The Business of AIRQuality

PART 6

ENERGY

Warringah Council

our environment it's a living thing

PART 6. ENERGY

Part 6 covers best practice guidelines for energy consuming activities and equipment used by small to medium sized industrial businesses.

Energy consumption is an important consideration when advising industrial businesses to install equipment or alter practices according to best practice guidelines for air quality. The following guidelines have been adopted from the Department of Energy, Utilities and Sustainability (DEUS) and can be found on their website at *http://www.energysmart.com.au/wes/*.

DUES has a variety of material available including:

- **The Energy Smart Toolbox.** The toolbox is a resource kit on energy efficiency and management offering a step by step guide to managing energy by businesses. The toolbox helps businesses understand where energy is used, existing types of technologies and systems and how efficiency can be improved. It can calculate and quantify energy savings to present a financial case for decision-making to improve inefficient energy technologies and systems. More information on the toolbox can be found at *http://www.energysmart.com.au/sedatoolbox/*.
- **The Energy Smart Business Program.** If a business has energy bills of more than $300,000 each year they may be eligible to participate. Further information can be found at *http://www.energysmart.com.au/wes/*.
- **Green Power Retail Program.** If a business has energy bills less than $300,000 they can purchase energy from an accredited Green Power Retail Program. Further information can be found at *http://www.greenpower.com.au/business.html*.

Part 6 Energy is divided into seven sections:

Section 6.1 Savings in the office.
Section 6.2 Savings in heating and cooling.
Section 6.3 Savings in lighting.
Section 6.4 Savings in hot water systems.
Section 6.5 Savings in motor systems.
Section 6.6 Savings in pumps and fans.
Section 6.7 Savings in compressed air systems.

SECTION 6.1 SAVINGS IN THE OFFICE

- Computers, photocopiers, printers, faxes should have an Energy Star power management feature enabled. This feature enables office equipment to go into sleep mode, reducing the generation of greenhouse emissions and extending equipment life.
- Where possible a laptop computer should be used, as it uses less energy than desktop computers.
- Where possible an inkjet printer should be used, as it uses far less energy than laser models.

SECTION 6.2 SAVINGS IN HEATING AND COOLING

- Ceiling fans or portable fans should be used to improve airflow as an alternative to air conditioning.

SECTION 6.3 SAVINGS IN LIGHTING

- Energy efficient lighting should be used.
- Timer controls, daylight or movement sensors, which switch lights off automatically should be used.
- Fluorescent lighting should be used as it generates as much light and about one fifth of the greenhouse gases as conventional lighting.
- The use of natural light should be optimised. In warehouses significant savings can be achieved through the installation of translucent roof panels or skylights.
- Walls should be painted in light colours. Dark coloured walls absorb light, increasing the amount of light needed. Light coloured ceilings and floors reflect light and help reduce the number of lights required.

SECTION 6.4 SAVINGS IN HOT WATER SYSTEMS

- Many workplaces have hot water systems for hand washing, general kitchen use and showering supplied by a domestic hot water system. Businesses should reduce the amount of hot water consumed.
- Excess hot water use should be prevented by installing AAA rated showerheads, flow restriction valves, water saving aerators on taps.

- Taps and pipes should be maintained and repaired quickly.
- An adjustable thermostat should be installed to provide better temperature control and ensure water is not heating to unnecessary temperatures. Most thermostats are set at 80 degrees centigrade when they could be economically set at 55 to 65 degrees centigrade.
- Pipes between the tank and taps should be insulated. This insulation should be at least 10 millimetres thick, particularly for the first two metres leading from the hot water system.
- The hot water tank should be installed as close as possible to the usage point.
- Unused hot water systems should be switched off and removed.
- When replacing a hot water system the new system should have a high energy efficiency rating from DEUS. Further information on the installation of an energy efficient hot water system can be found on the DEUS website at *http://www.energysmart.com.au/sedatoolbox/esm101.asp*.

SECTION 6.5 SAVINGS IN MOTOR SYSTEMS

- A regular maintenance and servicing schedule for motor systems should be conducted according to the manufacturer's specifications.
- Motors consume the bulk of energy used by a business. The efficiency of the motor should be suited to the particular task.
- To maximise energy savings the efficiency of all components in the system, including the motor, drive control, fans and ducts should be increased. This will increase the efficiency of the overall system.
- Motors should only be used when necessary.
- The motor with the smallest possible energy capacity should be used. The motor's operating speed should be matched to load requirements. This may mean replacing an existing motor with a smaller one, trimming impellers or pumps or changing gear or pulley ratios. It is common to oversize motors to insure against unexpected peak loads or allow for process expansion in the future. As a result motors can be used that are grossly oversized. Motors are most efficient when they operate at a full load. Through installation of a smaller motor, which operates at a full load, operating efficiency will be greatly improved.
- A timing switch should be installed to restrict the time the motor runs.
- The entire cost of a motor system, including the purchase price, installation cost and operating cost should be taken into consideration when purchasing a new motor system. Many businesses purchase a motor with a low capital cost but ignore its operating costs and energy efficiency.
- Motors should have a Variable Speed Drive (VSD) installed. A VSD is an electrical device which controls power to the motor and is suitable if loads are not always constant. Instead of continuously running at full speed, regardless of the loads, the VSD varies the speed of the motor to accurately match the loads.
- All components of the motor systems should be kept in good condition and adjusted and serviced according to the manufacturer's specifications. This includes the drive belts, chains and couplings.
- All components of the motor system should be properly aligned. If the motor is misaligned some parts will wear more quickly, reducing the motor's life.
- Data should be recorded for each motor used to determine if any are running unnecessarily. This should include information on the motor's application, the nominal power from the motor's identification plate and how the motor is controlled.
- Electric motors should be replaced rather than rewound. It is common practice to rewind an electric motor several times during its operational life. Each time the motor is rewound it reduces in efficiency, adding to the operating cost. The best solution if a motor burns out may be to look at the loading needs and the purchase of a new high efficiency motor to match that load.

SECTION 6.6 SAVINGS IN PUMPS AND FANS

- A qualified engineer or supplier of pump and fan systems should be consulted to determine the best option for installation.
- Pump and fan systems should be run at maximum efficiency. Throttle valves, bypass systems and pressure relief valves should not be used to reduce output to a level that matches demands on the pump or fan. This is highly inefficient.
- To improve efficiency the pump and fan systems should be checked as to whether throttle valves are constantly restricting the rate of flow. If they are, impeller trimming can help reduce energy demands.
- Pumps and fans should not be overly noisy or vibrate. This may indicate efficiency problems.
- Pumps should be correctly sized according to requirements. An oversized pump may result in continual throttling to balance the system. To balance output the pump's impeller should be trimmed or replaced with one of a smaller diameter. Alternatively a VSD may be installed on the motor. To take advantage of impeller trimming, advice should be sought on quantifying pumping process requirements and a pump service provider contacted for impeller trimming assistance. Impeller trimming for fans can also achieve energy savings. Altering the angle of the fan blades can reduce the load on the motor and save energy.
- The number of bends and valves in the pipework should be kept to a minimum. This can help reduce energy loss due to friction and increase energy efficiency.
- Fans and pumps should be turned off when not required. This can be achieved through the installation of automatic controls. The most effective way to match output to demand and save energy is to reduce the speed of the pump or fan.
- Pumps and fans should be cleaned regularly to ensure maximum efficiency. Accumulation of dirt or dust can decrease the efficiency of a fan by adding weight to it and increasing pressure loss in the system.
- Worn seals and fan blades should be replaced.
- Low friction coatings should be used on the internal surfaces of pumps to improve efficiency.
- Drive belts should be maintained in good condition. They should be evenly matched and correctly aligned.

SECTION 6.7 SAVINGS IN COMPRESSED AIR SYSTEMS

- The compressed air system should be reviewed as a whole. Electricity consumption can be reduced and compression capacity increases avoided. This can be achieved by repairing air leaks, reducing intake air temperature, optimising system pressure, managing compressor operation and eliminating inappropriate uses of compressed air.
- Leaks should be quickly found and repaired. To help find and repair leaks the following activities should be used:
  - All equipment should be shut off and the compressor started. Leaks can be found by listening for air escape sounds around the plant. By isolating one section of the pipe work at a time and monitoring the rate of loss of compressed air, the areas of greatest loss can also be located. This should be done on weekends or outside working hours.
  - A maintenance program using compressed air leak tags should be established. These tags are simply placed on leaks identified by personnel, making it easy for maintenance personnel to locate leaks.
  - An ultrasonic leak detector should be used. This detector can be used without shutting off equipment. Detectors are hand held and scan for leaks through a headset, so a leak can be heard despite ambient noise. Detectors cost about $800 to buy and have a fast payback, or can be hired for around $300 per month. Look under "Hire – electric and electronic test equipment" in the Yellow Pages for suppliers.
- The Compressed Air Calculator developed by DEUS can be used to show businesses how much air leaks are costing. This calculator can be found on the DEUS website at: *http://www.energysmart.com.au/sedatoolbox/compressedAir.asp*.

- Leaks and pressure drops should be minimised. The pressure can then be properly matched to system demand without wasting energy and money. Pressure drops occur as the air travels from the compressor through dryers, separators, filters and piping to the point of use. This means that the pressure initially supplied by the compressor is reduced at the end of the distribution system. Unnecessary leaks and pressure drops create a situation where supply pressure must be increased to compensate for these losses.
- Pipes should be correctly sized for the velocities they are experiencing. The higher the velocity, the higher the pressure drop. Small pipe sizes often result in high air velocities that cause excessive pressure drop, leading to an increase in energy consumption.
- Pressure drops should be reduced by repairing leaks, selecting components with the lowest possible pressure drop, reducing the complexity of the distribution network (for example, minimising bends in the system) and reducing the distance air travels through the distribution system.
- Unused compressor air lines should be removed and unused equipment separated with a valve.
- The temperature of the air intake into the compressed air system should be reduced. For every three degrees centigrade reduction in inlet temperature, energy use is reduced by one per cent. This can be achieved by ducting fresh air from outside from a cool and shaded area.
- A control system that shuts off compressed air systems not required and turns on additional compressed air systems when required should be installed. Many compressed air systems have inbuilt controls to shut them off when not required. In assessing the type of control system needed, advice should be sought from a service provider of compressed air equipment.
- A VSD should be installed. The VSD allows the compressor to operate under a range of loads by accurately matching the motor speed to the actual load. This can help limit peak electricity demand by running equipment for longer at a lower output. However it should be noted that some compressors run less efficiently at part load and a VSD cannot be fitted to an existing compressor. A compressor already fitted with a VSD should be installed.
- Timer controls should be installed. These can be applied to most compressed air systems and switched off after production periods.
- The waste heat from the compressor should be used to pre-heat boiler feed water, process hot water or for other useful tasks. Up to 90 per cent of the electricity used by the compressor is converted to waste heat.
- If compressed air is used to move particles or liquid, businesses should consider installing a specially designed nozzle which can be added onto the end of existing tubing. Such a nozzle draws in surrounding air to increase the volume of air and can reduce the amount of compressed air needed for a task by 70 per cent.