Facts Every Energy Manager Needs to Know

This paper presents a solution for companies (and their Energy Managers) across the globe who share a common problem. How can they reduce their operating costs in the face of ever-increasing energy prices? Using a retail store portfolio as the example, it discusses, the means that are available to meet corporate energy reduction goals. The facts of the laws of physics are used to explain how one particular energy conservation measure stands apart from others that compete for the Energy Manager's time and attention.

You know only too well of the many products and systems being touted that "will save you 15% of your energy costs". When such claims are made without knowing anything specific about your facility or energy spend, and with only "fuzzy" backup, it is natural to be cautious of any company or product.

*That is why the focus here is on **FACTS**.*

Please read on to learn how you can cut your energy spend and avoid missing an opportunity to shine within your company.

Facts Every Energy Manager Needs to Know

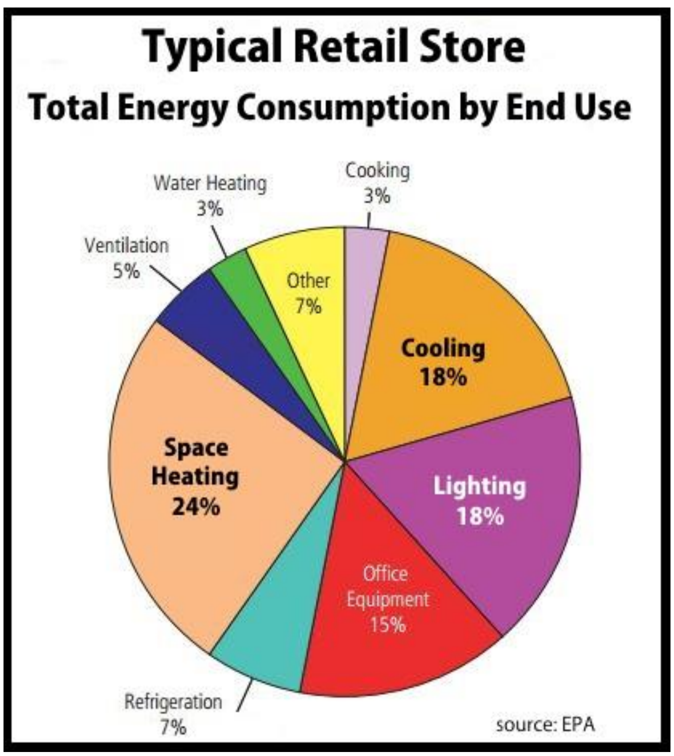
What is Job #1? Reduce energy costs.

Corporate energy managers have a tough job. When the CEO makes a statement in the Annual Report or at some industry conference declaring "We will reduce our energy costs by 20% across our entire portfolio by 2018", who has to deliver? The Energy Manager.

How much can even be saved in an existing store or facility?

In any retail store, for example, there are only so many things to *reduce*. The stores must be well lit and comfortably conditioned for the customers. In new stores, designers can make changes that address energy efficiency going forward. Existing stores, however, make up most of the portfolio, and correspondingly the lion's share of the annual energy spend.

Here's a chart of a typical retail store's energy use:



It's easy to see that heating, cooling and lighting make up the biggest portion.

Lighting got the early attention. Why? Because it was simple.

For existing stores, lighting upgrades were considered by most to be the "low hanging fruit". It is the place where most energy reduction projects got started. The solutions were direct replacement of bulbs, lamps or fixtures. The savings were direct: energy used by the new fixture versus that of the previous fixture. Utilities widely encouraged lighting upgrades by making rebates available to reduce the overall cost of implementation and improve the return on investment.

The magnitude of energy usage/cost reductions being mandated cannot be achieved through lighting changes alone. The bigger pieces of the pie must be addressed.

What about HVAC?

HVAC rides to the Energy Manager's rescue, knocking on the door as the savings opportunity they need to meet their reduction goals. Heating and cooling account for 42% of the energy use in the chart above, while lighting represents 18%. The opportunity seems quite large. How do we take advantage of it?

Why not just buy new units that are more efficient?

The short answer is money. Capital funds can be difficult to get even when equipment is old and failing. Getting money to replace even inefficient units that are in otherwise good working condition is a very hard sell to most CFOs.

Chances are a large portion of your existing HVAC units have several years of useful life remaining – many more years than can justify the capital dollars required to replace them. The focus must be on reducing the operating costs of the existing units in order to get the overall energy reduction needed.

Where's the waste in my existing HVAC system?

In a retail store environment, the HVAC equipment of choice is almost always packaged rooftop units. Designers size these units to have enough capacity to cool the space during the hottest times of the year and to heat the space during the coldest times of the year. Most design engineers are conservative, and will often choose to err on the "bigger" side when their load calculations are done.

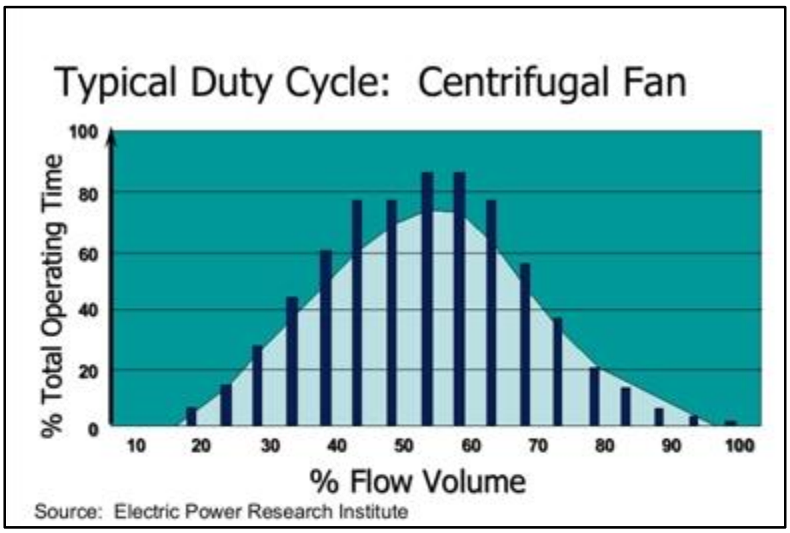
That inherently means that the units are ***oversized*** about 90% of the time they are operating, since those *hottest* and *coldest* days are a fraction of the days throughout the year.

Part-load performance – that less-than-hottest-day operation – where your units operate most of the time becomes very, very important.

What does my existing HVAC system do now?

Most retail stores have units that are large enough to have two stages of cooling and heating. They can run half the cooling (compressors) or half the heating capacity when that is all that's needed. That provides some level of *load matching* that helps with the costs directly related to heating and cooling.

However, the blower fan in these standard units only has one capacity – 100%. The fan's motor always runs at full speed, moving that large quantity of air only needed on the very hottest days of the year.



What is my #1 option to reduce my HVAC energy spend?

The answer lies in the use of variable frequency drives (VFDs), also referred to as variable speed drives. A Google search of "VFDs save energy" returns 164,000 hits. That they save energy is not debatable… they do.

Formerly very expensive, and physically somewhat large, VFDs are now much more robust, compact and reliable. Combined with a lower price point and ever-higher electricity costs, applying VFDs to smaller motors is now a good investment. It is those smaller fans and motors that are found in commercial rooftop HVAC blower fan applications. Retrofitting them with the current VFD technology now makes good economic sense.

What are my risks?

Our experience from installing DrivePak™ over 30,000 times on equipment in more than 3,000 facilities allows us to assure you that retrofitting your equipment with this load-matching technology is very cost-effective and very low risk. We go over your particular equipment inventory, how you operate that equipment, and other factors to determine that DrivePak IS a good fit for you.

The application of VFDs to fans in HVAC systems is definitely low-risk as far as whether it will save energy. See the physics lesson below. What does vary is the size of the savings, or reward. So it isn't a matter of *if* it will reduce power consumption, it is one of *how much*. That answer lies in the following criteria:

1. The horsepower of the fan motor
2. How many hours the fan operates
3. The cost per kWh of the power being consumed

These criteria, along with other information we need to discuss with you, will allow for an evaluation of the opportunity in your portfolio. Rest assured, if it is not a good fit, or doesn't have an excellent chance to meet your hurdle rate we won't try to sell you something you don't want or need.

The biggest risk may be failing to bring home these significant savings for your company.

Why do VFDs offer such great electrical reduction results?

PHYSICS LESSON: VFDs take advantage of something called the Fan Affinity laws.

One fan law relates the airflow rate to the fan rotational speed. It says that they are directly proportional. If you change the speed from 100% to 80%, the amount of air deliver is reduced from 100% to 80%.

But the fan law we're really interested in is the one that relates the fan rotational speed to the power consumed. The relationship of speed to power is a "cube" function. This works for all size motors, but as the horsepower increases, the savings increase <u>exponentially</u>.

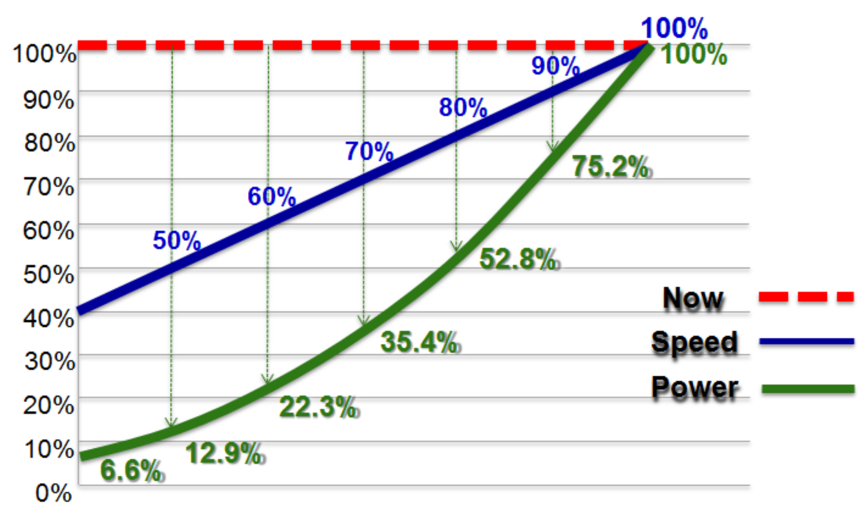


Chart Illustrating Fan Affinity Law

For example: Speed reduced from 100% to 80%.

Power is reduced from 100% to 51% (80% x 80% x 80%). That is the pure math. Because we need to account for some motor and drive efficiency losses, the actual figure we use to calculate savings is 53% (or 47% reduction). So **reducing the speed/volume by only 20% results in the motor using 47% less power.**

For example: Speed reduced from 100% to 65%.

Power is reduced from 100% to 27% (65% x 65% x 65%). Again, that is the pure math. Because we need to account for some motor and drive efficiency losses, the actual figure we use to calculate savings is 29% (or 71% reduction). So **reducing the speed/volume by 35% results in the motor using 71% less power**.

Your HVAC system can operate at these reduced speeds most of the time. And, rather than sacrificing comfort as many energy-saving measures requires, comfort is maintained or even improved.

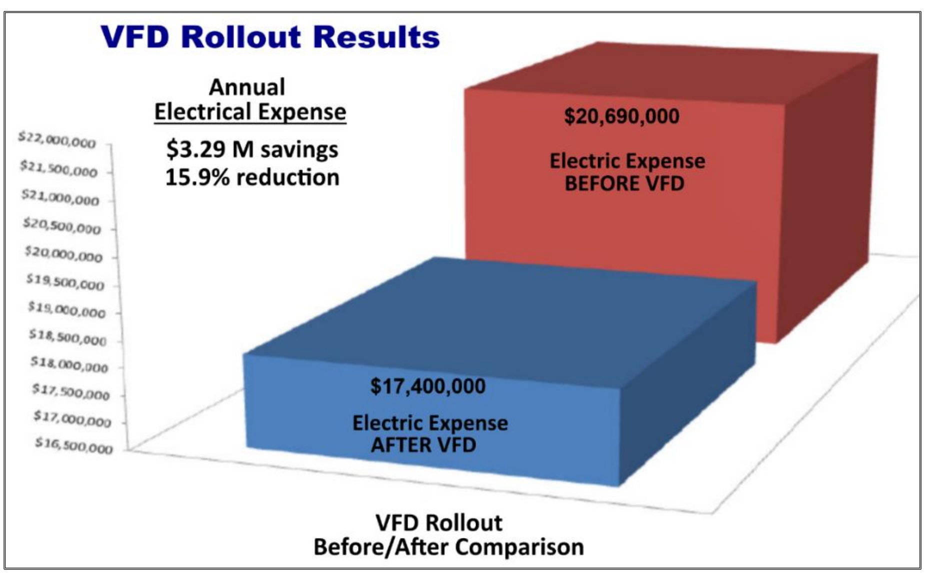
Do the Math

Once the physics part is calculated, the rest of the math is pretty simple. Using the horsepower of the motor, you figure in the annual hours the motor runs (which right now is at 100% full-speed) and multiply by the cost of power. Recent DOE figures put the U.S. average commercial rate for electricity at $0.11/kWh.

- More horsepower = more savings
- More operating hours = more savings
- Higher electric cost = more savings .... and if you have all three -- BINGO! Jackpot.

What kind of results have others achieved with this simple VFD application?

This DrivePak™ customer recently presented these results at a national conference.



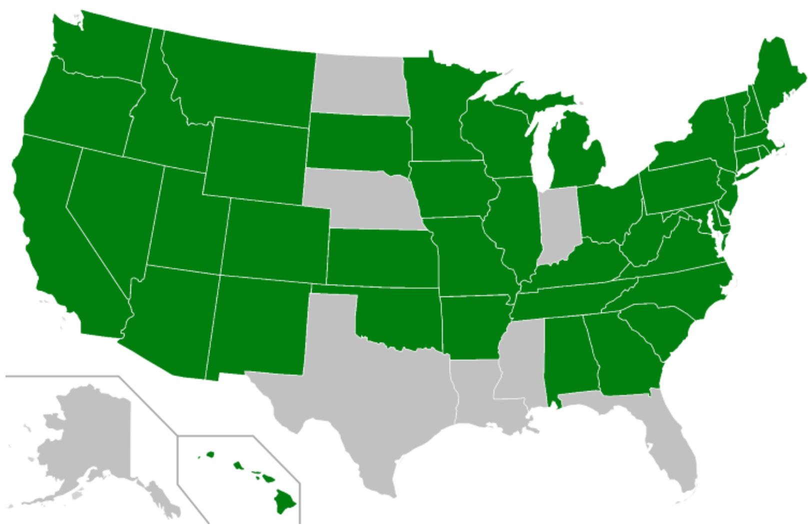
<u>Another DrivePak™ customer</u> wrote this in his Annual Facilities Report to his Board:

"DrivePak™ VFD retrofits were completed in 475 locations and are tracking a 22.4% reduction in energy"

DrivePak™ retrofit projects provide an internal rate of return that even a CFO can love. An example for a store with twelve rooftop units and a 5hp average blower motor size, has a projected simple payback of 1.34 years and a 5-year IRR of 70%. Do you think that might get your CFO's attention?

Other People's Money

Utility <u>rebates and incentives</u> are widely available for this proven technology. These funds can result in even quicker returns. In many areas, rebates can pay for one-half or more of the project's cost. In the example above, 50% in project rebates make that same project pay back in just 8 months.



States shown in green have VFD rebates available

Take the Next Step – it's FREE

Find out if a DrivePak retrofit makes sense for your facilities. In return for a few minutes with one of our national account executives and an exchange of information, we will provide you with our expert opinion on the suitability of DrivePak to your specific application.

Please email a Business Development Manager at info@nexrev.com or call us at (972) 578-0505.

If you're interested in NexRev Authorized Dealer opportunities, please email us at dealer@nexrev.com.