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 expanding opportunity to trim operating costs.

Energy Trust of Oregon is dedicated to helping you identify options for improving your plant's energy efficiency over time. We can help you identify the best opportunities for energy savings in your operation and 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.

According to the Oregon Employment Department, primary metals manufacturing in Oregon has grown faster than the industry nationally, and our percent of employment in the industry is nearly twice the national average. But energy costs take a bite out of the industry—impacting our economy and jobs.

EnergyTrust of Oregon

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. Typical simple payback can be immediate.
- ❏ 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. Typical simple payback of one to six years.
- ❏ Invest in new compressors with VFDs. Typical simple payback of one to four years.
- ❏ 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. Typical simple payback can be less than one year.
- ❏ 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. Typical simple payback can be less than one year.
- ❏ 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. Typical simple payback can be less than one year.
- ❏ Upgrade inefficient compressed air dryers to higher efficiency systems. Typical simple of one to four years.
- ❏ 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 occupancy sensors to control lights in areas used intermittently. Occupancy sensors can reduce lighting energy use by as much as 90 percent in seldom-used areas.
- ❏ Upgrade High Intensity Discharge lighting systems 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 can reduce lighting energy use by up to 50 percent, while improving color rendering.
- ❏ Upgrade older linear fluorescent systems to more efficient T8 task lighting and T5 high-bay lighting.
- ❏ 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.
- ❏ Use photo sensors to turn off outdoor lighting when natural light is available. Typical simple payback as short as one year.

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. Typical simple payback can be as short as several months.

❏ 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. Typical simple payback as short as two years.

❏ 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 quick pay backs by decreasing heat wasted from the production process.

❏ Insulate any bare equipment that allows significant heat transfer to the environment. Typical simple payback of several months.

❏ Add or replace insulation on furnaces or ovens that lose excessive heat to surrounding spaces. Typical simple payback as short as one year.

❏ 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. Typical simple payback as short as several weeks.

❏ Improve controllers to better manage burner operation. Typical payback of one to three years.

❏ Replace inefficient burners with more efficient models. Typical simple payback can be shorter than one year.

❏ 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. Typical simple payback of one to five years.

❏ Use a heat exchanger to transfer wasted heat to combustion air for the furnace. Typical simple payback of one to four years.

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. Typical simple payback of one to five years.
- ❏ 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.
- ❏ Rebuild worn motors to an efficiency similar to original specifications to boost efficiency and throughput.
- ❏ Replace existing pneumatic or hydraulic motors with high-efficiency electric motors.
- ❏ Replace V-belts with cogged belts whenever possible. Typical simple payback as short as one year.
- ❏ Consider correcting power factor when running equipment with a large reactive load.

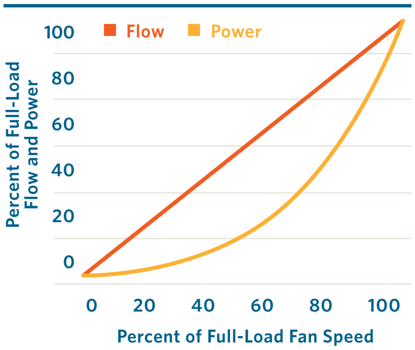
OFFICE HVAC

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.

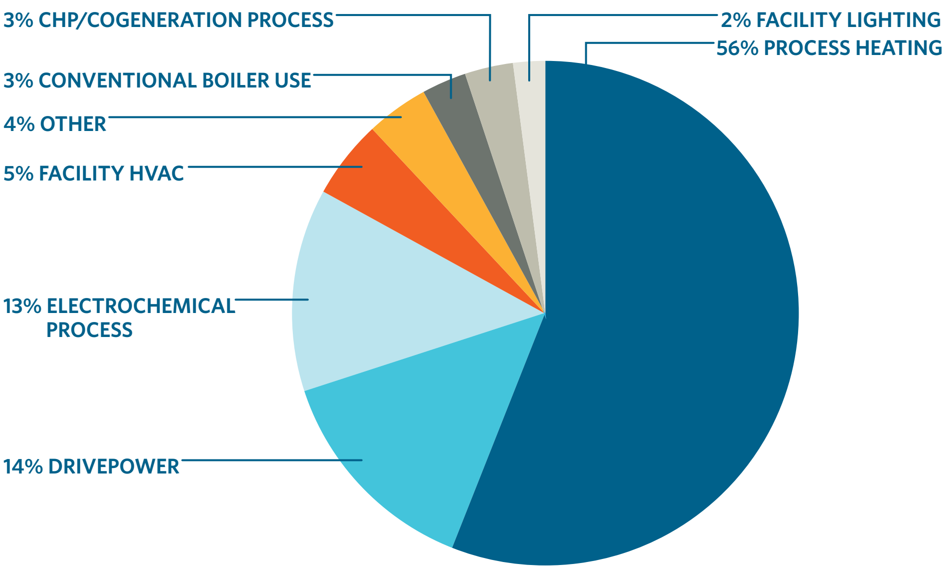
ENERGY TRUST INCENTIVES MAY REDUCE PAYBACK PERIODS LISTED IN THIS GUIDE BY AS MUCH AS 50 PERCENT ON CAPITAL UPGRADES.

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 PDCs 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 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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