

Green engineering

When it comes to saving energy and using resources more efficiently and sustainably, today's engineers and bean counters alike know that green is the new black. This special report on green engineering takes a look at some of the latest tools and tactics for greening up your next design.



Efficient motors comply with EISA

The Energy Independence and Security Act (EISA), signed into law December 2007, includes several items geared to promote sustainable energy supplies and energy efficiency. Part of EISA addresses raising the efficiency levels of industrial electric motors. As mandated by EISA, which

goes into effect December 2010, the efficiency of 1 to 200 hp electric motors will be raised to NEMA Premium levels. Super-E motors, available now, already meet or exceed EISA mandates. Custom Super-E designs are also available through 15,000 hp.

Baldor Electric Co.

www.baldor.com
(479) 646-4711

Bearing system suits wind turbines

A modular bearing system is available for planetary gears in wind turbine gearboxes that transform the relatively low rotational speed of the main shaft into higher speeds required for power generation. Ready-to-install matched bearing sets feature tight tolerances for the overall height of each bearing to ensure even distribution of radial loads. Each set includes components required to secure bearings axially in the planetary gears, such as retaining rings and loose rib rings.

NKE Austria GmbH

www.nke.at
(518) 371-5759



Energy efficiency: A vital strategy

Ernest Moniz, an energy expert at the Massachusetts Institute of Technology (MIT), Cambridge, Mass., is a scientist who sees the big picture. How will the world supply energy to billions more people, meet the growing electricity demand in China, India, and other developing countries, while not dramatically increasing carbon emissions? Moniz, a former undersecretary of energy during the Clinton administration, believes the world will need to intelligently combine all energy resources to meet the demand, including nuclear power, coal, natural gas, and renewables such as wind and solar energy. At the same time, the professor does not dismiss the possibility that technical whiz kids — perhaps among his own students — will discover a radically new solution.

In the meantime, top priority is efficiency. Moniz joined MIT's faculty in 1973, specializing in theoretical nuclear physics; having shifted his focus to energy policy and technology, he now serves as director of MIT's Laboratory for Energy and the Environment as well as director of its Energy Initiative. Efficiency satisfies the three requirements for all energy solutions, he says: meeting legitimate development needs, protecting national security interests, and preserving the environment.

In terms of industry response, Moniz believes businesses should

Gearmotors conserve energy

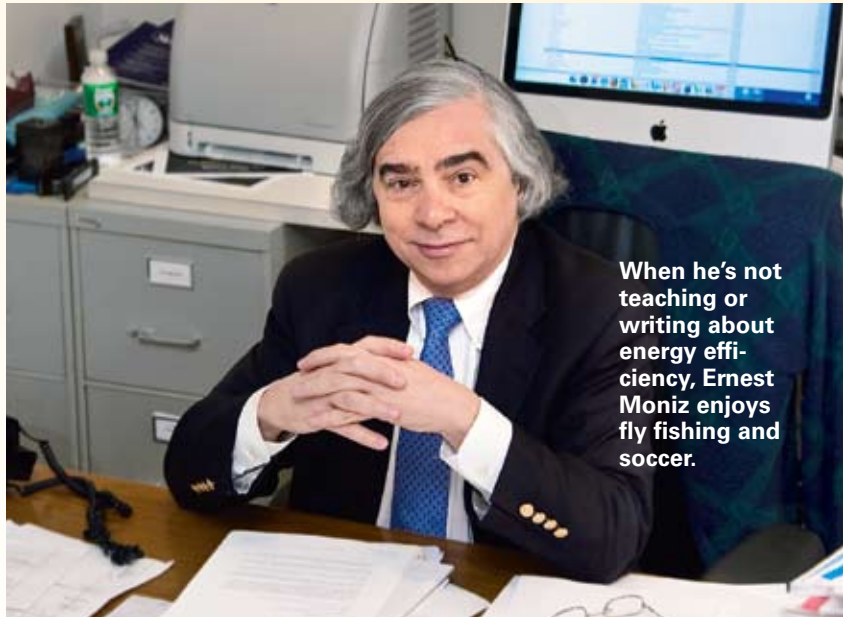
In response to requests for increased efficiency in equipment using fractional hp electric motors, a new gearmotor series is available in five standard models. 107 series Verdant Duty gearmotors are rated at 1/20 hp at 230 volt, 60 Hz, 3-phase and feature an operating range from 6 to 90 Hz to provide a 15:1 range of adjustable output speeds. Gearmotors feature totally enclosed, non-



Photo courtesy Cathy Ord of WeDo

start by making buildings and processes more efficient. In the U.S., for example, commercial and residential buildings account for 70% of the country's total electricity demand. Other commercial areas that could reap major energy savings include industrial processes, recycling, and remanufacturing.

Turning to the global energy future, Moniz speaks in terms of terawatts. A terawatt is a rate of energy use representing one trillion watts of electricity-generating power. Currently, the world consumes 14 terawatts, or 14 million megawatts. What happens when, as many predict, the world population reaches 9 billion, up from the current 6.7 billion? What happens when India and China raise their standards of living closer to European levels? Moniz seeks answers to these dilemmas: In 2003, he was an author of *The Future of Nuclear Power*, an MIT report on the feasibility of increasing nuclear power capacity in the U.S. But Moniz bristles at the suggestion he is pushing the nuclear option. Today, the world's nuclear power capacity is about a third of a terawatt, out of the total 14 terawatts. Even with a renaissance in nuclear power, Moniz says, by 2050 the maximum power production might only reach one terawatt. Coal may be a higher priority, says Moniz, as it is both cheap and abundant, with the U.S., China, and India all holding huge reserves. Last spring, MIT published a second report in its energy series, *The Future of Coal*, in which



When he's not teaching or writing about energy efficiency, Ernest Moniz enjoys fly fishing and soccer.

Moniz and his coauthors promote the use of carbon capture and sequestration to prevent coal from accelerating global warming. Next in its energy series, MIT plans to publish a report on solar power, which has tremendous long-term potential, although technological breakthroughs are needed to capture energy in a more cost-effective way.

Efficiency greens bottom line

Conserving energy is a great idea, but companies want to see results in the bottom line: How much money can they save by improving efficiency? SKF USA Inc., Norristown, Pa.,

has collaborated with MIT to develop models that quantify energy savings in systems such as paper mills and wind farms. To calculate potential energy savings, SKF offers an assessment called *Client Needs Analysis – Energy and Sustainability* that estimates energy savings for an entire manufacturing process or a specific application. Recommendations might include installing low-friction bearings and preventing shaft misalignment. At one manufacturing site, SKF identified a dozen high-payback areas of improvement, with potential annual energy savings totaling \$100,000.



ventilated ac motors. Employing integral gear reducers with gear ratios from 6.7:1 to 95.5:1, they offer output speeds from 368 to 1.7 rpm with output torques to 100 in.-lb.

Bison Gear & Engineering Corp.
www.bisongear.com
(800) 282-4766

Turn your gearbox into a greenbox

Several factors influence how and why efficiency is lost during operation of a gearbox system. A new whitepaper, *How Green is Your Gearbox?* from Sumitomo Drive Technologies, Chesapeake, Va., explains some of these factors. It also offers recommendations and ideas for obtaining a highly efficient gearbox that meets application constraints. Visit www.motionsystemdesign.com and go to the *Whitepapers* area, listed under *Interactive Products*.



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Riding the energy wave

A new project hopes to harness the energy of the rolling tides. Electro Standards Laboratories (ESL), Cranston, R.I., in collaboration with the University of Rhode Island (URI), has been awarded a \$200,000 grant from the Rhode Island Science and Technology Council (STAC) to further develop renewable energy/direct-drive wave energy conversion devices to power autonomous coastal buoys.

The work continues the development of commercial devices that can power such systems by converting mechanical wave energy to electrical energy using electrical generators housed in spar-based buoys. The project will focus on developing a renewable energy source for a free-floating buoy that can be used to power coastal surveillance systems, emergency beacons, or other devices that can be connected to the buoy structure. The idea is to integrate electrical generators with a customized spar buoy design and with that of a unique generator control



and energy storage system. This goal is to have few moving parts, function in a wide range of ocean sea state conditions, and be inexpensive to manufacture.

The technology could be useful for emergency beacons for commercial and recreational watercraft, and for offshore rig-monitoring buoys in the oil industry. Long-term development would scale up the technology to provide an inexhaustible source of renewable electrical energy for powering larger systems. For more information, visit www.electrostandards.com.

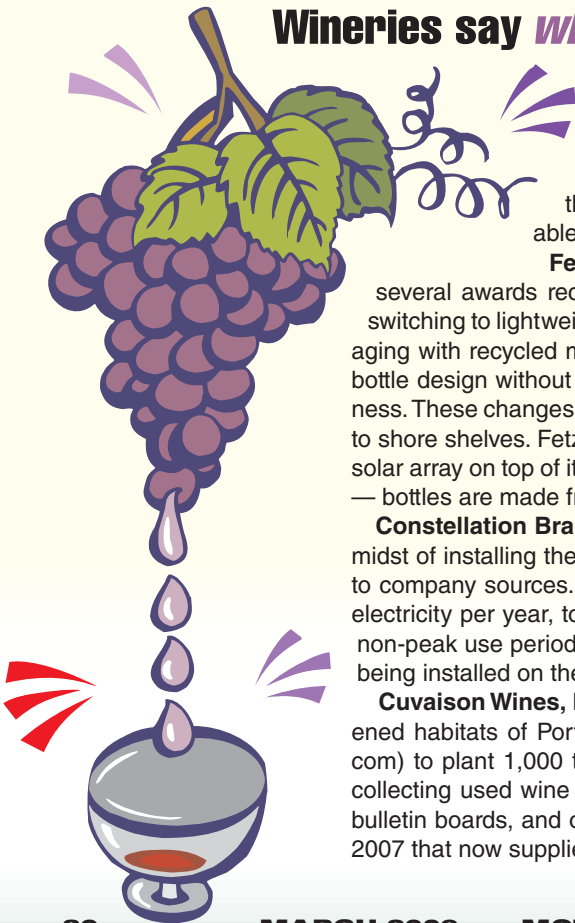
Wineries say *why not* to green ideas

Based on recent news stories, it appears that some industries are embracing green technologies faster than others. Food and beverage packaging operations seem to be among the early adopters, notably some of the country's top wine producers. Cheers to energy efficiency and sustainable packaging.

Fetzer Vineyards, Hopland, Calif., one of the largest U.S. wineries, has won several awards recently for its commitment to sustainability. Earth-friendly initiatives include switching to lightweight glass, using 100% renewable energy for all winery operations, and packaging with recycled materials. The new bottles reduce glass usage by 16%, the result of a new bottle design without the "punt" (or traditional indent on the underside) and reduced glass thickness. These changes also reduce the energy needed to produce the glass and to transport bottles to shore shelves. Fetzer uses solar, wind, and geothermal energy, and has the industry's largest solar array on top of its bottling facility. The company also uses recycled materials in all packaging — bottles are made from 35% recycled glass and box partitions use 100% recycled materials.

Constellation Brands Inc., Fairport, N.Y., a producer of wines and other beverages, is in the midst of installing the "world's largest winery solar energy system" in Gonzales, Calif., according to company sources. Once in place, the system will produce more than 1.7 million kW hours of electricity per year, to be used at the winery and exported to local residents during the winery's non-peak use periods. Through partnerships with local energy suppliers, 6,358 solar panels are being installed on the main building's roof.

Cuvaision Wines, Napa Valley, Calif., has joined an effort to save the cork oak forests in threatened habitats of Portugal. The winery is working with ReCORK America (www.recorkamerica.com) to plant 1,000 trees by the end of April. During the same time period, the project is also collecting used wine corks to be recycled into floor tile, building insulation, fishing rod handles, bulletin boards, and other products. In addition, Cuvaision began using a solar energy system in 2007 that now supplies 95% of its electricity.



Drum motors handle heavy loads

Offering a high-performance belt conveyor drive solution, a new 8.5-in. diameter drum motor is designed to manage demanding medium and heavy



load applications. The 220 Series motor, which is IP66/67 food grade approved, features an internal gearing system with 97% efficiency and uses less power

than many conventional drives. When fully loaded, the motor uses 32% less power than equivalent gearmotor drives, reducing energy costs and carbon footprints. It is a self-contained unit with motor, gearbox, and bearings all enclosed in a steel shell.

Interroll

www.interroll.us

(800) 830-9680

Coreless design enhances efficiency

Athlonix high-power density, brush dc motors deliver solid speed-to-torque performance in a compact lighter weight package (15 to 53 grams depending on frame size) with output power up to 9 W. Motors feature an energy efficient coreless design with an optimized self-supporting coil and magnetic circuit to deliver maximized power density and sustained endurance over the motor's life. Uses include automation applications such as electronics assembly requiring constant pick-and-place operations. Motors are available in 12, 16, and 22 mm frame sizes.

Portescap
Danaher Motion
www.portescap.com
(610) 235-5499

