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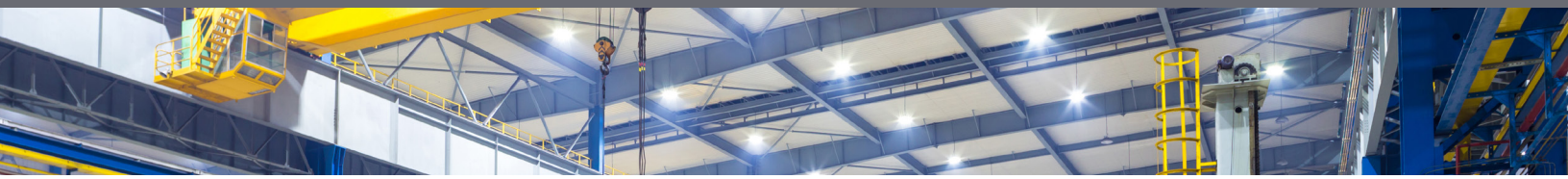
SCE Energy Conservation Series

Start Your Energy-Efficient Engines



Making motors and compressors more efficient could save your manufacturing business 15% or more on energy costs.[1]

Manufacturing is an integral part of California's economy and consumes about 22% of the state's total annual electricity demand. What's more, motor-driven equipment—such as pumps, air compressors and fans—consumes about 16% of all the energy used in U.S. industrial applications.[2]

You Have the Power to Save Energy

Uncontrolled utility costs can reduce your profits, erode your capital and maintenance budgets, increase product costs and reduce competitiveness too. Fortunately, improving the efficiency of your motors and compressors can have a significant positive impact on controlling these expenditures.

We have compiled this handy guide to help you in your quest.

What Makes for an Energy-Efficient Motor?

There is a surprisingly big difference between the performance of standard and energy-efficient motors. To be considered energy efficient, a motor's performance must equal or exceed the nominal full-load efficiency values provided by the National Electrical Manufacturers Association (NEMA).

Improved design, materials and manufacturing techniques enable energy-efficient motors to accomplish more work per unit of electricity. For these same reasons they may also offer other benefits that increase reliability such as:

- Longer insulation and bearing lives
- Lower waste-heat output
- Less vibration

Many energy-efficient motors come with longer warranties as well, making them even more attractive.

Productive Thinking

Assuming energy represents 3% of production costs and profits 20% of production costs, then **reducing net energy** costs by one third can result in a **5% gain** in profits.[3]

Energy-Efficient Motors Drive a Multitude Of Benefits

- ✔ Smarter energy usage
- ✔ Longer insulation and bearing lives
- ✔ Lower waste-heat output
- ✔ Reduced vibration
- ✔ Greater reliability
- ✔ Enhanced production/performance

[1] *Best Practices: Motor-Driven Systems.* Energy.gov
[2] Ibid.
[3] M.F. Hopkins, et. al., "*Industrial Demand Side Management: A Status Report,*" Battelle Pacific Northwest Laboratory, PNL-10567, May 1995.

Did You Know?

Manufacturers like you can often **reduce electricity use and costs by 5 to 15%** or more by improving the efficiency of your motor-driven systems.[4]

Generate a Compelling Return On Investment

Like any advanced component, energy-efficient motors tend to cost more. But that extra cost is often quickly repaid in energy savings, producing a favorable return on investment (ROI). In a typical manufacturing environment such motors become cost-effective when they operate more than 4,000 hours a year, given a two-year simple payback scenario.[5]

For example, with an energy cost of $0.04 per kilowatt-hour (kWh), a single point of efficiency gain for a continuously operating 50-HP motor with a 75% load factor saves 4,079 kWh, or $163 annually.[6] Though they are even more expensive, motors offering four points of efficiency gain can still pay for themselves within that two-year timeframe.[7]

Taking advantage of utility incentives for using energy-efficient motors can further improve your ROI.

Steps to a More Energy-Efficient Manufacturing Environment

As the maxim goes, what gets measured tends to get improved. Without basic information on how much energy each motor or compressor is using—and how much you're spending on energy each month, it is very challenging to know where to focus your efforts.

Start by conducting an in-house energy survey, focusing on machinery with the following criteria:

- Running time exceeds 2,000 hours/year
- Motors from 10 to 600 HP[8]
- Three-phase NEMA Design B Motors
- Non-specialty motors
- Older or rewound standard-efficiency motors
- Motors that operate at or near the full-load point most of the time

Review your energy bills

Check for patterns in the use and cost of energy. Be especially mindful of time-of-use (TOU) summer on-peak periods (noon to 6 p.m., June 1 – September 30th) when cost-per-kilowatt-hour is at its highest.

Analyze the results

Compile an "energy balance" that compares the total energy output for your motors and compressors against the energy supplied to them. This will show how effectively these machines are utilizing energy, and give you an idea of where you might see your biggest gains in energy efficiency.

Take specific steps toward improving your motor and A/C compressor energy efficiency.

Learn more about this discussion at Tips For Improving Motor and Compressor Energy Efficiency.

Apply for SCE equipment upgrade incentives

We offer a number of incentives relating to motor controls and compressors. The preferred way to apply for them is through our Online Application Tool at sceonlineapp.com or you can also talk to your Account Manager.

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[4] *Best Practices: Motor-Driven Systems.* Energy.gov
[5] *Motors: Defining and Improving Efficiency*, facilitiesnet.com, September 2008.
[6] Ibid.
[7] Ibid.
[8] Typically, motors above 20 HP represent 20% of the overall; consume 60% of motor driven equipment energy. McCoy, Gilbert A., et al. *Energy Management for Motor-Driven Systems. Office of Industrial Technologies*, U.S. Department of Energy, March 2000.

Tips For Improving Motor and Compressor Energy Efficiency

Like many other established processes you may have, there's a method to saving money by improving the energy efficiency of your motors and compressors.

For general motor-driven systems:

- Compare rate schedules and use the one best suited to your operation
- Train employees to be aware of TOU summer on-peak periods (noon to 6 p.m., June 1 – September 30th) when cost-per-kilowatt-hour is greatest
- Run motors and other electric loads off-peak whenever possible
- Avoid scheduling periodic equipment testing during peak hours
- Maintain correct voltage and phase balance
- Identify and eliminate current leaks
- Prevent harmonics in the electrical supply
- Follow the manufacturer's instructions for periodic maintenance
- Use sequenced start-ups
- Install capacitors to reduce power factor charges
- Match motors to drives and to required system loads
- Choose energy-efficient or premium-efficiency replacement motors
- Replace V-belts with cogged or synchronous belt drives
- Use standby generators to reduce peak demand

Electrifying Fact:

Industrial motor systems use nearly 70% of the electricity consumed in the U.S. manufacturing sector today .[9]

For A/C compressor motors:

- Fix leaks and prevent new ones; they represent the biggest source of energy loss in an air compressor system
- Change the filters. Dust, dirt, moisture and grease can clog the filters, leading to a pressure drop in the system, which uses more energy.
- Correct narrow air delivery lines or looping and sharp bends in the lines. These can create pressure drops, which increases demand on the system.
- Use cooler intake air to reduce the energy required for compression. Move the compressor intake outside the building and into a shaded area.
- Use variable-speed drives (VSDs). Read on for more information on VSDs.
- Consider using multiple smaller compressors. This gives you the flexibility to bring online only as much compressor power as needed and shut down unnecessary machines.
- Set your machines to switch off at night and on weekends
- Run machines at required pressures, not beyond
- Make sure condensate drains are not stuck open
- Recover heat. Compressing air generates heat – reuse it!
- Follow the manufacturer's instructions for periodic maintenance

Variable-Speed Drives Make a Big Difference

Installing variable-speed AC drives (VSDs) on your motors can be one of the most effective ways to manage energy usage and can save businesses like yours 30% or more of the energy in many centrifugal compressor applications.[10]

[9] U.S. Dept of Energy
[10] Atlas-Copco

VSDs work by regulating the AC current and voltage that supply the motor. Thus, the speed of the motor shaft can be controlled with great accuracy, ensuring that it provides optimal performance for the work at hand—using no more and no less energy than it absolutely needs.

Along with reduced power costs, VSDs can also protect against power surges (from starting AC motors) and deliver a more constant compressor pressure as well. Not only that, they are quite effective at helping you manage energy usage during TOU peak periods or down times.

We're Here to Help With Incentives and On-Bill Financing

Another smart solution on the road to greater energy efficiency—and managing energy costs—is our Energy Management Solutions Program, designed with your bottom line in mind.

Through this program, customers like you can receive financial incentives for replacing old equipment or upgrading to new, high-efficiency equipment. This could lead to permanent load reduction energy savings, which could translate into lower electricity bills.

Contact your Account Manager to learn more about our Energy Management Solutions Program. Or visit sce.com.

By Conserving Energy, We All Win

Motor-driven systems consume a significant portion of your energy bill. Optimizing these systems could increase your productivity rate and reduce the amount of energy your business uses significantly. Suggestions found in this guide also go far toward protecting or reducing strain on the electrical grid, which benefits our entire community and helps us better provide for the future.

Additional Resources

Energy.gov

***Publication MG 1-2014.* National Electrical Manufacturers Association (NEMA), December 15, 2014.**
nema.org/Standards/Pages/Motors-and-Generators.aspx

Energy Management for Motor-Driven Systems. Office of Industrial Technologies. U.S. Department of Energy
eere.energy.gov/manufacturing/tech_assistance/pdfs/NN0116.pdf

***Determining Electric Motor Load and Efficiency.* U.S. Department of Energy**
eere.energy.gov/manufacturing/tech_assistance/pdfs/10097517.pdf

Interested in learning more?

Choose from the many topics in our Energy Conservation Series:

- LED Lights: A Bright New Way to Conserve Energy
- Plug In To Greater Energy Savings— With Smart Plug Load Management
- Switch To a More Energy-Efficient Business—With Smart Lighting Controls
- On The Menu: Major Energy Savings With Restaurant Refrigeration
- Cold Hard Facts About Refrigeration and Energy Conservation for Grocery and Convenience Stores
- Energy Efficiency Is In the Air: Optimizing Your HVAC
- Agricultural Pumping: Pumped and Primed to Save Energy

Did You Know?

If your compressor is running at less than 65% of capacity, a smaller one could pay for itself in 18 to 24 months on average.

If your compressor is more than 10 years old, a new one could also yield an 18-24-month payback.[11]

[11] Last, Tim. Vice President of Quality Air Systems, Atlas Copco Compressors LLC. Industrial Equipment News, ien.com/article/10-steps-to/149114