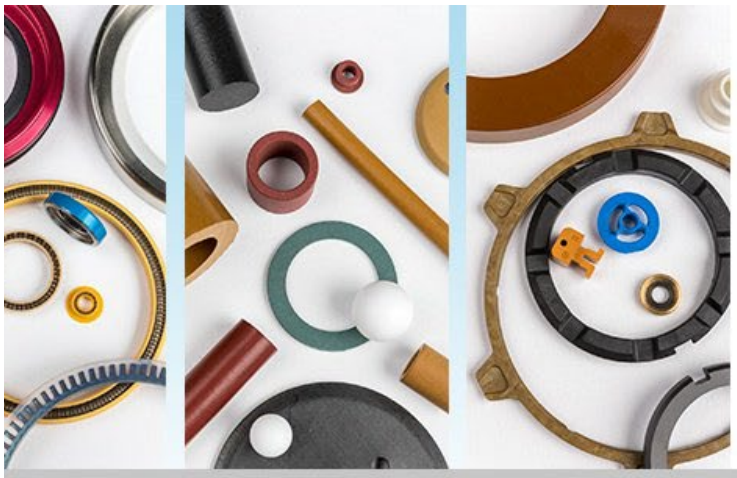

The Critical PARTner

Industrial Strength Rotary Lip Seals: Critical Parts in Air Screw Compressor Systems

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THE CRITICAL PARTNER

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In the manufacturing and industrial field, having a reliable energy source to generate power and perform functions can make or break a business. This is why compressor air systems are a critical part and imperative for both small and large-scale businesses. Just how important are they, and what can happen if they are not working effectively? An estimated 30 to 50 percent of energy used in a compressed air system is wasted during operation.

Businesses not only have to self-regulate their production but also face the challenge of stringent standards from government bodies and industry groups that require today's air compressor systems to meet peak energy efficiency and performance targets. As a result, manufacturers are driven to gain a competitive edge through cost-effectiveness, safety and reliability, design efficiency, and storage. Utilizing precise fit seals or polymer components supports these strategic goals.

Because of the working conditions, some of the industry's toughest sealing challenges come from compressors as they are used in industrial manufacturing, oil refineries, petrochemical processing, chemical processing, food and beverage, textile, mining, environmental, and life sciences markets. These applications involve toxic, combustible, or caustic environments as well as high-pressure; therefore, they need to have reliable parts such as seals or bearings to help with leakage and other issues.

Compressors come in different types: vane, scroll, centrifugal, reciprocating, and screw. Rotary-screw compressors leverage pneumatics and rotors to compress gas with the help of screw actions. They often replace piston compressors in situations requiring high volumes of compressed air pressure, such as with industrial applications, and are less noisy and easier and less expensive to operate and maintain. Rotary-screw compressors offer better efficiency and reliability due to improved rotor profiles, which have reduced internal leakage. They can also offer economies of scale over other options, particularly as horsepower (HP) levels increase. While a 250 HP compound compressor is a large piece of equipment often requiring its own foundation, a 250 HP rotary-screw compressor is generally considered "compact" and can be moved with a forklift and rest on the shop floor. Rotary-screw air compressors can handle low and high-pressure appliances ranging between 7 to over 100 bar respectively.

They make up the majority of the market share in the global compressor market, valued at $36.6 billion in 2017 and expected to reach $45.7 billion by 2023, of which rotary screw compressors contributed the majority of the market share in 2017, and is expected to continue holding the larger share

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through 2023, according to Prescient & Strategic (P&S) Intelligence. And Markets and Markets agrees the rotary screw segment of the compressor rental market is projected to grow at the highest CAGR from 2016 to 2026.

Demand for screw compressors is being driven, in large part, from industrialization in emerging economies (with Asia Pacific and China, in particular, as examples – read more on this past blog about growth in Asia) and growing needs for efficient tools & machinery in them. However, screw compressors are also used in oil and gas, automotive, and life sciences industries, with oil-free screw compressors often used in the latter to avoid potential contamination from oil-related machines. Oil-free screw compressors are also used in food and beverage, where avoiding contamination from external particles in compressed air is also necessary. Here oil-free screw compressors are regularly used to maintain air quality standards.

Up to 30% of industrial jobs could not be done without high-density, high-pressure air pumped by rotary screw compressors, and if they malfunction, the result could be very costly in time and money. Analysts estimate that factories lose anywhere from 5 to 20 percent of productivity to downtime overall. And some studies estimate the cost of unplanned downtime at $50 billion each year for industrial manufacturers.

How do sealing solutions like OmniSeal® polymer rotary lip seals work in rotary screw compressor systems to help ensure reliability and performance?

The Strength of Rotary Lip Seals

OmniSeal® rotary lip seals, which are made from various types of PTFE, came onto the market in the early 70s. They were designed to bridge the gap between conventional elastomer lip seals and mechanical face seals to significantly help improve performance. They also perform in extreme temperatures, aggressive media, with high surface speeds and high pressure, and do not require lubrication. As such, they are used in pumps, gearboxes, motors and mixers, in addition to compressors.

Saint-Gobain Seals developed their OmniSeal® metal-cased lip seals to work well in industrial applications such as oil-free and lubricated compressors. The seal retains the oil inside the airend, but also keeps air, dust, and dirt from sucking in along the rotating shaft when the machine is off load. Rubber lip seals proved to be ineffective as they could not withstand high pressures and can result in a leak.

How strong is rotary screw technology? Can you believe that this same technology is being utilized by superchargers, designed to increase pressure and density of fuel in high-performance automotive internal combustion engines to help them to work harder?! Supercharging adds about 46 percent more horsepower and over 30 percent more torque to engines, and Saint-Gobain Seals also provides rotary lip seals for this application (read more about this case study as well as others in the PTFE lip seal handbook).

OmniSeal® lip seals address high speeds (shaft speed of 4,000 – 14,000 RPM and surface velocity of 525 – 7,000 feet/minute) as well as temperatures (up to 350°F / 177°C). They address vacuum pressures of 25 PSI (1.7 BAR), require limited lubrication, and offer an extended seal life.

Don't Screw Around; Use Reliable Sealing Solutions for Your Screw Compressor

As mentioned, rotary screw air compressors are used in many businesses around the world and are very versatile. With this global need, there are many benefits that this machine's technology and the critical seals inside them provide. Following are four aspects of rotary lip seals to look for:

- Cost-effectiveness: Rotary screw compressors are made to operate for long periods of time, and overall production costs decrease in most manufacturing and industrial applications when using reliable sealing parts that do not fail. OmniSeal® lip seals have been shown to exceed seal life in screw compressors, greatly reducing warranty claims for manufacturers as a result. They also offer tight leakage control, with vacuum pressure up to 400 PSI (27 BAR), and are able to run with a wide range of lubricants.

- Safety and stability: Rotary screw air compressors power a multitude of machines and systems, which operate in extreme conditions or temperatures. They must be able to handle furnace-like heat, extreme cold, and high pressure. OmniSeal® rotary lip seals have a life in excess of 15,000 hours, can handle wide temperature ranges from 65°F to 450°F (-53°C to 232°C), function well under high pressure in excess of 500 PSI (34 BAR) and withstand high speeds in excess of 7,000 ft./min. (35 m/s). They also meet strict EPA leakage requirements, providing tight leakage control.

- Design efficiency: Because rotary screw compressors are adjustable in nature, they are one of the most efficient and versatile power

sources for industrial applications. OmniSeal® rotary lip seals are designed with the same flexibility, as they can be custom-designed to be compatible with a wide range of oils, refrigerants and abrasive media.

- Storage: Accessing and storing rotary screw compressors can be a challenge; the same can be said for the internal parts. OmniSeal® rotary lip seals are easily installed as they accommodate a small space within the system.

You can find more technical details as well as benefits of rotary lip seals in this rotary screw compressor case study where Saint-Gobain Seals' team in China is helping many key businesses to keep running efficiently; they also support other compressor systems such as scroll compressors as you can read in this scroll compressor case study.. Rotary screw compressors utilize some of the most advanced technology available in the industrial compressor industry; they offer a critical function in providing continuous compressed air for precision tasks. With reliable rotary lip seals from design engineering companies like Saint-Gobain Seals, these core systems can run 24 hours a day, 7 days a week, for many years . . . and keep our world moving!

Want to know how your compressor system can be cost-effective, safe and reliable? Contact our industrial sealing and polymer experts.

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Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the wellbeing of each of us and the future of all. They can be found everywhere in our living places and our daily life: in buildings, transportation, infrastructure and in so many industrial applications.

Saint-Gobain Performance Plastics' group of businesses gather solutions to save energy, provide protection, improve comfort and sustain the environment for a variety of markets.