

5 environmental factors affecting the performance of air compressors

Some manufacturing industries utilise air compressor systems to supply the pressurised gas that drives their processes. While such equipment often increases productivity, various physical factors can disrupt its performance. Operators incorporating air compressors into their processes must therefore be aware of these influencing factors in order to mitigate them appropriately.

What factors affect the flow rate performance of an air compressor?

Like any other industrial equipment, the efficiency of an air compressor system can be negatively affected by a variety of physical variables.

For systems that do not operate in a vacuum, factors that can affect the effectiveness of any given air compression system operating under standard conditions include

Altitude/altitude

Ventilation of the industrial space

Humidity levels in and around the machine

Operating temperature in the surroundings

Presence of contaminants in the air

1. Altitude / Altitude

A key factor in determining the performance of an air compressor is the altitude at which the machine is operated. For example, the operating altitude or altitude of a rotary screw air compressor can significantly affect overall performance.

As altitude increases, the nominal atmospheric pressure will drop, the compression ratio will decrease accordingly and the approximate capacity of the compressed gas delivery will be reduced (in SCFM). Operators must therefore consider at what altitude their air compressor will be operating and calibrate it appropriately to achieve maximum output.

2. Ventilation

In addition, the air compression process is associated with thermal changes. Reducing the volume of air to increase its pressure level releases a significant amount of compression heat, which should be dissipated in the best interest of optimum equipment function. A well ventilated environment is valuable in preventing heat trapping around air compression systems.

An additional benefit of maintaining a well-ventilated operating space is the protection of heat-sensitive equipment components. In addition, it makes it easier to eliminate water vapour from the new compressed air as the environment cools rapidly.

3. Humidity

In many industrial systems the retention of water vapour usually has a detrimental effect on production results. The presence of moisture in and around air compression systems is no exception. There is also the risk of corrosion damage, the build-up of rust within process equipment and exposure to sensitive electrical components. For these reasons, air compressors must be located in areas where moisture is less likely to accumulate. If the air compressor must be placed in an environment with high humidity, special precautions should be taken to actively maintain an appropriate level of water vapour.

4. Temperature

In addition, extremes of temperature can have a bad effect on industrial air compression systems. Very hot or very cold operating temperatures can damage sensitive compressor components and reduce the life of the equipment. For this reason, manufacturers usually specify the temperature ranges within which compressors should be operated. In order to prevent costly downtime, compressor operators should keep the ambient temperature at their premises within the stated range.

5. Contaminants in the air

Although most compressors have an external compartment and filter that shields most airborne contaminants (such as dust, dirt and other particulate materials), operators must regularly maintain their equipment. Each manufacturer has recommendations on how often filters should be cleaned or replaced. Adherence to these maintenance standards is essential to optimise the performance of air compressors.

Optimum operating conditions for air compressors

Determining the optimum temperature for operating an air compression system is a key step in any industrial setup that requires a steady flow of compressed air to drive its processes. Since we know the detrimental effects of temperature on air compressors, determining the optimum thermal conditions is very straightforward.

The ideal temperature for most air compressors is between 50 °F and 85 °F. Within this range, there is no risk of freezing or overheating of compressor components. An informal way to assess whether your compressor is operating within the ideal thermal range is to use normal body temperature. For example, if you feel uncomfortably hot or shivering in standard work clothes near an air compressor, then the ambient temperature may not be suitable for the machine either.

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