

## Top Five Natural Energy Savings Opportunities in Six Industry Sectors

The Energy Efficiency Program of the West Virginia Development Office compiled this list of the most common industry and process specific energy savings opportunities. The five most common recommendations made by Industrial Assessment Centers in each of six manufacturing sectors nationwide. Review by the Oregon Department of Energy indicates that many, if not most of these, are low or moderate cost with very high rates of energy cost savings return (10 to 100% IRR) in typical facilities.

### Casting

- Insulate the bare surfaces of ovens and furnaces
- Replace existing furnaces to increase their efficiency
- Cover crucible and melting furnaces
- Use outside air for compressor intake
- Repair compressed air leaks

### Aluminum

- Preheat combustion intake air using hot flue gases in furnaces and kilns
- Reduce lighting usage in designated areas
- Retrofit existing T12 fluorescent lighting luminaries with T8 bulbs and electronic ballasts
- Implement a motor management system
- Reduce compressor air pressure

### Steel

- Replace drive belts on large motors with energy efficient cog belts
- Implement a motor management system
- Improve power factor
- Use synthetic lubricants in compressors
- Repair compressed air leaks

### Chemicals

- Repair steam leaks
- Implement a motor management system
- Install a back pressure turbine instead of the existing pressure reducing station
- Insulate bare steam pipes and boiler surfaces
- Preheat combustion intake air using hot flue gases in boilers

### Forest Products

- Implement a motor management system
- Replace drive belts on large motors with energy efficient cog belts
- Preheat boiler intake air using hot flue gas
- Replace the 400W metal halide bulbs with 360W metal halide bulbs
- Install a waste oil burner for plant heating in winter time

### Glass

- Insulation of boilers, ovens, and furnace surfaces
- Preheat combustion intake air in boilers, ovens and furnaces
- Heat recovery and redistribution
- Reduce infiltration and space heating loads
- Adjust air fuel ratio in ovens, boilers and furnaces

## **DESCRIPTIONS OF RECOMMENDATIONS**

### **COMPRESSORS**

#### **USE SYNTHETIC LUBRICANTS IN COMPRESSORS**

Industrial data demonstrates that synthetic lubricants have improved characteristics resulting in lowered equipment frictional energy losses. Replacing the lubricant in the air compressors with a synthetic type lubricant would save energy.

#### **USE OUTSIDE AIR FOR COMPRESSOR INTAKE**

By utilizing the outside air as the supply to the air compressors, it is possible to reduce the compressor energy requirement. Outside air is (on average) cooler and therefore denser and needs to be compressed less than indoor air.

#### **REPAIR COMPRESSED AIR LEAKS**

Repair leaks in compressed air lines on a regular basis. This increases the energy savings by reducing the amount of time the compressor has to be operated to produce the air that is lost in the leaks.

#### **REDUCE COMPRESSOR AIR PRESSURE**

For every 2-psig increase in pressure, the energy required to compress and deliver the air increases by 1%. The compressor line pressure could be reduced to save on energy.

### **MOTORS**

#### **REPLACE DRIVE BELTS ON LARGE MOTORS WITH ENERGY EFFICIENT COG BELTS**

Standard V-belts have been shown to have an efficiency of about 92%. Cog Belts are belts with notches flex more easily and have been shown to increase the efficiency of drive system by 2% to 8% (A Self-Assessment Workbook for Small Manufacturers, Version 1.0, Office of Industrial Productivity and Energy Assessment, Rutgers University, Piscataway, NJ. 1996). We recommend replacing the standard V-belts with notched V-belts (cog belts) when the current belts wear out.

#### **IMPLEMENT A MOTOR MANAGEMENT SYSTEM**

Implement a motor management system (MMS) such as MotorMaster<sup>®</sup> to help document motor inventory and to identify/analyze motor driven systems for various energy conservation opportunities.

### **LIGHTING**

#### **REPLACE 400W MH WITH 360W MH BULBS**

This is an option for reducing the amount of energy used for lighting. This change does not require the change of the fixture and the ballast.

#### **REPLACE THE EXISTING T12 LIGHTING BALLASTS AND BULBS WITH T8 BULBS WITH ELECTRONIC BALLASTS AND REFLECTORS**

Install T8 lighting fixtures using reflectors and electronic ballasts in place of the existing T12 fixtures containing magnetic ballasts. The combination of T8 lamps and electronic ballasts and reflectors provide the same amount of light as the T12 fixtures, while using up to 50% less energy.

## **REDUCE LIGHTING USAGE IN DESIGNATED AREAS**

Reduce the lighting energy usage in the designated areas as they are over lit to save energy.

## **NATURAL GAS**

### **REPLACING THE EXISTING CRUCIBLE AND REVERBERATORY FURNACES TO INCREASE THEIR EFFICIENCY**

Replace the current crucible and reverberatory melting furnaces with new ones that would improve energy efficiency. The achieved energy savings would offset the capital cost incurred. The efficiency of these melting furnaces reduces over a period of time.

### **COVER THE CRUCIBLE AND FURNACES**

Cover the natural gas fired melting furnaces with hinged lids to reduce heat loss by radiation and convection from the molten aluminum surface. This practice will result in significant savings in natural gas energy that is currently being used to compensate for these losses.

### **PREHEAT BOILER INTAKE AIR USING HOT FLUE GASES**

The boilers' exhaust gas temperatures were measured and found to be quite high. This potential of exhaust gas heat is now being wasted through the boiler's stack. It is well proven by several research studies that boiler combustion efficiency can be increased by 1% for every 40°F increase in combustion air temperature. For this reason, we recommend installing counter flow heat exchangers and necessary ductwork to capture this wasted heat and use it in preheating the boilers' combustion air.

### **INSULATE BARE STEAM PIPES AND BOILER SURFACES**

Insulate the bare pipes in the plant to reduce heat losses and associated costs. The bare pipes and the boiler surfaces are radiating significant energy due to lack of insulation.

### **INSTALL A WASTE OIL BURNER FOR PLANT HEATING IN WINTER TIME**

Install a waste oil burner to heat some of the plant area during winter by burning waste oil generated by the plant. The plant area is heated in winter using natural gas space heaters. This waste oil burner will reduce the consumption of natural gas for heating.

### **REPAIR STEAM LEAKS**

Steam leaks usually develop around valve packing and stems, pressure regulators, and pipe joints. Even a small leak signifies a significant loss of steam produced annually. Steam leaks contribute to direct heat loss in the steam distribution system. Steam will cause an increase in boiler load and makeup water consumption, as the steam lost has to be compensated by an addition of steam in the system to meet the needs.

### **ADJUST BOILER AIR-FUEL RATIO**

Adjust the combustion system air-fuel ratio on the boiler to reduce the amount of excess air passing through the boiler and thus improve the combustion efficiency of the boiler.

## **ELECTRICITY**

### **IMPROVE POWER FACTOR**

Most utilities charge for low power factor because they must supply adequate line power whether the equipment uses it or not. Hence, capacitors can be installed to improve the power factor.

## **GENERAL**

### **REDUCE INFILTRATION OF OUTSIDE AIR**

Eliminate the infiltration of cold air in the winter and reduce the load on the surrounding space heaters. Due to the greater density of cold air, the outside air falls to the worker level while the heated inside air escapes through the ventilation breaks in the roof. Because of these isolated streams of cold air, more energy is required in order to maintain the appropriate temperature setting. If air quality is acceptable, use fan systems to push warm air back down to floor level.

### **HEAT RECOVERY FROM STACK EXHAUST**

Use air-to-air type heat exchanger to capture heat from the exhaust gases from the oven and the furnaces for heating the plant in wintertime.

### **INSTALL A BACK PRESSURE TURBINE INSTEAD OF THE EXISTING PRESSURE REDUCING STATION**

Install a backpressure turbine at the boiler house to use the potential pressure difference between the turbine's inlet and exit steam as a prime mover for the boiler feed water pump.