Minimize Compressed Air Leaks

Leaks are a significant source of wasted energy in a compressed air system, often wasting as much as 20-30% of the compressor’s output. Compressed air leaks can also contribute to problems with system operations, including:

- Fluctuating system pressure, which can cause air tools and other air-operated equipment to function less efficiently, possibly affecting production
- Excess compressor capacity, resulting in higher than necessary costs
- Decreased service life and increased maintenance of supply equipment (including the compressor package) due to unnecessary cycling and increased run time.

Although leaks can occur in any part of the system, the most common problem areas are: couplings, hoses, tubes, fittings, pipe joints, quick disconnects, FRLs (filter, regulator, and lubricator), condensate traps, valves, flanges, packings, thread sealants, and point of use devices. Leakage rates are a function of the supply pressure in an uncontrolled system and increase with higher system pressures. Leakage rates are also proportional to the square of the orifice diameter. (See table below.)

Leak Detection

The best way to detect leaks is to use an ultrasonic acoustic detector, which can recognize high frequency hissing sounds associated with air leaks. These portable units are very easy to use. Costs and sensitivities vary, so test before you buy. A simpler method is to apply soapy water with a paintbrush to suspect areas. Although reliable, this method can be time consuming and messy.

### Leakage rates\(^a\) (cfm) for different supply pressures and approximately equivalent orifice sizes\(^b\)

<table>
<thead>
<tr>
<th>Pressure (psig)</th>
<th>Orifice Diameter (inches)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1/64</td>
</tr>
<tr>
<td>70</td>
<td>0.3</td>
</tr>
<tr>
<td>80</td>
<td>0.33</td>
</tr>
<tr>
<td>90</td>
<td>0.37</td>
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<tr>
<td>100</td>
<td>0.41</td>
</tr>
<tr>
<td>125</td>
<td>0.49</td>
</tr>
</tbody>
</table>

\(^a\) For well-rounded orifices, multiply the values by 0.97, and for sharp-edged orifices, multiply the values by 0.61.

\(^b\) Used with permission from Fundamentals of Compressed Air Systems Training offered by the Compressed Air Challenge™.
Example

A chemical plant undertook a leak prevention program following a compressed air audit at their facility. Leaks, approximately equivalent to different orifice sizes, were found as follows: 100 leaks of 1/32” at 90 psig, 50 leaks of 1/16” at 90 psig, and 10 leaks of 1/4” at 100 psig. Calculate the annual cost savings if these leaks were eliminated. Assume 7000 annual operating hours, an aggregate electric rate of $0.05/kWh, and compressed air generation requirement of approximately 18 kW/100 cfm.

Cost savings = # of leaks x leakage rate (cfm) x kW/cfm x # of hours x $/kWh

Using values of the leakage rates from the above table and assuming sharp-edged orifices:

Cost savings from 1/32” leaks = 100 x 1.5 x 0.61 x 0.18 x 7000 x 0.05 = $5,765
Cost savings from 1/16” leaks = 50 x 5.9 x 0.61 x 0.18 x 7000 x 0.05 = $11,337
Cost savings from 1/4” leaks = 10 x 104 x 0.61 x 0.18 x 7000 x 0.05 = $39,967

Total cost savings from eliminating these leaks = $57,069

Note that the savings from the elimination of just 10 leaks of 1/4” account for almost 70% of the overall savings. As leaks are identified, it is important to prioritize them and fix the largest ones first.