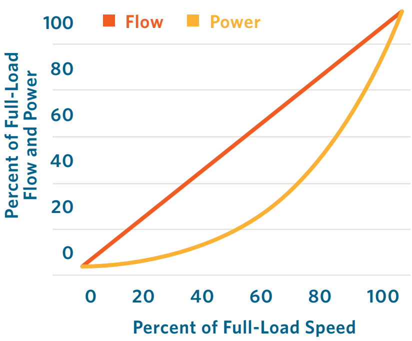
Printing and Publishing Energy Savings Guide

Oregon printing and publishing plants face challenges of rising operating costs, environmental and other regulations, outdated equipment and customer demand for improved sustainability. Throughout the state, printing facilities continually look for ways to control costs while enhancing the quality and performance of their products and services. Because printing and drying require significant energy input, energy efficiency offers an expanding opportunity to trim operating costs.

Energy Trust of Oregon is dedicated to helping you identify options for continuous energy improvement. We can show you how energy is used in typical heatset and coldset printing operations and can help you understand where to focus your efforts. We've also compiled a list of "next steps" for you to review. Talk with your Program Delivery Contractor, PDC, about which of these steps could have the biggest impact on energy savings at your business.

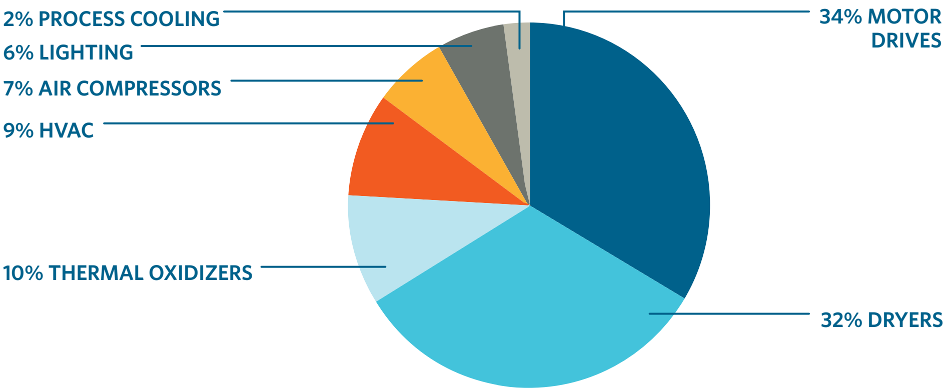
Energy Trust of Oregon

VFDs AND THE AFFINITY LAWS

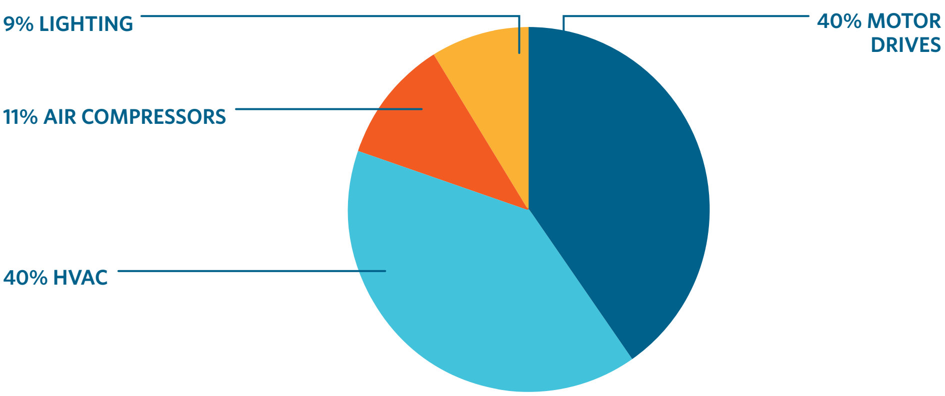


Variable Frequency Drives improve pump and fan efficiency by reducing motor shaft speed to the minimum revolutions per minute, rpm, necessary to satisfy flow requirements. A graph of the affinity laws shows that the flow produced by a pump or fan is directly proportional to shaft speed, while the power requirement for that flow is proportional to shaft speed cubed. For example, at 80 percent of full-load flow, a pump or fan operates at 80 percent of full-load rpm, but uses only 51 percent of full-load power, yielding a steady state energy cost reduction of 49 percent. At 50 percent of full-load flow, the pump or fan operates at 50 percent of full-load rpm, but uses only 13 percent of full-load power, yielding an energy cost savings of 87 percent.

ENERGY USE PROFILE FOR A TYPICAL HEATSET PRINTING OPERATION



ENERGY USE PROFILE FOR A TYPICAL COLDSET PRINTING OPERATION



COMPRESSED AIR

Could the energy efficiency of your compressed air system be improved through set point optimization and strategy improvement? Adjusting compressed air system settings and making changes in how your plant uses compressed air can significantly reduce energy use. These improvements can pay for themselves quickly—often in as little as a few weeks.

- ☐ Identify and reduce leaks in the compressed air system.
- ☐ Optimize compressed air system pressure. Every two psi of pressure reduction reduces energy use one percent.
- ☐ Adjust regulators and valves within the compressed air system to optimize flow and reduce pressure drop. These adjustments may allow a reduction in compressed air supply pressure, which decreases energy use.
- ☐ Minimize open blowing of compressed air. Optimizing volume and/or reducing frequency decreases compressed air demand.
- ☐ Eliminate inappropriate use of compressed air in the plant, such as for cleaning or cooling. Use more energy-efficient methods.
- ☐ Identify processes, areas and times that allow one or more compressors to be turned off.

Could compressed air capital improvements lead to substantial energy savings? Replacing inefficient equipment with new high-efficiency technologies can substantially reduce energy use and produce a quick return on investment.

- ☐ Install Variable Frequency Drives, VFDs, on existing compressors that operate under varying load. VFDs save energy by adjusting the compressor speed to fit system demand.
- ☐ Invest in new compressors with VFDs. Typical simple payback of one to four years.
- ☐ Consider installing a blower that produces low-pressure, high-volume airflow to replace less-efficient compressed air in processes that require open blowing.
- ☐ Retrofit controls to load/unload compressor operation in place of existing inlet modulation control systems.
- ☐ Install a master control and monitoring system to sequence and maintain the optimum combination of compressors based on demand.
- ☐ Use small, dedicated compressors to provide compressed air for the dry-fire suppression system.
- ☐ Use engineered nozzles for compressed air blowing. Upgrading to air-entraining nozzles reduces the volume of compressed air compared to conventional nozzles or open blowing.
- ☐ Add controls and valves to reduce nozzle airflow as the process allows.
- ☐ Upgrade inefficient compressed air dryers to higher efficiency systems.
- ☐ Reduce or eliminate the use of oversized compressed air components by installing equipment appropriate for the end-use requirements.
- ☐ Install a dedicated compressor for the Thermal Oxidizer to better optimize system pressure.
- ☐ Upgrade compressed air piping. Piping strategies that are more free flowing provide better system performance and energy efficiency.
- ☐ Reduce or eliminate the runtime of standby compressors that operate during non-production periods. Use a manual switch to provide timed use of the standby compressor for maintenance purposes.

LIGHTING

Could lighting upgrades yield significant energy savings? Upgrading old or inefficient lighting to high-efficiency technology cuts energy use and often provides a higher quality of light.

- ☐ Use occupancy sensors to control lights in spaces with intermittent use. Occupancy sensors can reduce lighting energy use by as much as 90 percent in seldom-used areas.
- ☐ Replace less efficient fluorescent lighting with high-efficiency linear fluorescent technology. Fluorescent lighting options include energy-efficient T8 task lighting and T5 high-bay lighting.
- ☐ Reduce the number of lamps in overlit areas.
- ☐ Upgrade existing High Intensity Discharge lighting to newer, more energy-efficient technologies to save energy and improve visibility. The switch from Metal Halide or Sodium Vapor to T5 or T8 fluorescent lighting could reduce lighting energy use by up to 50 percent, while improving color rendering.
- ☐ Consider installing LED lighting as an energy-efficient replacement for other less-efficient technologies. LEDs combine ultra-high efficiency with excellent performance and long life in an increasingly affordable package. LEDs also produce little heat, which decreases the plant's cooling load.

SCRAP COLLECTION

Could systems that remove materials from the production area be improved to reduce energy use? Removal of scrap from printing and publishing processes can be highly energy intensive. Scrap collection systems can be optimized to provide high-quality scrap collection with the smallest energy input possible.

- ☐ Rebalance air-handling systems to improve duct flow and reduce energy use for fans that move materials from the production area to the collection area. Improving flow also can reduce buildup of materials in ducts.
- ☐ Optimize duct velocity while maintaining proper movement of scrap to collection areas.
- ☐ Add controls to fan systems that serve equipment used intermittently. When equipment is idle, fan systems may be turned off.
- ☐ Install VFDs and controls on system fans to match fan speed to the needs of the scrap collection system.
- ☐ Install VFDs and controls on bag house and cyclone fans to modulate fan speed to fit system demand.
- ☐ Upgrade active cleaning technology in the bag house. Upgrade mechanical cleaning systems that use shakers to clean filter media or reverse air-cleaning systems to pulsejet cleaning systems to reduce energy use.
- ☐ Use low-pressure drop filters in the bag house to reduce fan energy.

CHILLER

Is there an opportunity to improve the efficiency of your chilled water system through low-cost operations and maintenance improvements? Changes to the set points of the chilled water system do not typically require a large investment of time or capital.

- ☐ Optimize the chilled water temperature set point while providing proper water temperature to support production processes. Typical simple payback of several weeks to one year.
- ☐ Reduce pump pressure in the chilled water loop. Typical simple payback as short as one month.
- ☐ Clean cooling tower coils and chiller tubes regularly.
- ☐ Eliminate inappropriate use of chilled water for low-intensity cooling processes that could be accomplished with municipal water.
- ☐ Adjust controls to stop pumping cooling water when presses are not operating. Typical simple payback as short as one month.

Are there opportunities to save energy through capital improvement to your chilled water system? Capital improvements to the chilled water system may be necessary to replace aging equipment. Investment in new energy-efficient equipment can dramatically decrease the cost of supplying chilled water for plant operation.

- ☐ Add VFDs to cooling towers to match the speed of cooling tower fans to the needs of the chiller. Typical simple payback of one to five years.
- ☐ Consider using chiller staging controls on systems that have multiple chillers to take advantage of greater part-load efficiencies while providing similar cooling characteristics.
- ☐ Optimize chilled water pumping by adding VFDs, which match pump speed to momentary demand.
- ☐ Install a water-side economizer to take advantage of free-cooling, which allows the cooling tower to use ambient air to help chill water. Typical simple payback of one to four years.
- ☐ Consider installing an oversized cooling tower to take further advantage of free-cooling.
- ☐ Replace existing chillers with high-efficiency models to reduce chilled water system energy use by up to 50 percent, while reducing maintenance costs and improving system function.

BOILER

Could your boiler be operating more efficiently? Hot water and steam system efficiency can be improved through low-cost operations and maintenance measures, as well as through capital upgrades. Routine maintenance is often all that is required to reduce boiler system energy use.

- ☐ Optimize the temperature of the hot water system to fit production needs. Operating with water that is hotter than process requirements reduces system efficiency.
- ☐ Avoid using steam for tasks such as heating process water. Look for more efficient ways to accomplish the job.
- ☐ Identify and replace steam traps that leak dry steam.
- ☐ Optimize combustion efficiency by adjusting excess air. Typical simple payback as short as two weeks.
- ☐ Install sensors and controls to optimize excess air for dynamic fuel conditions.
- ☐ Add a condensing economizer to the boiler stack to take advantage of flue heat that is exhausted and wasted. Typical simple payback of two to five years.
- ☐ Improve boiler and piping insulation to reduce system heat loss.

- ☐ Install a heat exchanger to recover heat from flash steam and use it to preheat boiler makeup water. Upgrade burner controls for better burner management and increased efficiency.
- ☐ Upgrade the burner for more efficient combustion. Burner upgrades can have a simple payback as short as one year depending on the capabilities of existing burner controls.
- ☐ Replace inefficient boilers with high- efficiency models, which also can improve the function of the boiler system.
- ☐ Replace a single inefficient boiler with multiple smaller condensing boilers. Use controls to bring boilers online to match heating loads, while reducing inefficiency of part-load operation that exists with larger boilers.

OXIDIZER SYSTEMS

Are there opportunities to improve the energy efficiency of VOC removal? Energy used for VOC elimination can be reduced or reclaimed to improve energy efficiency.

- ☐ Add secondary heat exchangers to recapture heat from existing oxidizers for use in other plant processes. Typical simple payback as short as one year.
- ☐ Update controls to optimize oxidizer operation based on system demand.
- ☐ Replace existing inefficient oxidizers with high-efficiency oxidizer systems. Typical simple payback as short as two years.

PROCESS HEAT RECOVERY

Could process heat that is lost to the environment be reclaimed for use within the facility? Heated air or water used during production is often exhausted as waste heat. Capturing and reusing waste heat offers the opportunity to reduce energy use.

- ☐ Add air-to-air heat exchangers to recover heat from air that is used in drying processes. Heated air may be used as a preheat input for oxidizer or drying processes. Typical simple payback as short as one year.
- ☐ Recover excess steam from the production process and return it to the boiler before the steam condenses.
- ☐ Use preheated water from presses as an input for boilers.

ENERGY TRUST INCENTIVES MAY REDUCE PAYBACK PERIODS LISTED IN THIS GUIDE BY AS MUCH AS 50 PERCENT ON CAPITAL UPGRADES.

HVAC

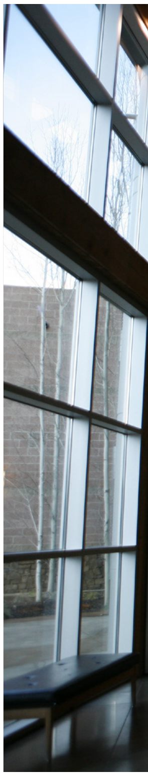
Is your HVAC system functioning properly? HVAC systems that are not operating properly because of deferred maintenance or mechanical malfunction reduce occupant comfort as well as energy efficiency.

- ☐ Tune up demand controlled ventilation to tailor ventilation to meet occupancy levels.
- ☐ Install programmable thermostats to reduce unnecessary energy use during unoccupied hours and to maintain comfortable conditions when workers are present.
- ☐ Repair economizers and calibrate set points to take advantage of free-cooling opportunities. Typical simple payback of between two weeks and one year.
- ☐ Add VFDs to supply and return fans that serve rooftop units to match fan speed to system demand.
- ☐ Add controls that allow a reset of supply air temperature based on ambient air temperature.
- ☐ Adjust existing controls to optimize supply temperature based on outdoor temperature.
- ☐ Add communicating controllers to adjust static pressure reset based on sensor feedback from system zones. Typical simple payback as short as one year.
- ☐ Consider heating individual stations as needed with direct-fired radiant heaters.

MOTORS AND CONTROLS

Are the motors that operate throughout your plant operating as efficiently as possible? Several energy-saving strategies could be applicable to motors that use more energy than they should.

- ☐ Adjust existing motor control systems to minimize the amount of energy used for normal operation. Small adjustments to control systems could lead to significant energy savings.
- ☐ Add VFDs and associated controls so motor speed matches process needs. During periods of reduced demand, the rpm and energy use of the motor can be reduced.
- ☐ Rebuild worn motors to an efficiency similar to the original specifications. Green rewinds are a cost effective way to boost energy efficiency.
- ☐ Replace existing pneumatic or hydraulic motors with high-efficiency electric motors if process needs allow a change in motor technology.



ENERGY PLAYS A CENTRAL ROLE IN PRINTING AND PUBLISHING.

Energy Trust can help your facility take control of your energy costs and reduce the impact of energy on your bottom line.

Energy Trust provides cash incentives and technical services to help your plant improve energy efficiency and reduce operating costs. Our PDCs are highly skilled industrial energy experts who understand different types of printing and publishing systems, what will work in your facility and how to make the most of energy-saving opportunities. Energy Trust PDCs are located throughout Oregon and can work closely with your personnel to achieve your goals.

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Discover how to continuously improve your energy performance.
Talk with your PDC, or call Energy Trust directly at **1.866.202.0576** or visit **www.energytrust.org/industrial-and-ag**.

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