

MAINTENANCE TECHNOLOGY

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When you can't vary the speed of the driven load...

Reducing Energy Usage On Lightly Loaded Motors

It used to be that you managed your company's facilities and all of the machines and technology in it. Today, if you're like so many other facilities and maintenance managers, you've been assigned another area of responsibility: managing your company's energy consumption.

Soaring energy prices have business and industry scrambling for solutions—with motor solutions at the top of the list. That's because electric motors play such a significant role in our energy problems. The true workhorses of our industrial and

commercial facilities, they consume roughly a quarter of all electricity produced in the U.S. and more than 60% of all electricity used in industrial facilities.



Don't give up. You have options. Other control technologies can take up the flag when a VFD won't work for your application

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Unfortunately, electric motors often operate very inefficiently, consuming more electricity than required to maintain full speed (RPM). Overpowered motors waste substantial energy when they are lightly loaded or idling. Whether they are driving unloaded conveyor belts, plastic granulators with empty hoppers or jaw crushers with no boulders to break, these motors are doing nothing but sitting there generating heat and squandering electricity. (And we all know how heat can kill a motor—and how difficult those wee-hour-of-the-morning emergency calls to replace failed motors can be.)

Until recently, when looking for ways to reduce energy usage on motors, users typically have relied on solutions such as:

- The ON/OFF Switch—Of course, the best energy-saving device around is still the On/Off switch. But, shutting off an idling motor isn't always an option.
- Right-Sizing Motors—A recent U.S. Department of Energy (DOE) study determined that 44% of industrial motors operate consistently at <40% of full load, the point at which efficiency drops off precipitously. While the DOE recommends that these motors be replaced with smaller motors, this is not an option if the motor is sized to accommodate a much larger peak load, however infrequently it may be required.
- Variable Frequency Drives (VFDs)—A VFD can positively impact energy consumption—in applications for which they are a fit. VFDs, however, won't help when you can't vary the speed of the driven load.
- Premium Efficiency Motors—While they are effective in applications when the motor is sized appropriately for the load, high-efficiency motors, just like standard- efficiency motors, are highly inefficient when they are lightly loaded.

As you audit your facility with an eye toward energy-efficiency options for your electric motors, remember that VFDs are good for numerous situations—but not every situation.

Another alternative

One technology that is demonstrating its ability to conserve energy on constant-speed, variable-load applications is the Power Genius™. It incorporates state-of-the-art electronic circuits that constantly monitor the workload of the motor as represented by the amount of lag between the current and voltage. These circuits sense the power factor and reduce voltage in order to supply the precise amount of energy required to maintain a motor at full speed. Although the core technology has existed since a NASA engineer named Frank Nola invented it in the late 1970s, Power Efficiency Corporation has made proprietary and patented improvements to its fast-response and phasebalancing circuitry that make it more effective.

The Nola technology works by measuring the phase lag between the voltage and the current waveforms at the terminals of an AC induction motor and reducing the voltage accordingly. The lower voltage reduces the magnetizing current and the flux, effectively matching the motor load capacity to the driven load. Note that by lowering the current, the I²R losses to heat also are reduced. Because of this, the motor runs cooler.

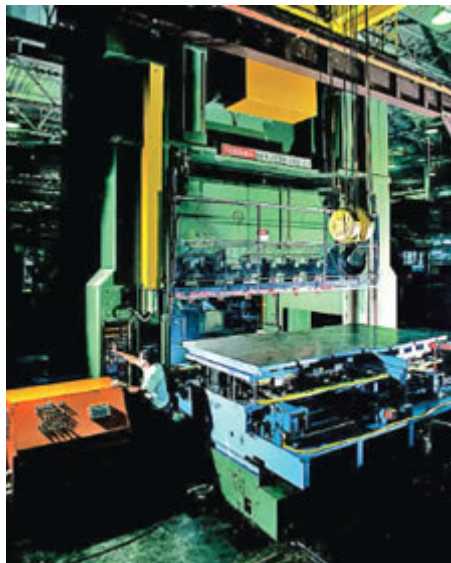
Despite a somewhat uncertain reputation in industry, Nola technology really does work quite well in the proper application. The problem arises in the implementation. In fact, in the wrong application, Nola technology actually can increase power usage.

The right application

The Power Genius line of energy-saving motor controllers is targeted at motors that spend a significant percentage of time at 20% load or less (indicated by a low power factor). Applications run the gamut from escalators and elevators to big jaw crushers, stamping presses, plastic granulators, lathes, mills and enormous aggregate conveyor belts in rock-crushing plants. The bigger the motor—and the more time that motor spends idling or lightly loaded—the bigger the payoff and the faster the payback. Energy savings of 20-40% are not unusual in vertical transportation equipment. Even a 15% savings on a 300 hp jaw crusher that averages 50 kilowatts will save 7.5 kW. Based on a 16-hour/6-day-a-week run time, that's more than 37,000 kWh a year.

A recent test of the Power Genius by Nevada Power Company (the electric utility in southern Nevada) on a 40 hp escalator motor at a major Las Vegas Strip casino showed a reduction in average power consumption of 32% (from 6.4 kW to 4.3 kW—a savings of 2.1 kW). The utility report stated, "Results show a significant reduction in average motor demand for the periods with the (technology) "On".

In another test, conducted at Check-mate Industries on a 60-ton stamping press (similar to the machinery shown here), the Power Genius reduced energy consumption during a normal work cycle by 23%. With these kinds of savings, a two- or three-year payback on investment easily can be achieved. When rebates from utility companies and higher electricity rates in regions like California and much of the Northeast are factored in, the paybacks grow shorter, with one-



to two-year ROIs quite common.

As you audit your facility with an eye toward energy-efficiency options for your electric motors, remember that choices well-suited for constant speed/variable load applications do exist. VFDs are good for numerous situations—but not every situation. Under many circumstances, other technologies can be a better fit.

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