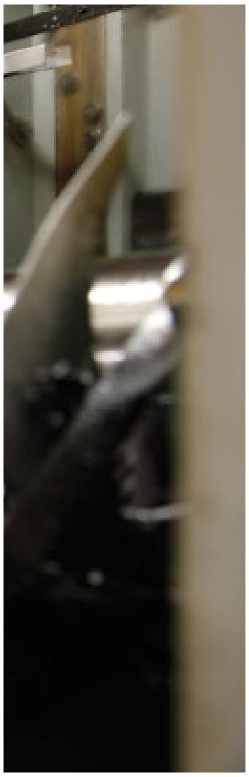


Primary Metals Manufacturing Energy Savings Guide

Oregon metals manufacturers face challenges of rising operating costs, rigorous product and safety standards, evolving environmental regulations and increasing competition domestically and abroad. Metals manufacturers must continuously look for ways to control costs. Because metal production requires a significant energy input, energy efficiency offers an opportunity to trim operating costs.

Energy Trust of Oregon is here to assist you in identifying energy improvement options for your plant. This Energy Savings Guide explains many ways to save energy in your operation and will help you decide where to focus your efforts.

Our contact information is at the end of the guide. We're ready to talk with you about what energy improvements will make the most sense for your business.

COMPRESSED AIR

Could the energy efficiency of your compressed air system be improved? Adjusting compressed air system settings or changing compressed air utilization can pay back rapidly in reduced energy costs.

- ❑ Identify and reduce leaks in compressed air systems to decrease compressor load.
- ❑ Reduce compressed air system pressure to the minimum that satisfies demand. Every 2 psi of pressure reduction reduces energy use by 1 percent.
- ❑ Adjust regulators and valves to optimize flow and reduce pressure drop.
- ❑ Reduce or eliminate open blowing to avoid unnecessary compressor cycling. Typical simple payback of a few weeks to months.
- ❑ Eliminate inappropriate use of compressed air, such as for cleaning or cooling. Typical simple payback as short as several weeks.
- ❑ Identify processes, areas and times that allow one or more compressors to be turned off.
- ❑ Ensure that compressor intake air is as cool as possible to maximize compressor efficiency.
- ❑ Reduce or eliminate the run time of standby compressors that operate during nonproduction periods. Use a manual switch to provide timed use of the standby compressor for maintenance purposes.
- ❑ Increase receiver volume to reduce compressor cycling and improve demand response.

Could compressed air capital improvements lead to substantial energy savings? Several proven capital improvements are available that can trim operating costs and improve system performance.

- ❑ Add controls and valves to reduce nozzle airflow when the production process permits.
- ❑ 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.
- ❑ Use engineered nozzles for compressed air blowing. Upgrading standard nozzles to air-entraining nozzles reduces the volume of compressed air for most processes that require blown air.
- ❑ Reduce or eliminate use of oversized compressed air components by installing equipment appropriate for end-use requirements.
- ❑ Consider installing a blower for processes in which low-pressure, high-volume would be equally effective.
- ❑ Upgrade compressed air piping. Piping strategies that are more free flowing provide better system performance and energy efficiency.
- ❑ Install zero-loss condensate drains.
- ❑ Replace inlet modulation control systems with those that load/unload compressor operation.
- ❑ Install a master control and monitoring system to sequence and maintain the optimum combination of compressors based on demand.
- ❑ Upgrade inefficient compressed air dryers to higher efficiency systems.
- ❑ Use a small, dedicated compressor to support the dry-fire suppression system.

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.

- ❑ Reduce the number of lamps in overlit areas.
- ❑ Use Luminaire Level Lighting Control (LLLC) technologies to control both interior and exterior lighting based on natural light contribution, motion, and time of day scheduling. High and low light levels can be trimmed and adjusted to meet the lighting requirements for varied tasks or change of use areas.
- ❑ Consider installing LED lighting as an energy-efficient replacement for other less-efficient technologies for interior and exterior environments. LEDs combine ultra-high efficiency with excellent performance, quality, and long life in an increasingly affordable package. LEDs also produce very little heat, which decreases the plant's cooling load costs and extends the life of the cooling system.

MATERIAL COLLECTION AND AIR ABATEMENT

Could systems that move particulates within the production area be improved to reduce energy use?

- ❑ Add controls to fan systems that serve equipment used intermittently so fans turn off when equipment is idle.
- ❑ Remove unnecessary material-handling fans and sections of ducting to improve material-collection efficacy and reduce energy use.
- ❑ Rebalance air-handling systems to improve duct flow, increase efficiency and reduce the buildup of materials in ducting.
- ❑ Modulate fan speed with Variable Inlet Vanes (VIVs) or VFDs to match airflow to the needs of the collection system.
- ❑ When possible, install gates to remove offline drops from service; modulate the collection system via VFD or VIV.
- ❑ When applicable, change sheaves to a fixed-fan speed for a given material-handling need to improve duct velocity while maintaining proper movement of particulates.
- ❑ Upgrade to active-cleaning technology in the bag house. Replace reverse air designs, or mechanical cleaning systems that use shakers to clean the filter media, to demand-controlled pulse-jet systems.
- ❑ Use free-flowing filters in the bag house to reduce fan energy.
- ❑ Replace inefficient existing material-handling fans with high-efficiency models.
- ❑ When applicable, use efficient belts or bucket conveyers in place of inefficient fan conveyance.

PROCESS HEATING

Does the energy efficiency of process heating offer opportunities to improve your company's bottom line? Set point adjustments and controls upgrades can offer savings by decreasing heat wasted from the production process.

- ❑ Insulate any bare equipment that allows significant heat transfer to the environment.
- ❑ Add or replace insulation on furnaces or ovens that lose excessive heat to surrounding spaces.
- ❑ Eliminate openings in the furnace or oven that allow cool surrounding air to enter.
- ❑ Adjust existing controls to optimize the burner fuel/air ratio to maximize burner efficiency.
- ❑ Improve controllers to better manage burner operation.
- ❑ Replace inefficient burners with more efficient models.
- ❑ Reconfigure process timing to eliminate unnecessary cooling of charges and furnace surfaces or prolonged periods when the furnace is open to the environment.
- ❑ Locate the furnace so heat transfer is minimized when heated materials are moved.
- ❑ Consider replacing equipment that has become oversized due to changes in operations with energy-efficient equipment appropriately sized for current and future needs.

WASTE HEAT RECOVERY

Does your facility take advantage of exhaust heat? Heat lost to the environment is an untapped opportunity.

- ❑ Descale existing heat exchanger surfaces regularly to maximize heat transfer.
- ❑ Capture waste heat from furnace exhaust gas for use in preheating of charges prior to entry into the furnace.
- ❑ Use a heat exchanger to transfer wasted heat to combustion air for the furnace.

PUMPING

Can energy be saved from process pumping? Matching pump output to process needs can greatly improve energy efficiency.

- ❏ Eliminate leaks in the vacuum system to reduce vacuum pump flow.
- ❏ Add VFDs to vacuum pumps so pumps operate at the minimum rpm needed for production.
- ❏ Control vacuum pump staging to operate the minimum number of pumps to support production.
- ❏ Remove excess pumps from service.
- ❏ When practical, replace oversized positive displacement pumps and pump motors with pumps appropriately sized for the application.
- ❏ Control positive displacement pumps via VFD to match flow and pressure requirements to process needs.

MOTORS, DRIVES AND CONTROLS

Are motors running as efficiently as possible? Motors that operate inefficiently represent a continual missed opportunity to trim energy consumption.

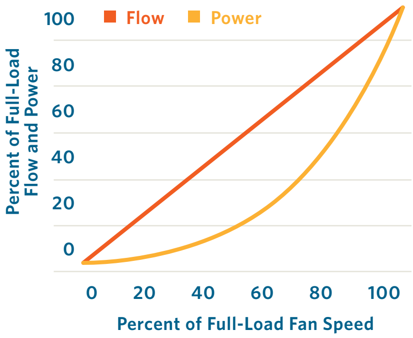
- ❏ Install controllers on motors that constantly actuate pumps or fans when intermittent operation would suffice.
- ❏ Add VFDs and associated controls to adjust the rpm on motors that require speed modulation in response to process requirements.
- ❏ Replace oversized motors with high-efficiency motors appropriately sized for the application.
- ❏ Replace standard-efficiency motors that are at the end of their useful life with premium- efficiency motors.
- ❏ Replace V-belts with cogged belts whenever possible.
- ❏ Consider correcting power factor when running equipment with a large reactive load.

OFFICE HVAC

Is your HVAC system functioning properly? Mechanical malfunction and deferred maintenance can reduce human comfort and energy efficiency.

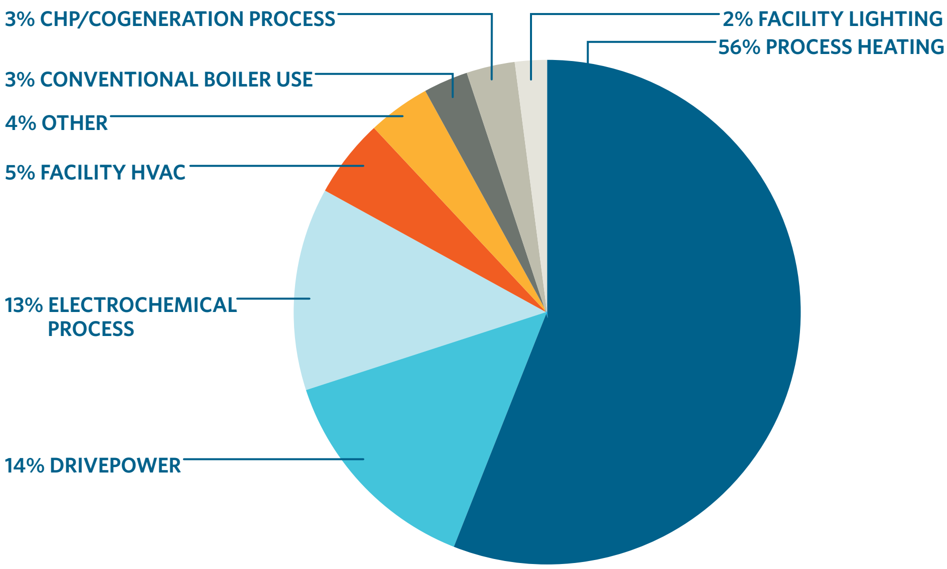
- ❏ Optimize set points to ensure HVAC systems are operating as efficiently as possible.
- ❏ Implement temperature setback for unoccupied hours.
- ❏ Retrofit existing HVAC systems with economizers to take advantage of free cooling.
- ❏ Tune up demand-controlled ventilation to optimize outside air based on human occupancy.
- ❏ Install programmable thermostats to maintain comfort when employees are present and reduce unnecessary energy use during unoccupied hours.
- ❏ Update HVAC system controls to optimize demand-controlled ventilation, economizers and other system components.

FAN AFFINITY LAWS



Variable Frequency Drives improve fan efficiency by reducing fan speed to the minimum revolutions per minute, rpm, required to satisfy flow requirements. Fan affinity laws show the flow produced by a fan is directly proportional to fan speed, while the power required to produce that flow is proportional to fan speed cubed. For example, at 80 percent of full-load flow, a 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 fan operates at 50 percent of full-load rpm, but uses only 13 percent of full-load power, yielding energy cost savings of 87 percent.

TYPICAL ENERGY USE PROFILE IN PRIMARY METALS MANUFACTURING



ENERGY PLAYS A CENTRAL ROLE IN PRIMARY METALS MANUFACTURING

Energy Trust can help you take control of energy costs and reduce the cost impacts of energy on your bottom line.

Energy Trust provides cash incentives and technical services to help you improve energy efficiency and reduce operating costs. Our Program Representatives are highly skilled industrial energy experts who understand what works in your business and how to make the most of energy-saving opportunities. Energy Trust Program Representatives are located throughout Oregon and can work closely with your personnel to achieve your goals.

Discover how to continuously improve your energy performance.
Email us at **production@energytrust.org**, call **1.866.202.0576** or visit **www.energytrust.org/industrial-and-ag**.

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Energy Trust of Oregon is an independent nonprofit organization dedicated to helping utility customers benefit from saving energy and tapping renewable resources. Our services, cash incentives and energy solutions have helped participating customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas save on energy costs. Our work helps keep energy costs as low as possible, creates jobs and builds a sustainable energy future. **Printed with vegetable-based inks on paper that contains 100% post-consumer waste. 1/24**