

Are oil-free compressors worth the investment?

In recent years there has been a rise in the number of industrial applications requiring oil-free compressed air. Though many compressors still use oil for lubrication purposes and filter it out, some manufacturers have responded with the introduction of machines that do not use any oil at all. However, oil-free compressors often come at a higher price than oil-lubricated equivalents, can be less energy efficient, cost more to maintain and still require downstream filtration to ensure 'oil-free' air. So are they the most appropriate option? Here, **Andy Jones**, general manager at **Mattei**, discusses the pros and cons



Mattei offers five filtration specifications and can supply oil-, vapour- and odour-free compressed air

Oil-free compressed air is being demanded on a more frequent basis, and machines that don't use any oil at all are being hailed as the optimum solution. But, with the filtration levels of oil-lubricated machines reaching an all time high, a factory manager has to ask if it's worth paying more for an oil-free machine, especially when it's likely to increase energy costs and won't actually remove other contaminants such as dust and hydrocarbons which are drawn into the compressor from the atmosphere. These still need to be removed by filtration in order to ensure that the final compressed air supply meets the client's air quality requirements.

At Mattei we have striven to improve our filtration mechanisms to ensure that our rotary vane compressors can be used in oil-free applications - for example in food, beverage and pharmaceutical industries, where oil could contaminate products or ingredients.

Nowadays, oil removing filters have reached exceptional levels of performance. An oil-lubricated machine can now provide a quality of air over and above the ISO 8573-1 compressed air contaminants and purity standards, simply and cost effectively. In fact, modern filtration devices are capable of making compressed air 400 times cleaner than the air we breathe.

In a Mattei compressor, oil removal occurs at several stages. The primary mechanical separation occurs in the oil chamber, at the outlet of the rotor/stator unit, by continuous changes of air direction through a labyrinth path. Secondary mechanical separation occurs at the separator inlet, prior to the filter. Final separation occurs via an integral coalescing filter. Mattei only uses high quality

separator filter elements, which can last for up to 10,000 hours, ensuring that our machines have low oil carry-over throughout their operating lives.

This arrangement means that the oil quantity carried over is less than three parts per million as standard, in accordance with ISO 8573-1 class 4. However, the oil content can be further reduced to less than one part per million with additional filtration - so our machines can be used where 'oil-free' compressed air is a requirement.

An alternative option

Producing oil-free air with an oil-lubricated compressor and filtration is an alternative option, and actually offers several advantages over specifying a completely oil-free machine.

Firstly, oil-lubricated compressors cost less to purchase and maintain than oil-free machines. This will depend on the size of compressor, but the difference can be significant.

Secondly, on average, oil-free machines will absorb more power than oil-lubricated compressors, making the latter more economical to operate. This is because oil retains heat during compression, which increases performance efficiency. Oil acts as a coolant, and in a lubricated compressor it removes around 80 percent of the heat produced during air compression, thereby keeping the temperature of the compression process at around 80 to 90°C. In contrast, an oil-free compressor, due to the omission of oil, will see temperatures reaching 170 to 180°C during compression. A temperature increase of 10K represents an energy loss of one to one and a half percent, therefore we can conclude that oil-lubricated compressors are 10 to 15 percent more energy efficient than oil-free machines.

Thirdly, oil-lubricated compressors are capable of capturing other contaminants besides oil. As well as containing oxygen, nitrogen and rare gases, air also contains water vapour, dust, oils, hydrocarbons and combustion residuals. And, in an industrial area, the quantities of these impurities can be four to five times higher than in urban areas, containing up to 150 million particles per cubic metre. This can be increased by up to eight times once air is compressed to a pressure of seven bar.

All of these impurities will be drawn into a compressor, whether it is oil-free or oil-lubricated. However, approximately 80 percent of these particles have a diameter of less than two micron, and therefore can't be retained by the air intake filter - so additional filtration will always be a necessity.

Whereas in an oil-free compressor all the impurities will be exhausted through its air outlet to the external filters, in a lubricated compressor the oil will capture and retain many of the particles and noxious gases, allowing removal by the internal mechanical and coalescing separation process prior to the air reaching the external filtration system. This guarantees high air quality and reduced downstream filter maintenance costs. Mattei offers five filtration specifications and can supply oil-, vapour- and odour-free compressed air.

Technological advances

In recent years we have definitely seen an increase in demand for oil-free compressed air, and there may be a place for oil-free compressors. However, contrary to a common misconception, these are not the only option for achieving oil-free air. In fact, technological advances in oil-lubricated compressor design and filtration materials means that factory managers can achieve air quality requirements while still meeting the economical demands of their business.

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