

The ENS FanSaver is designed to reduce the energy used by evaporator fans in walk-in coolers by reducing the speed of the fans whenever there is no demand for cooling.

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ENS FanSaver®

A device that controls the evaporator fans in walk-in coolers

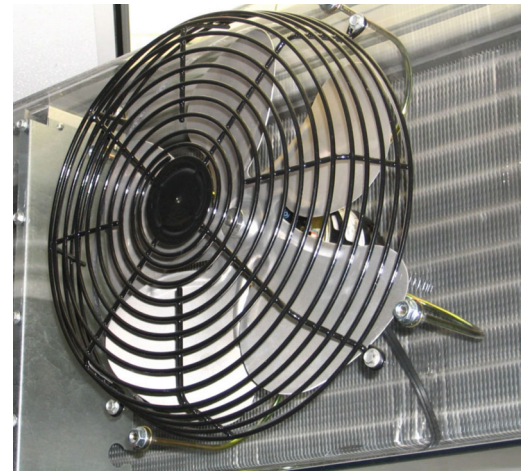
Product

FANSAVER 4000, FANSAVER 5000

Manufacturer

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Product Website URL

www.energysync.com/fansaver.html

Distributors

ENS FanSaver is distributed exclusively through the manufacturer (see contact information above).

When Did Product Debut in the Northwest?

February 1998 (as the ART Controller)

Product Function and Application

Evaporators are used to remove heat from walk-in coolers. Fans mounted on the evaporators are used to move air across the cooling coils. Typically, these fans run continuously. With the ENS FanSaver installed, when cooling is not required, the fans continue to run to prevent temperature stratification in the cooler, but at a reduced speed. Fans typically used on evaporators are extremely inefficient. These fans usually are single-phase, shaded-pole or permanent-split-capacitor motors rated at 1/10 to 1/20 horsepower and have efficiencies ranging from 10% to 40%.

The ENS FanSaver saves energy in two ways. First, when cooling is not required, it reduces the speed of the fan by regulating the voltage. Typical evaporator fan speed is around 1600 rpm; the ENS FanSaver reduces this to about 400 rpm. Any reduction in fan speed is a significant reduction in energy usage since horsepower decreases by the cube of the speed (a fan running at half speed only needs an eighth of the horsepower used at full speed). Thus, an evaporator fan running at a quarter of full speed would

theoretically draw only 1.56% of full-load power. However, parasitic losses (friction, controls, and component heating) realistically make the usage in the range of 15-25% of full-load power. Second, since the fan is using less power at this reduced speed, it generates less heat. With less heat needing to be removed from the walk-in cooler, the compressor runs less often to cool the space.

The application of the ENS FanSaver needs to be considered carefully. It is not designed to be used on all walk-in coolers. The ENS FanSaver is designed to function on both low-temperature and medium-temperature walk-in coolers that use single-phase evaporator fan motors and that have a dedicated compressor. Small grocery and convenience stores are the best candidates for application of the ENS FanSaver. Larger grocery stores tend to use rack compressors where the ENS FanSaver will not work properly.

Look for four things to determine the right application for the controller:

1. The compressor must be off a significant percentage of the time. The less the compressor runs, the more the ENS FanSaver will save. Thus, it will save more if the compressor is over-sized.
2. The walk-in coolers should typically be 800 cubic feet or larger; smaller units do not usually save enough energy to make installation worth the effort unless the electric rates are high.
3. The walk-in cooler needs to be temperature-controlled, not EPR controlled (exhaust pressure regulation, in which the refrigerant is throttled). The ENS FanSaver needs the refrigerant flow to be either "on" or "off." In the case of throttled flow, the fans operate (at full speed) all the time, eliminating any savings. Also, the walk-in cooler must use a single thermostat and not a master refrigeration controller; a thermostat mounted inside often indicates a good candidate.
4. The motors used on the evaporator fan need to be single-phase and not have a centrifugal start (usually shaded-pole or permanent-split-capacitor motors).

Energy Saving Claims

Energy savings is dependent on several factors: evaporator fan power, compressor duty cycle, and electric rate. Estimates given by the manufacturer suggest savings of 25-50% of evaporator fan and compressor energy. Field tests of the product show a greater range of 10% to nearly 60%. More than likely, the savings is 10-60% percent of fan energy with some portion of that savings being attributed to reduced run-time of the compressor. Claims of high compressor savings are questionable and should be considered carefully.

The amount of savings achievable with this device will vary

greatly from system to system. The main factor that will determine how cost-effective the ENS FanSaver is will be the run-time of the compressor. The less the compressor runs, the more it will save. A savings calculator is available on the manufacturer's website that gives a conservative estimate of savings: www.energysync.com/argtcalc1.asp. With proper application of the equipment, the ENS FanSaver can give better results than shown by the calculator.

Savings Example. According to the on-line calculator, for a system with 6 evaporator fans at 1.6 amps and 110 volts and an installed cost of \$600, the approximate savings at \$0.05 per kWh would be:

Compressor % Run time	Annual kWh Savings	Dollar Savings	Payback per Year
20%	6,189	\$309.47	1.9
40%	4,642	\$251.45	2.4
60%	3,095	\$154.75	3.9
80%	1,547	\$77.37	7.8

Non-Energy Benefits

There are several non-energy benefits with the ENS FanSaver. The reduction in heat from the motors should reduce compressor usage, providing a small reduction in compressor maintenance. There is also some indication from field-testing that the decrease in fan speed reduces evaporation (i.e. drying out) from produce, reducing product loss from shrinkage. In addition, through internal datalogging, the FANSAVER 5000 (not the 4000) will keep track of the energy saved from reduced fan use. It also tracks "on" and "off" time and elapsed time of fan use. This information, which can be downloaded with software, can aid in troubleshooting, maintenance, and energy management.

Independent Testing Results

At least two field-tests of ENS FanSavers have been performed. The U.S. Department of Energy's Inventions and Innovation Program assisted Advanced Refrigeration Technologies in the commercialization of the product and conducted field tests at the Walnut Creek School District and at a McDonald's restaurant in California. Avista Utilities conducted a field test at a Safeway grocery store in Spokane, Washington. In the Walnut Creek test, the energy consumption was reduced by about 60%. The McDonald's test showed a reduction of 43.5%. At the Safeway grocery store, the ENS FanSaver reduced evaporator fan energy 65%; the compressor energy was not tested.

In an E-Source report showing results from a Pacific Gas and Electric study, a fan energy savings of 47% resulted from installation of the ENS FanSaver. This savings in turn reduced the cooling load, achieving a compressor savings of 15% of compressor load. Adding both of these savings components amounts to a total of 66% of fan

energy savings. If *system* energy savings (compressor and fan energy) is used, then the savings is 29.4% of the total. To put these numbers in perspective, total fan and compressor usage before the ENS FanSaver was installed was 40.4 kWh/day (14,746 kWh/yr, or \$737). After installing the ENS FanSaver, fan savings was 8.5 kWh/day (3,102 kWh/yr) and compressor savings was 3.4 kWh/day (1,241 kWh/yr), for a total annual savings of \$217 per year at \$0.05 per kWh.

Cost

Model 5000, MSRP (with datahead, cables, and software)	\$500
Model 4000, MSRP (no accessories included)	\$425
Typical Installation* (by customer or contractor 1-1 ¹ / ₂ hours)	\$60-120
Total	\$485-620
<i>*Costs provided by refrigeration contractor</i>	

Alternative Products and Strategies

A few other companies offer alternative products to accomplish the same task as the ENS FanSaver, but by other methods or with different features. In one case the evaporator fan is shut off completely, but a separate circulation fan is used to prevent stratification. Another product has the advantage of being able to control throttled systems, but it costs more. A third product is very similar to the ENS FanSaver. It is a bit more expensive, but it works on three-phase fans as well. The main differences among these products are the options of how many components can be controlled, and the price. The ENS FanSaver has good features, lowest price, and simple installation. This is accomplished by targeting a very specific market.

When considering energy efficiency in walk-in coolers, the ENS FanSaver is just one option. Other strategies could include a reduction in suction pressure, a compressor VFD, additional insulation, and integration into a complete rack refrigeration system that meets the needs of the whole facility. Contact the EnergyIdeas Clearinghouse with any of your energy conservation questions (see “Additional Information” below).

Case Studies

The following case studies and informational reports are all from independent sources. Note that the product was first owned and produced by Nevada Energy Control Systems, Inc. Advanced Refrigeration Technologies, Inc. then fully acquired Nevada Energy Control Systems, Inc., and used the product name ART Controller. The current manufacturer, GlobalNet Energy Investors, Inc., in 2004 purchased the patents and all rights to the product, now using the name “ENS FanSaver.” Because of this,

the names used for the product in the following reports will vary.

1. ENS FanSaver for Medium-Temperature Walk-In Refrigerators

Inventions and Innovation Program Success Story # I-OT-670, October 2001, U.S. Department of Energy. This fact sheet claims the ENS FanSaver has achieved savings of over 6 billion BTU cumulatively through 2000, saving over \$80,000. It also claims the ENS FanSaver can reduce evaporator fan and compressor energy consumption by 30% to 50% in the right application.

www.eere.energy.gov/inventions/pdfs/ensfansaver.pdf

2. Refrigeration Monitoring Test Results – Walnut Creek School District

Prepared by Nevada Energy Control Systems Inc. (now EnergyNSync) for the U.S. Department of Energy, ERIP DE-FG01-96EE15670, April 1997.

www.energynsync.com/fansaver-results.html

3. Energy Savings in Refrigerated Walk-in Boxes

Produced for the U.S. Department of Energy by the Lawrence Berkeley National Laboratory, DOE/EE-0170, June 1998. This study showed energy savings of 13% to 59% at five different facilities in California.

www.eere.energy.gov/femp/pdfs/EnrgySvngsTechInstal.pdf

4. Easy Savings for Walk-in Coolers: The ART Evaporator Fan Controller

E Source Report EE-99-8, May 1999. This report is only available to E Source members. It covers the technology in detail and provides a calculator for determining potential savings. The same equations used in this calculator are available on the ENS FanSaver website at:

www.energynsync.com/argtcalc1.asp

Suggestions for Further Research and Testing

Further testing on this product should be done with regards to destratification of temperatures in walk-in coolers and increased humidity. It is logical to assume that increased humidity will help reduce fresh market product losses in walk-in coolers. If testing can be done to prove this, it could show that this product may save more by a reduction in product loss than it does in energy savings.

Additional Reviewer Comments

The three major components of a refrigeration system that consume energy are the compressor, the condenser fan, and the evaporator fan(s). By far the biggest energy user in the system is typically the compressor, with the evaporator fan typically using somewhere between 15% and 30% of the total refrigeration energy. This device only controls the evaporator fans, which are

typically only 1/20 to 1/10 hp. If they save 50% of evaporator fan energy, this is only about 7-15% of total refrigeration energy (typically an annual savings of about \$30-\$75). This will also lower the load on the compressor by that amount, increasing the savings.

A situation where you could achieve anything like a 50% or 60% savings of total refrigeration energy using the ENS FanSaver would indeed be unusual. In tests conducted by Advanced Refrigeration Technologies personnel (originators of the device), E Source found that they had not accounted for power factor, which is around 0.60 for these evaporator fan motors. This was the case in the DOE report for Walnut Creek and was further skewed by an extremely low compressor run time of 16%. In most cases where it is suggested that the ENS FanSaver achieves large percentage savings, it is probably referring to a percentage of evaporator fan energy savings, or the application is unusual in that the compressor only runs a small percentage of the time because it is greatly oversized for the application. The actual dollar value of the savings is generally small compared to the overall refrigeration energy.

The more time that the compressor is off, the more the ENS FanSaver will save energy. For example, if the compressor is oversized for the load (as is typical in new installations), then the compressor is off more of the time and the fans can run at a reduced speed more of the time. This is one product that actually saves more energy when measures such as additional insulation are implemented to improve energy efficiency of the system. In contrast, if the walk-in compressor is designed to closely match the load so that it runs often and long, or is undersized for the load where it runs all the time, or if the walk-in is in poor repair and insulation losses cause the compressor to be overworked, then the ENS FanSaver will not save much energy. In these cases, there is not enough opportunity to reduce fan speed. Given these precautions, there are still many applications where it is very appropriate and beneficial.

Note that the manufacturer has modified the installation to allow the ENS FanSaver to be used on walk-in freezers as well as coolers. However, most reports and website information still indicate that the device is not designed for walk-in freezers.

Conclusion

The ENS FanSaver saves energy without compromising product quality. It may even enhance product quality. The cost is reasonable, it is easy to install, and it is simple to operate. The product is well suited for a prescriptive utility program that clearly defines appropriate applications. For suggested guidelines, contact the manufacturer.

Additional information

Northwest businesses and electric utilities can contact the EnergyIdeas Clearinghouse for additional information on this or other energy technologies or products. Contact:

Phone: 1-800-872-3568
 Email: info@EnergyIdeas.org
 Website: www.EnergyIdeas.org

Reviewer

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Date

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