

LEAKS FROM COMPRESSED AIR SYSTEMS

Compressed air is frequently used in meat processing sites for purposes such as cutting, animal handling, product sorting and pneumatic controls. Compressed air equipment operates at high pressures which can lead to leaks within piping, drains, joints, relief valves, quick disconnects, flexible hoses and filter/lubricator units. Some leaks are not immediately noticeable and are often overlooked, resulting in significant energy losses. Therefore regular detection and maintenance of leaks can result in significant energy savings.

Typically, compressed air applications account for around 1-3% of the electricity consumption on site. While this may not seem like a lot, identifying and fixing leaks is a relatively straightforward and affordable way of achieving electrical energy savings. One such example is outlined below.

FACT BOX: LIGHTNING NOMENCLATURE

A meat processing site in NSW consumes 3,097 MWh of electrical energy each year, amounting to total electricity costs of \$564,414 per year. Compressed air equipment is used air for cutting, animal handling, product sorting and pneumatic controls and accounts for ~1% of the total electricity consumption.

It was determined that a 3% electrical energy saving in the compressed air equipment operation could be achieved through the removal of leaks present in the system. This would result in a 9 MWh saving, corresponding to a **cost saving of \$1,634 per year**. Taking into consideration that the project costs (including technician fees and equipment replacement) would be \$3,780, this project has a **payback of only 2.3 years**.

DETECTING LEAKS

It is recommended that part of regular maintenance practice is to check for compressed air leaks every few months. Leaks are not easily identifiable (since the characteristic hissing noise of a leak can be hard to hear over other plant noises), and hence other techniques are used to find leaks. A simple but reliable technique is that of applying soapy water using a paintbrush to simply cover the equipment and observe bubbles where a leak exists. However, this is messy and time-consuming and for sites with larger compressed air systems it may be beneficial to use an ultrasonic detector. An ultrasonic detector detects the sound made by air leaks. Such checks are best done when the site is relatively quiet in order to maximise the chance of successfully detecting leaks.

FIXING AND PREVENTING LEAKS

Once detected, a compressed air leak can be very simple to fix however it can also be very complicated. It can be as easy as tightening a connection or as complex as replacing equipment.

Air leakage often occurs when bad or inappropriate thread sealant has been used. Hence using a good quality and appropriate sealant thread can help preventing the air leaks. Furthermore, air lost in leaks is directly linked to the air pressure. Consequently, stabilising or reducing the system pressure will minimise leakage rates.

ENERGY LOSSES DUE TO LEAKS

The amount of energy lost as a result of leaks depends on the pressure of compressed air, the hours of operation of the system per year, and of course also the size/number of leaks. Table 1 gives an indication of the annual energy waste resulting from leaks with particular size for a system running at a pressure of 700kPa for 2,000 hours per year. Here, the sizing is given in equivalent hole diameter.

Equivalent Hole Diameter (mm)	Quantity of Air Lost in Leaks (L/s)	Annual Energy Waste (kWh)
1.6	3.2	2,128
3.2	12.8	8,512
6.4	51.2	34,040
12.7	204.8	136,192

Table 1 - Air leakage and wasted energy for equivalent hole diameter (Sustainable Energy Authority, Victoria)

Assuming that the price paid for electricity is \$0.17/kWh, Figure 1 gives an indication of the energy cost savings possible by removing leaks of certain sized, depending on the hours of operation per year. The graph indicates that removing leaks with an equivalent hole size of 12mm diameter would result in an annual saving of \$40,000, for a system operating for 4,000 hours in the year.

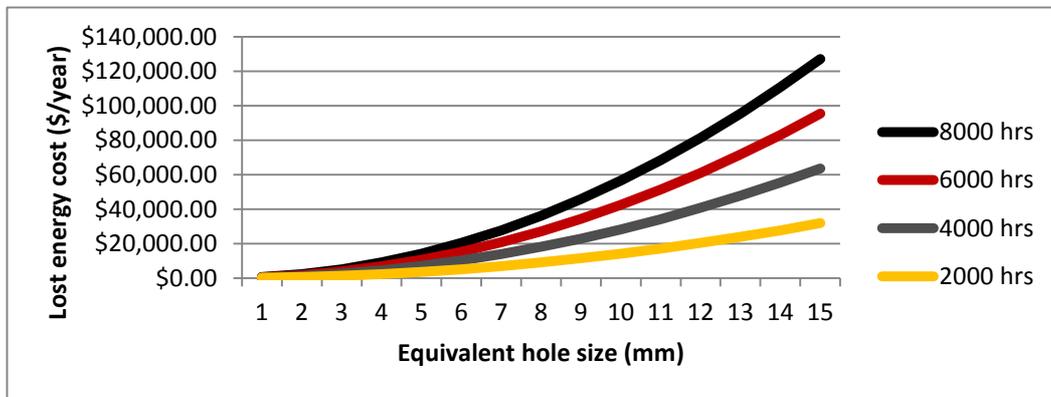


Figure 1- Energy savings resulting from the removal of leaks of certain equivalent hole size, depending on annual operation hours.