



NOT ALL ROTOR COATINGS ARE CREATED EQUAL: WHAT IT MEANS FOR YOUR OIL FREE ROTARY SCREW AIR COMPRESSOR

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When considering oil free rotary screw air compressors, composition of the rotor coating should be a consideration in the buying journey. It may not seem like a likely candidate, but it should be near the top of your list for reasons explained in this blog.

Why Rotor Coating is Important

Rotor coating is critical to ensure the efficient operation of an oil free screw air compressor over a long period of time. Rotor coating helps with reducing the gap between rotors; sealing; protecting the rotors against high temperatures and corrosion; reducing friction of the air passing through the rotors during the compression process, reducing wear, and keeping energy consumption at a lower level.

In an oil flooded rotary screw air compressor, oil is injected into the compressor chamber to help avoid friction between the rotors, sealing and to decrease the temperature. In oil free rotary screw air compressors,

there is no oil in the compressor chamber; really, there is nothing more than air in the compressor chamber. In other words, there is no oil to seal between the rotors, making the rotor coating extremely important. If you lose rotor coating on an oil free rotary screw air compressor, your compressor won't be functional.

Rotor Coating Base Options

PTFE and MoS₂ are the two primary base components recognized in the market for oil free air compressor rotor coatings.

1. Polytetrafluoroethylene (PTFE)

- Melting point: 620° F / 326° C
- Initial decomposition temperature: 392° F / 200° C

2. Molybdenum Disulfide (MoS₂)

- Melting point: 2165° F / 1185° C
- Initial decomposition temperature: 1200° F / 650° C*

You'll notice the sharp contrast in melting point between the two: 620° F for PTFE, versus 2165° for MoS2.

If your oil free rotary screw air compressor runs at a high pressure, high altitude and/or in a high ambient temperature, the machine can easily run close to 400° F (close to decomposition temperature of PTFE). This means in compressors with PTFE-coated rotors, it is not unlikely for coating decomposition/degradation to take place. When the compressor operates in high temperatures, the rotor coating materials can begin to degrade. This is the reason many compressor manufacturers using PTFE coating require the compressor to be installed and run in a stable operation of temperature and humidity (it really means at low temperature and low humidity). Otherwise, the rotor coating will potentially degrade.

The reason for this is because the two biggest enemies of oil free compressors are humidity and high temperature. Why temperature? Because temperature makes the PTFE unstable. Why humidity? Because humidity could create micro-corrosion in the points where the coating starts degrading. The corrosion then continues spreading in the rotor, increasing the level of degradation.

When the degradation of the rotor coating occurs, your oil free rotary screw air compressor will likely experience:

1. Decrease of performance
2. Increased power consumption
3. Increase of temperature of the outlet of the air ends
4. Increased risk of multiple shutdowns
5. Increased risk of failure

When one or more of the five above occurs, there is only one costly solution to fix it: replacing one or both of the air ends. Depending on the compressor manufacturer, **the cost of replacement is generally 50-65% of the cost of the equipment altogether!**



Signs of rotor coating degradation

Summary

Humidity and high temperatures are the two biggest enemies of the oil free rotary screw air compressors. To ensure that your compressor is going to be reliable, efficient and durable, you need to be sure about **what kind of rotor coating is used on the air ends and on the housing of your oil free rotary screw air compressor.**

Remember and recognize that the most common damage in an oil free rotary screw air compressor is rotor coating degradation.

Also recognize that when MoS2 is used as the base for coating the rotors and housing on oil free screw compressors, customers will have a huge advantage when it comes to reliability, durability and performance, so be sure to make a good decision and opt for the better coating.

* Source: <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19690013627.pdf>