee comfort. Proper engineered lighting fixture layout can improve efficiency. Motion sensing and centralized automated control also offer opportunities for significant improvements in energy savings and maintaining consistent levels of light.

Because lighting is easily measured, many government agencies and power providers offer significant available rebates and tax incentives.

Compressed Air

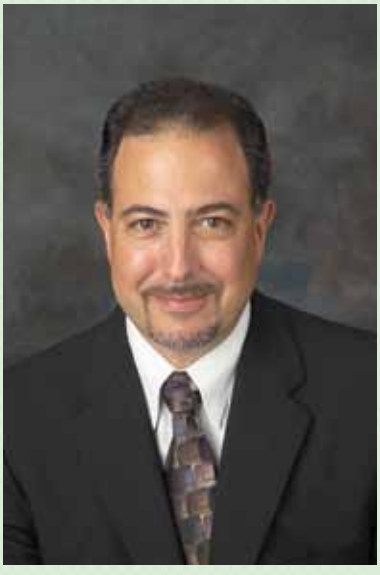
The generation and delivery of compressed air is inefficient, with one-third of all compressed air horsepower lost in the process. A supply and demand side audit, as well as a system leak evaluation, can yield tremendous benefits. Savings are typically realized in low-capital activities, such as leak repairs, piping changes, air storage sizing and proper compressor sequencing.

Melt Savings

Buying the right scrap can net energy savings before melting materials are received at the metalcasting facility. Ferrous casting facilities have been comfortable receiving post-consumer steel scrap that contains surface rust, paint, adhering non-metallics and other non-steel attachments. Sheared scrap can contain 5-8% by weight of tramp non-metallic materials. It takes 1.7 to two times the energy to melt slag than iron. By purchasing clean scrap created by shredding rather than shearing, a metalcaster can reduce energy consumption by 15-20%.

Further melt savings can be achieved by cleaning gates and risers of sand by passing them through a rotary

FROM THE AUTHOR



Many of these ideas are not new, and we have all talked about implementing them. However, time passes, and maybe we have not pursued these ideas due to other current concerns or we have done so only in an inconsistent manner. Reaching the point of determined action and embracing the possibilities of sustainability may prove to be one of the industry's greatest challenges. With a focus on thinking green in all aspects of the process and the pragmatic application of existing technology, the metalcasting industry will be recognized as a sustainability leader.

Gary Gigante is president of ThyssenKrupp Waupaca, Waupaca, Wis., a gray, ductile and compacted graphite iron casting producer and one of the largest metalcasters in the world.

The industry has only scratched the surface of achieving the higher level ofsustainability the future will demand.

drum or shot blast equipment. Keeping scrap yard sand/dirt to a minimum and away from the charge bucket will provide energy benefits, as well as reductions in potential fugitive dust.

Cores/Binders

The Casting Emissions Reduction Program (CERP), which is a collaboration among the U.S. Department of Defense, environmental agencies and the private sector, evaluates the hazardous air pollutant emission potential of various coremaking processes and binder systems. CERP identified phenolic urethane nobake and coldbox cores as having the highest emissions. The binder industry responded with options to replace some or all of the aromatic solvents.

In ferrous applications, biodiesel binders can reduce benzene, toluene, xylene and naphthalene emissions at pouring, cooling and shakeout by 20-30%. In nonferrous applications, tetraethyl orthosilicate replaces aromatic solvents in parts 1 and 2 of urethane coldbox resins. This silicate-based solvent reduces condensate formation and smoke and odor at pouring, cooling and shakeout. This is especially important with the lower pouring temperature used in aluminum semi-permanent molding, as excessive smoke and condensate formation in the die are not only environmental concerns, but they also affect productivity.

Even with substitutions, the continued use of phenolic resins is threatened by lower emission standards. This has given rise to a new generation of inorganic systems such as heat-cured sodium silicates or ester-cured nobake sodium silicate. The latest generation systems all use some form of aluminosilicate or other inorganic additive to reinforce the water-soluble silicate. These systems have little to no volatile organic compounds, are generally non-flammable, generate no odor during mixing, coremaking and shakeout, and generate little to no smoke during casting.

Further, many efforts have been made to remove core washing from the coremaking process. In many cases, it can be eliminated with improved coreroom process controls, while for other castings it is a necessity. A novel way to cut core drying costs is to use a color changing indicator in the core wash to determine when it is dry. Drying time and therefore gas consumption can be reduced by 50%.

U.S. FOUNDRY'S CREATIVE ECOLOGICAL INITIATIVES

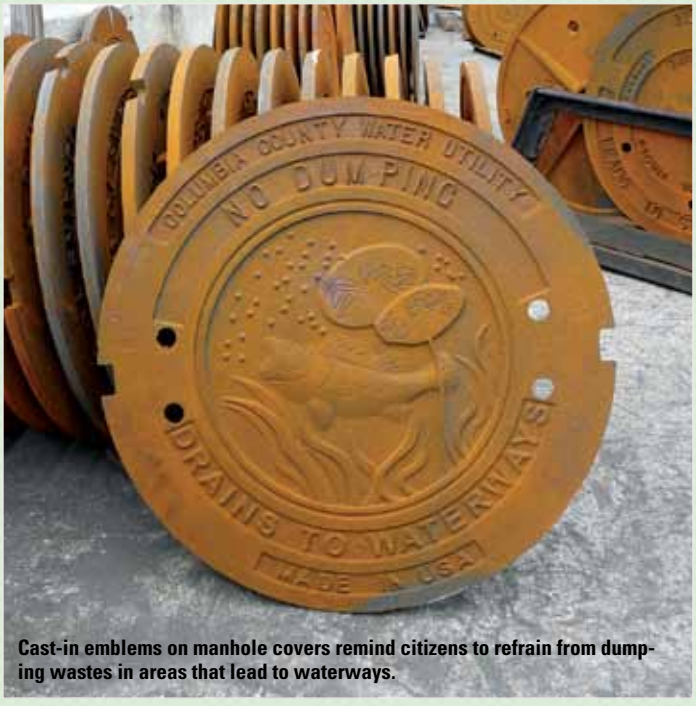
All metalcasting facilities use some degree of recycled material. U.S. Foundry, Medley, Fla., uses 100% recycled material in its castings. The maker of municipal castings, such as manhole covers, tree grates and curb and gutter inlets, does not purchase any pig iron or prepared metal, according to technical director Adam SanSolo.

U.S. Foundry receives recycled metal from typical and atypical sources. For instance, while the rubber in tires is a well-known recycled material used in athletic facilities and playgrounds or as a fuel source, the steel wire used in steel-belted radial tires has historically been disposed. U.S. Foundry melts the wire at its casting facility.

"It enables us to use 100% recycled material and also means that the tire itself is then a 100% recycled material," SanSolo said.

U.S. Foundry is also a recognized recycler of demilitarized material, so it melts scrap from arms and explosives and is licensed by the State of Florida as a recycler of special waste that would otherwise go to a landfill.

"We've been a recycler of special waste since the mid-1990s," SanSolo said. "We are always trying to find more unique materials to recycle. We strictly adhere to our technical properties, but because of the product we produce, which is a low technology



Cast-in emblems on manhole covers remind citizens to refrain from dumping wastes in areas that lead to waterways.

Ductwork

Heat leakage in heated ductwork in the winter months might be considered acceptable as a supplemental heat source, but in the summer, it adds to the plant temperature load and must be exhausted from the plant. Perform regular inspections on all ductwork and calculate the heat losses. The value of insulating ductwork and piping will be recovered quickly.

Motors

High-efficiency motors used in moldmaking can save 2-5% on operating energy. When considering the cost of high-efficiency motors, remember that the original purchase price will probably be no more than 5% of the operating cost of the motor over its lifespan. The cost of electricity will be more than 95% of the cost of operation.

In the case of re-winding motors, studies have shown that rebuilding motors nearly always results in a motor that is not as efficient as the original purchased motor.

If re-winding must be done, a carefully written set of engineering instructions and procedures must be in place.

Another consideration is using variable frequency motors for operations that have widely varying loads throughout a cycle, such as in sand mulling. MC

This article is adapted from the paper, "How Can We Become a Practical Green Foundry Industry," which was first presented at the 114th Metalcasting Congress as the Hoyt Memorial Lecture.

part when it comes to chemistry, we have the opportunity to use more exotic materials."

U.S. Foundry also looks for scrap coming from nearby sources, including scrap steel from the Orange Bowl stadium when it was torn down in 2008. Local sources of steel help the metalcasting facility and its customers earn credit through LEED, a green building certification program that encourages sustainable building and development practices.

"We can receive LEED credit for pre- and post-consumer recycling and for using locally produced/locally supplied products," SanSolo said. U.S. Foundry works with its customers to provide evidence of recycled content and/or local supply to help them earn LEED certification.

U.S. Foundry also has found a way to help its customers become more environmentally friendly. Through a U.S. Environmental Protection Agency initiative, the National Pollutant Discharge Elimination System permit program, communities are obligated to instruct citizens on the harm of dumping something into waterways. U.S. Foundry offers to incorporate an emblem or message on a drainage casting at no charge as a reminder to industries not to dump.

"It's a permanent, low-cost way of discouraging dumping into communities," SanSolo said. MC

—Shannon Wetzel, Senior Editor