

The Energy Efficient Agenda

PT MANUFACTURERS PUT SUSTAINABILITY ON TO-DO LIST IN 2012

Matthew Jaster, Associate Editor

Next time you're strolling across a manufacturing plant, check out the hardware on the ground. Shop floors are nothing but cables plugged into machines, cables plugged into computers, cables plugged into other cables. The energy being used at the average factory is mind blowing. It's no great trade secret that the industrial workplace is one of the largest energy wasters in the world, representing one-third of the energy consumption in the United States.

According to Siemens, studies show that up to 80 percent of the energy currently used in the various production, transmission and conversion stages from the energy source to the consumer can be lost. You'd think with every green manufacturing conversation, article, webinar and trade show presentation, the *power transmission* community would be at the forefront to change the status quo—well at least they're trying.

"In my opinion, there are many factors steering companies away from implementing an energy efficient strategy, especially on older machines," says Abdulilah Alzayyat, product manager at Bosch Rexroth Corporation. "Some of the biggest energy wasters on a machine are overlooked. Often servos are oversized, which leads to machines that consume more energy than necessary—something which can easily be avoided through proper design. Also, energy efficiency is still regarded as a low priority in many organizations, despite the potential for savings. Many machine builders are reluctant to implement energy efficient solutions in their machines due to the perception that new technologies will make their machines more expensive to sell. Businesses and end-users are underestimating the returns from energy efficiency investments since it costs more up front and may take years to pay back."

"There is a tendency to use the same equipment that was used in the past," says Chad Brown, Baldor product manager, Dodge Gearing. "Another factor may be a lack of understanding about energy efficiency and the potential benefits at a plant operations and maintenance level."

"The way most companies approach it, they're considering energy efficient systems, but nobody has the time to be proactive," says Ken Kerns, marketing manager at Siemens. "You also have manufacturing companies that have simply decided not to implement upgrades or changes to their current systems."

Out With the Old

Three companies that are on the forefront of energy efficiency and sustainability are Siemens, Bosch Rexroth and Baldor (of the ABB Group). Kerns at Siemens says energy efficiency takes off when the entire organization has bought into the philosophy and focuses on the future instead of the past.

"We have a green initiative at the corporate level to pull all of these different efficiency facets together under one umbrella. It's something that is integral to the success of our business



The IndraDrive Mi is an integrated drive/control system that dramatically reduces installation costs (courtesy of Bosch Rexroth).



Rexroth systemizes the latest advances in automation for improving energy efficiency in accordance with the 4EE concepts—Efficient Components, Energy Recovery, Energy on Demand and Energy System Design (courtesy of Bosch Rexroth).

today. We promote energy efficiency as a three-step process: identifying energy flows, evaluating, and realizing the potential of the energy. There's not a department in the company that is not thinking about how they can be more energy efficient now and in the future," Kerns says.

One of Siemens' strongest green industrial segments includes pumps, fans and compressors. Siemens variable frequency drives (VFDs)—a unique way of controlling a motor's speed by converting AC to DC through a series of controllable elements—allow the customer to match the motor speed to the system or output requirements.

"If you have a pump that requires 50 percent output eight hours a day, a drive gets rid of the mechanical element and reduces the speed of the motor for better energy consumption," Kerns says. "One example is in the mining industry where some cross-country conveyor belts are downhill and you have to maintain the speed using dynamic braking. The typical way to control this is to have the motor act as a generator. Technology allows us to take that energy generated in maintaining the speed of the conveyor and feed the energy back into the drive and into the facility."

At Baldor, field representatives train new and existing customers about the benefits of energy efficient systems. "Our industry group combines strong product knowledge and expertise in a

particular industry segment to offer the customers solutions that are optimized for their particular needs," Brown says. "Our Installed Base Evaluation team performs equipment surveys at a customer's site and offers recommendations on improving efficiency, reducing downtime and consolidating spares."

Dodge, for example, offers a complete range of high efficiency helical and helical-bevel gear reducers including Quantis, MagnaGear, Motorized Torque Arm and Maxum. "Our products are used in almost every market imaginable—unit and baggage handling, food

and beverage, aggregate, mining and the grain handling industry, just to name a few. There can be an efficiency improvement of 50 percent or more when comparing less efficient motor and gearbox technologies to our premium efficient products."

At Bosch Rexroth, machine builders and end users are encouraged to benefit from their own experience in the transition to greater energy efficiency.

"For every measure we recommend, it is already implemented in our own plants to lower CO₂ emissions by 20 percent by the year 2020," Alzayyat says. "The decentralized servo drive is an example of an energy efficient component that is revolutionizing automation. The IndraDrive Mi combines control electronics and a servomotor in an ultra-compact unit. This reduces cabling, saves cabinet space and saves on the energy needed to keep the temperature inside the cabinet cooled down" (*Ed's note: See Bosch Rexroth sidebar page 22*).

Many Happy Returns

Becoming more energy efficient, however, does take a leap of faith (and typically more cash up front) to start seeing significant improvements over time. The return on investment (ROI) is a question that has kept many organizations from integrating some kind of sustainability plan into their current workflow.

"ROI calculations will vary signifi-



Bosch Rexroth offers a complete line of energy efficient products and services.



Dodge Quantis gearboxes and gear motors are based on a modular design concept to facilitate the implementation of custom configurations (courtesy of Baldor).

cantly by region due to differences in power costs and will vary with the specific application involved,” Brown says. “If the existing equipment is operating satisfactorily, we would consider the total cost of the new equipment in the ROI calculation. In this case, ROI will be longer, possibly 3–4 years. If there is a need to repair or replace the existing equipment, we would only look at the added cost of the more efficient equipment vs. the repair or replacement of the existing unit. In this case ROI can often be 1–2 years, sometimes less. There is often less of a price premium for energy efficient equipment than customers might expect.”

Bosch Rexroth has conducted a series of tests using its 4EE program to help determine the advantages of energy efficient programs. “Your costs for the transition pay off in only a few years in the form of low electricity costs. How do we know that? Because pilot projects in various Rexroth factories show that a machine manufacturer and industrial user can achieve substantially greater energy efficiency based on the 4EE systematic approach without completely renewing their entire machinery,” Alzayyat says.

A recent research project in the U.K. by Siemens Green League indicates

that 31 percent of those responsible for energy management in U.K. businesses say energy management is not taken seriously (courtesy of Edie Energy: www.edie.net). The survey concludes that more than a quarter of board directors (27 percent) didn’t even know what their energy bill was and one-fifth (18 percent) had no idea what their investment in energy management would be over the next three years. Additionally, one in three board directors blame the lack of perceived ROI for preventing a long-term commitment to energy efficiency. Optimistically, however, the report did indicate that 70 percent of businesses are planning to invest in energy efficient projects in the next three years.

Energy Incentives and Rebates

In order to assist manufacturers with energy efficient directives, there are varying incentives and rebates at the federal, state and local levels. Anyone interested in learning what’s available can

get a state-by-state breakdown at www.dsireusa.org. Everyone interviewed for this article believes more *can* and *will* be done in the near future to make green energy management more attainable.

“It would be wonderful if there were greater incentives for U.S. manufacturers who wish to invest in industrial infrastructure here,” says John Malinowski, senior product manager, Baldor AC Motors. “This has the potential to create more jobs in the United States and help our economy. Baldor’s motor plants, ABB’s drive plants, and most of Baldor’s Dodge mechanical plants are located in the United States, employing more than 7,000 people.”

Alzayyat says incentives and rebates are great, but the manufacturers need to play a larger role in an energy efficient mission. “While state and federal incentives are a great encouragement for machine builders to implement energy efficient designs, I believe this alone is insufficient. In addition, machine builders and their suppliers need to make available products that are performance comparable and price competitive to other standard products.”

Adds Kerns at Siemens, “The mentality is there and the government is trying to offer more to the industrial market. The Consortium for Energy Ef-



London is just one of several cities where Siemens is dedicated to improving energy efficiency and sustainability initiatives (courtesy of Siemens).

iciency actually brings these two sides together—both the industrial experts and the politicians—to discuss energy management. You have concerns over pollutions, resources disappearing, etc. This is not a fad that’s going to disappear anytime soon.”

Moving in the Right Direction

If there is reluctance from PT manufacturers to convert to more efficient equipment—for financial reasons or simply because of time constraints—now's the time to reconsider. *Bloomberg* recently reported that U.S. manufacturing grew in January at the fastest pace in seven months and reports from China all the way to Germany are optimistic as well. This means more equipment, more products and more energy consumption. Those that have embraced green manufacturing will undoubtedly have an easier road ahead than those that ignore it.

“Every element of our business is working on some aspect of energy efficiency and drive technology today, from Europe to China to the United States. We see new hires out of college with a similar mindset on energy efficiency,” Kerns says. “I think our leaders believe in that. They talk about this often. We want to strive to set the example. I'm encouraged by what I see and the direction energy management is going.”

For more information:

Baldor (A member of the ABB Group)
5711 R.S. Boreham, Jr. St.
Fort Smith, AR 72901
Phone: (479) 646-4711
www.baldor.com

Bosch Rexroth Corporation
5150 Prairie Stone Parkway
Hoffman Estates, IL 60192
Phone: (847) 645-3600
www.boschrexroth.com

Siemens Industry, Inc.
Drive Technologies-Motion Control
390 Kent Avenue
Elk Grove Village, IL 60007
Phone: (847) 640-1595
www.siemens.com



Siemens Automation & Drives Sinamics S120 system offers an integrated modular drives system for single-axis and multi-axis applications (courtesy of Siemens).

Rexroth Integrated Motor/Drive System Streamlines Case Packers

Brenton Engineering, a provider of packaging and palletizing equipment, designed a new line of side-loading case packers to exceed current green manufacturing end user trends, featuring servo control to increase speed and reduce energy costs within a compact footprint. Located in Alexandria, Minnesota, Brenton engineers spent months consulting with customers and vendors before designing the next generation of its popular BrentonPro Series of case packer machines.

“We asked our customers how we could improve the machine. The feedback was to make it a faster and simpler all-servo machine,” said Mike Grinager, vice president of technology for Brenton Engineering. “With the new design we did everything we could to reduce the complexity of the machine. We took out the pneumatics, which was the most expensive

aspect of the machine, and our engineers removed more than 200 moving parts, reducing costs by one-third. Plus, the integrated servomotors and drives that we now use require less space than even the smallest motors we used previously.”

As a result, Brenton's new BrentonPro Mach-2 case packer is an all-servo-driven, side-load case packer featuring an IndraDrive Mi integrated motor/drive platform with SERCOS distributed I/O, an IndraMotion MLC motion logic controller and the IndraControl VEP40 human machine interface (HMI)—all from Bosch Rexroth.

According to Grinager, the multi-axis machine reaches speeds of up to 25 cases-per-minute and can accommodate a variety of cases, including RSC, HSC, tray, wraparound, knock down and harness for cartons, bottles, cans and tubs. During operation, an

empty case blank is picked by vacuum and set in the machine. The case is moved through loading and sealing sections of the machine, which are powered by servo-driven flap traps. After loading, the full case is indexed through a compression and sealing area. The completed case is then discharged on the customer's takeaway conveyor. Brenton developed the Mach-2 case packer to minimize the environmental impact of packaging operations through the appropriate use of electric servo drives, resulting in lower energy consumption—including zero air consumption—and less product and packaging waste.

The company worked closely with local Bosch Rexroth distributor Motion Tech Automation during this phase of the development. "We recommended Rexroth's compact, scalable IndraDrive Mi integrated motor/drive system, which is an innovative, cost-effective and simple solution that satisfies the design challenges for today's modular and high-performance packaging equipment," said Shawn Nelson, sales engineer at Motion Tech.

Designed with sustainability in mind, the servos were sized to work out of the box as the most cost-effective solution. A holistic approach was taken, with motor drive and gearing all playing a role to reduce the power requirements of the machine. On average, the Mach-2 is expected to generate energy savings of up to 25 percent compared with the first-generation machine. Nelson said that Rexroth's IndraDrive Mi system combines each servomotor and drive amplifier into one compact unit mounted directly on the machine, outside of the control cabinet. A single cable running from the cabinet is daisy-chained to each motor/drive unit and provides both power and communication.

As a result, Rexroth's design has the potential to reduce a machine's cabling needs by more than 80 percent. The IndraDrive Mi is also 50 percent smaller than a traditional servo system, which uses a separate servo drive and motor. This innovative architecture also eliminates the need for an air condition-

ing unit in the control cabinet and the need to maintain or replace expensive filters. Conventional servo drives are typically mounted in a large, external control cabinet and are connected to the individual servomotors by separate communication, power and feedback cabling that must be mounted and run through large wire ways that clutter the machine.

"Our machine has a cleaner appearance without all the wires running to and from the electrical cabinet," said Grinager. "Because of the small integrated motor/drive units and fewer cables, the machine features an attractive walk-in design that allows easy access for the operator to clean and maintain it."

"The integrated motor/drive units help reduce the size of the electrical cabinet," added Nelson. Because the drives are integrated directly with the motors outside of the control cabinet, design engineers reduced the size of the Mach-2 control cabinet by 25 percent. Up to 20 IndraDrive Mi units can be connected from one power supply without additional distribution

boxes. The IndraDrive Mi easily accommodates the multiple functions of the Mach-2 case packer without increasing the size of the electrical cabinet. In addition, integrating the drive control and motor into one component provides a more flexible "plug-and-play" capability. More motors can easily be installed for machine upgrades or other machine configurations, such as unique infeeds, said Nelson.

Grinager said there was one additional advantage to using Rexroth's motor/drive system: versatility. Although the compact IndraDrive Mi system allowed Brenton to design a machine with a significantly smaller footprint, reducing size by about 30 percent, the space in the machine's case compression area was too compact to accommodate even the smallest integrated motor/drive unit. The solution was Rexroth's IndraDrive Mi KMS, which is a distributed drive unit that can be mounted on the machine near a conventional servomotor and

seamlessly connected with the IndraDrive Mi KMS cables.

Brenton Engineering's innovative controls team also used the IndraDrive Mi distributed input/output system (I/O), said Nelson. Having four I/O outputs directly on the motor eliminated the need for extra wiring and other costs associated with purchasing separate I/O outputs from another vendor.

Motion synchronization and control are handled through SERCOS digital communication to each servo drive. The case packer utilizes synchronous, electronic camming technology provided by Rexroth's IndraMotion MLC L40 motion logic controller. The MLC L40 features Flex Profile functionality, seamlessly combining synchronous and time-based steps into a single data function which optimizes system performance and recovery and also reduces the changeover time. In addition, Rexroth's IndraControl VEP 40 HMI, which was mounted to the frame instead of the control panel, integrates easily with the rest of the machine components via OPC communications. The VEP 40 is an embedded terminal with a Windows CE operating system and a high-performance 12-inch TFT touch screen display. Motion Tech provided an application engineer who was on-site for two days to help support Brenton Engineering's controls team after the machine was built.

In addition, Motion Tech and Rexroth engineers conducted in-depth, onsite training sessions for Brenton engineers. "The Mach-2 has become a standard for Brenton Engineering," concluded Grinager. "Rexroth technology allowed us to simplify the design of the Mach-2 case packer and reduce extraneous parts and energy consumption in the machine. The ability to daisy-chain servomotors led to less wiring and contributed to a smaller electrical cabinet and ultimately an overall smaller machine footprint."

For more information, visit www.boschrexroth.com.