

INDUSTRIES

BOILERS:

- Preheat combustion air with waste heat.
- Use variable speed drives on large boiler combustion air fans with variable flows.
- Burn wastes if permitted.
- Insulate exposed heated oil tanks.
- Clean burners, nozzles, strainers, etc.
- Inspect oil heaters for proper oil temperature.
- Close burner air and/or stack dampers when the burner is off to minimize heat loss up the stack.
- Improve oxygen trim control
- Use boiler blowdown to help warm the back-up boiler.
- Optimize deaerator venting.
- Inspect for scale and sediment on the water side
- Add an economizer to preheat boiler feedwater using exhaust heat.
- Recycle steam condensate.
- Study part-load characteristics and cycling costs to determine the most-efficient mode for operating multiple boilers.
- Establish a boiler efficiency-maintenance program. Start with an energy audit and follow-up, then make a boiler efficiency-maintenance program a part of your continuous energy management program.



STEAM SYSTEM:

- Accumulate work orders for repair of steam leaks that can't be fixed during the heating season due to system shutdown requirements. Tag each such leak with a durable tag with a good description.
- Use back pressure steam turbines to produce lower steam pressures.
- Ensure process temperatures are correctly controlled.
- Maintain lowest acceptable process steam pressures.
- Reduce hot water wastage to drain.
- Remove or blank off all redundant steam piping.
- Preheat boiler feed-water.
- Use an absorption chiller to condense exhaust steam before returning the condensate to the boiler.



FURNACES:

- Check against infiltration of air: Use doors or air curtains.
- Monitor $O_2/CO_2/CO$ and control excess air to the optimum level.
- Match the load to the furnace capacity.
- Improve burner design, combustion control and instrumentation.
- Provide temperature controllers.



INSULATION:

- Repair damaged insulation
- Insulate any hot or cold metal or insulation.
- Use an infrared gun to check for cold wall areas during cold weather or hot wall areas during hot weather.
- Insulate all flanges, valves and couplings
- Insulate open tanks.



WASTE HEAT RECOVERY:

- Recover heat from flue gas, engine cooling water, engine exhaust, low pressure waste steam, drying oven exhaust, boiler blowdown, etc.
- Recover heat from incinerator off-gas.
- Use heat pumps.
- Use thermal wheels, run-around systems, heat pipe systems, and air-to-air exchangers.



ELECTRICAL UTILITIES:

- Optimise the tariff structure with utility supplier.
- Schedule your operations to maintain a high load factor.
- Minimise maximum demand by tripping loads through a demand controller.
- Use standby electric generation equipment for on-peak high load periods.
- Relocate transformers close to main loads.
- Set transformer taps to optimum settings.
- Disconnect primary power to transformers that do not serve any active loads.

MOTORS:

- Choose correct size of motor (horse power) for optimum efficiency and use energy-efficient motors for continuous operations.
- Check for under-voltage and over-voltage conditions.
- Balance the three-phase power supply.



DRIVES:

- Use variable-speed drives for large variable loads.
- Use high-efficiency gear sets and use synthetic lubricants for large gearboxes.
- Check belt tension regularly.



COMPRESSORS:

- Use a synthetic lubricant if the compressor manufacturer permits it.
- Be sure lubricating oil temperature is not too high (oil degradation and lowered viscosity) and not too low (condensation contamination).
- Change the oil filter regularly.
- Periodically inspect compressor inter coolers for proper functioning
- Consider variable speed drive for variable load on positive displacement compressors
- Use waste heat from a very large compressor to power an absorption chiller or preheat process or utility feeds.
- Establish a compressor efficiency-maintenance program. Start with an energy audit and follow-up, then make a compressor efficiency-maintenance program a part of your continuous energy management program.



COMPRESSED AIR:

- Install a control system to coordinate multiple air compressors.
- Avoid over sizing -- match the connected load.
- Load up modulation-controlled air compressors. (They use almost as much power at partial load as at full load.)
- Turn off the back-up air compressor until it is needed.
- Reduce air compressor discharge pressure to the lowest acceptable setting.
- Replace standard v-belts with high-efficiency flat belts as the old v-belts wear out.
- Take air compressor intake air from the coolest (but not air conditioned) location
- Monitor pressure drops across suction and discharge filters and clean or replace filters promptly upon alarm.
- Use a properly sized compressed air storage receiver.
- Consider alternatives to compressed air such as blowers for cooling, hydraulic rather than air cylinders, electric rather than air actuators, and electronic rather than pneumatic controls.
- Use nozzles or venturi-type devices rather than blowing with open compressed air lines.
- Check for leaking drain valves on compressed air filter/regulator sets. Certain rubber-type valves may leak continuously after they age and crack.



HVAC (Heating / Ventilation / Air Conditioning):

- In winter during unoccupied periods, allow temperatures to fall as low as possible without freezing water lines or damaging stored materials.
- In summer during unoccupied periods, allow temperatures to rise as high as possible without damaging stored materials.
- Tune up the HVAC control system.
- Consider installing a building automation system (BAS) or energy management system (EMS) or restoring an out-of-service one.
- Balance the system to minimize flows and reduce blower/fan/pump power requirements.
- Eliminate or reduce reheat whenever possible.
- Use appropriate HVAC thermostat setback.
- Use morning pre-cooling in summer and pre-heating in winter (i.e.--before electrical peak hours).
- Improve control and utilization of outside air.
- Use air-to-air heat exchangers to reduce energy requirements for heating and cooling of outside air.
- Reduce HVAC system operating hours (e.g. -- night, weekend).
- Optimize ventilation.
- Ventilate only when necessary. To allow some areas to be shut down when unoccupied, install dedicated HVAC systems on continuous loads (e.g. -- computer rooms).
- Provide dedicated outside air supply to kitchens, cleaning rooms, combustion equipment, etc. to avoid excessive exhausting of conditioned air.
- Reduce humidification or dehumidification during unoccupied periods.
- Purchase only high-efficiency models for HVAC window units.
- Seal leaky HVAC ductwork and all leaks around coils.
- Eliminate simultaneous heating and cooling during seasonal transition periods.



REFRIGERATION:

- Use water-cooled condensers rather than air-cooled condensers.
- Challenge the need for refrigeration, particularly for old batch processes.
- Avoid oversizing -- match the connected load.
- Consider gas-powered refrigeration equipment to minimize electrical demand charges.
- Don't assume that the old way is still the best -- particularly for energy-intensive low temperature systems.
- Correct inappropriate brine or glycol concentration that adversely affects heat transfer and/or pumping energy.
- Consider change of refrigerant type if it will improve efficiency.
- Establish a refrigeration efficiency-maintenance program. Start with an energy audit and follow-up, then make a refrigeration efficiency-maintenance program a part of your continuous energy management program.



DG SETS:

- Optimise loading.
- Use waste heat to generate steam/hot water /power an absorption chiller or preheat process or utility feeds.
- Clean air filters regularly.
- Insulate exhaust pipes to reduce DG set room temperatures.
- Use cheaper heavy fuel oil for capacities more than 1MW.

