

Efficiency of Design

Energy efficiency is for more than just motors. Here are some mechatronics companies making sure you get more bang for your buck when it comes to your power bill.

Alex Cannella, Associate Editor

Energy efficiency is a buzzword that most commonly gets tossed around when talking about motors. Companies regularly (and rightly) tout how much their new IE5 motors are going to save you on your electricity bill while regulations have repeatedly raised the floor on the bare minimum efficiency required in commercial motors.

Energy efficiency isn't just for motors, though! The DOE has also been taking looks at full systems efficiency, such as with pumps, for example. And making sure every part in both your products and your manufacturing equipment is as energy efficient as possible goes a long way to making your own manufacturing efforts lean and efficient.

Have you considered, for example, the energy efficiency of your product's actuators? They're not exactly what you'd consider your primary source of energy consumption in most cases, but they're still a vital part of a lot of applications from the medical industry to fully automated manufacturing lines.

Today, we're going to be looking at the full automation side of that coin, or more specifically, at how SKF is expanding in the industry with its line of CASM (Component Actuator Servo Modular) electromechanical cylinders.

Cylinders are used regularly in automated assembly line machines, but they've predominantly been hydraulic- or pneumatic-based. SKF has expanded its line of electromechanical actuators, which have been designed to handle the constant wear of a 100% duty cycle, with the introduction of the CASM actuators to complement their existing assortment. The primary difference between the CASM actuators and SKF's other high performance actuators are the sizes,

which lend themselves to pneumatic replacements.

According to Cynthia Daneker, application engineering manager at SKF, many of the company's customers had started asking for actuators capable of handling full duty cycles, heavy loads or rapid movements. These applications were typically using pneumatics and hydraulics. By creating the CASM line, SKF was able to offer the market drop-in replacement products which met the basic envelope of the pneumatic actuators found in the market.

SKF's most recent electromechanical cylinder line, the CASM, was designed specifically to handle higher speeds and loads while running at up to a 100% duty cycle.

To compare CASM with other conventional cylinders is to compare the benefits of electromechanical cylinders themselves. Without the restriction on duty cycles holding them back anymore, electromechanical cylinders have a number of advantages over competing technologies, primary amongst them being energy efficiency.

According to SKF, an electromechanical cylinder will actually consume 90% less power than a pneumatic one. A majority of the savings are due to the nature of the cylinder—a pneumatic cylinder requires significantly more power to compress air than an electromechanical cylinder needs to just feed electricity through—but an electromechanical cylinder is also more efficient and loses fewer watts received from the motor.

Just replacing a cylinder won't automatically drop your energy bill by 90%. After all, you've still got all the other parts in the system drawing electricity as well. But it's still enough to



SEW Eurodrive's MOVIGEAR drive system has seen adoption outside its intended food and beverage market.

see a difference in your overall energy expenditure, and when coupled with other similarly energy efficient parts, the change spells savings in your daily operations.

The CASM line also gives manufacturers a wide amount of flexibility. SKF's actuators are designed to work with a manufacturer's existing setup, and can even be custom-made to accommodate specific customer requirements.

"[Customers] can use their own motors. They can use their own controls. The interface to the customer is highly customizable," Daneker said.

They're also programmable. According to Randy Hams, senior application engineer at SKF, several of SKF's actuator lines are fully programmable. Product lines such as the CASM cylinders can be programmed with almost any routine a manufacturer might require, no matter how complex. According to Hams, the sky is virtually the limit.

"If the time and money are available, there is practically no limits to what can be done with the current electronics available on the market for

closed-loop systems,” Hams said.

And thanks to their flexibility, SKF’s electromechanical cylinders can be reprogrammed more easily than other actuators. Often, reprogramming a pneumatic or hydraulic cylinder could potentially require a technician to physically adjust the cylinder during setup, as well, but an electromechanical cylinder has no such requirements, making reprogramming a simpler matter.

In their current form, CASM cylinders outstrip their pneumatic and hydraulic cousins, accomplishing the same tasks while using only a fraction of the energy. And with this product under their belt, SKF has been spending the past few years specifically taking aim at automated applications that were formerly not inside their reach. In particular, they’ve been making inroads with the automotive manufacturing industry, one of the strongest markets for automation.

SKF’s actuators aren’t the only product becoming more popular in the automotive industry. SEW Eurodrive’s MOVIGEAR mechatronic drive system has also been seeing adoption amongst automotive manufacturers.

Much like SKF’s actuators, MOVIGEAR’s main selling point is energy efficiency—and the savings that come with it. SEW’s studies have found that in some cases, MOVIGEAR uses up to 40-60% less energy than existing drive systems. According to Rainer Neufeld, corporate electronics manager at SEW Eurodrive, it’s the mechatronics ideology of studying electronics and mechanics side by side that has led to breakthroughs that have made the MOVIGEAR so efficient.

“Because of that mechatronics approach, a lot of our products reached the highest efficiency because the motor, gear, electronics, and communications are all designed to work together,” Neufeld said. “And that’s where you gain the highest amount of efficiency.”

SEW’s Electronics Product Manager, Brian Lambert, also cited the drives’ high breakaway torque as a primary reason behind their efficiency.

“You don’t have to oversize the motor because of the high breakaway torque,” Lambert said. “You can

right-size it and that’s where a lot of the energy savings come in at the end of the month when you’re looking at your electric bill.”

MOVIGEAR was originally designed with the food and beverage industry in mind, with an ergonomic design that washes easily and has no corners for food or bacteria to get caught in, but many of the MOVIGEAR’s selling points are appealing to more than just the food and beverage manufacturers.

“It was actually designed for the food and beverage market, but soon we found out that this was a very high-efficient product line, and very compact compared to other gearmotor lines we have,” Neufeld said.

MOVIGEAR drives have found applications in conveyor lines in the automotive, airport, and packaging industries, as well. In particular, SEW experienced a breakthrough with an



SKF’s CASM electromechanical cylinders are designed to operate in applications where a 100% duty cycle is required.

airport in California that was overhauling its entire conveyor system — 650 conveyors in all.

MOVIGEAR’s primary selling point was savings via energy efficiency, but according to Neufeld, the drives also offered up-front cost advantages. Because they drew less electricity, SEW’s drive systems could also run with smaller transformers, which the airport had been considering upsizing during the overhaul, saving the airport even more money compared to competitors.

The drives were also more efficient when it came to managing spare parts. The airport had originally been planning on maintaining an inventory of over 100 spare parts, but with SEW’s



system, they only had to keep 15 on hand for the entire system.

And the MOVIGEAR line will only become more maintenance-efficient as time goes on. Like many other IIoT-savvy companies, they're working on rolling out a preventative maintenance software upgrade. The upgrade would allow manufacturers to maintain a close eye on their drives, which will constantly track everything from how much current the motor draws to fault histories, and predict future maintenance needs before they happen based on that information. In addition, manufacturers can use the software to trigger warnings when a drive begins exceeding its limits, such as if a drive begins to run hotter than a certain predefined threshold, for example.

not, absolutely true, doubly so in a manufacturing line or conveyor system that is constantly running. When your automated line is running non-stop around the clock, the hours of use add up quickly, and across thousands of hours of runtime accumulated over multiple years, those incremental improvements in energy efficiency add up. It may take a few years to see, but a more efficient part will almost always be cheaper in the end.

The issue for companies like SKF and SEW is convincing potential customers. They can put together graphs and cite test results, but at the end of the day, the kind of savings they tout can sound unbelievable. Being able to energy costs by 90% sounds too good to be true, like a mysteriously conflated

it's been proven with drive systems, it's been proven with actuators. Your mileage will definitely vary depending on how often your machines are active and how stark the difference in efficiency is, but energy savings are something that can be calculated before you make a final decision to purchase. Hams noted that with actuators, in particular, also having a high-efficiency motor will also matter when calculating your savings.

"In electric actuation, it is the energy in that determines the energy out," Hams said. "This energy comes from a motor. In commercial actuators, the motors are primarily low cost brushed DC and single phase AC. In the CASM, we use servo, BLDC and three-phase AC that have the ability [to] accept high-end control systems with closed loop technology."

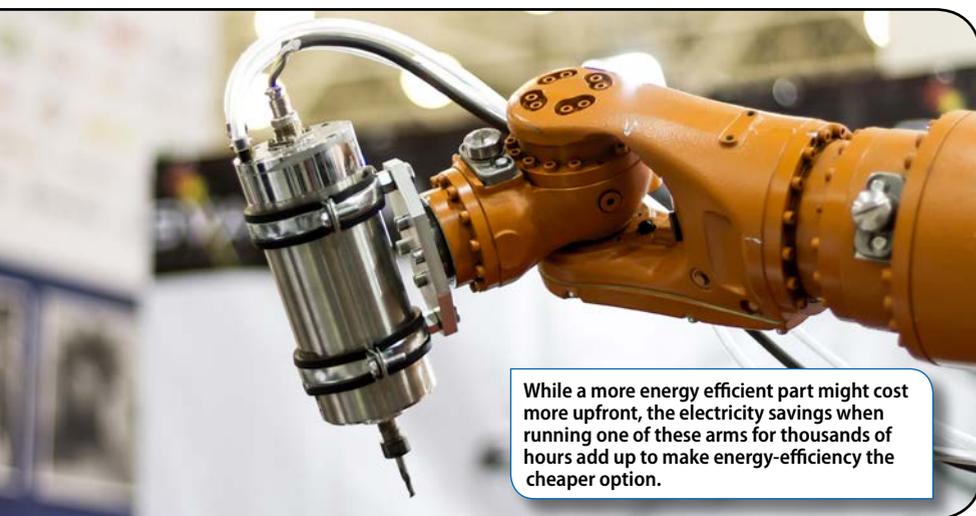
Daneker also noted that sometimes the pressure to switch to more eco-friendly products can come from then next rung on the manufacturing ladder. For every company that's balked at the additional cost of purchasing an electromechanical actuator from SKF, there's been a new lead that's been pressured by their own customer base to find more energy efficient or green options.

Customer pressure shouldn't be what ultimately convinces you, however. The savings with energy efficient products speak for themselves, no matter the field you operate in. It might not ultimately be an SKF actuator or SEW drive that you buy. But high-efficiency parts do make a difference to your bottom line, and when manufacturers are trying to find any way possible to make their manufacturing efforts leaner and more efficient than ever, that should be getting your attention. **PTE**

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While a more energy efficient part might cost more upfront, the electricity savings when running one of these arms for thousands of hours add up to make energy-efficiency the cheaper option.

Both companies have run into an unexpected issue, however: convincing customers that their product will save them money in the long run. According to Daneker, some customers tend to balk at the extra cost of SKF's electromechanical cylinder that they spend upfront compared to pneumatic or hydraulic competitors.

But the argument for SKF's cylinders goes the same as for any other product with a higher energy efficiency: Once you calculate how much you can save on your energy bill, the extra you'll spend up front is pocket change compared to the costs you would otherwise accumulate over the next five or ten years of using a less efficient competitor.

It's a claim that is, more often than

number that the marketing department marked up by taking advantage of very carefully curated facts.

In SEW's case, the airport that eventually installed MOVIGEAR drives outright didn't believe the energy savings SEW advertised, and it took a lot of sitting down and talking

"A lot of times, customers have a hard time believing the efficiency savings and they start second guessing," Lambert of SEW said. "But no, these are the numbers that we've got. Seeing is believing, though, and we've more than once sent a unit out to a customer to run on the line and see on a power meter for themselves."

But the fact of the matter is that energy efficient products do save money. It's been proven with motors,