



Omniseal Solutions
SAINT-GOBAIN

BEYOND
the boundaries of possible



LIFE SCIENCE CASE STUDY

PORTABLE OXYGEN CONCENTRATOR (POC) AIR COMPRESSOR





RULON® FLUOROPOLYMERS

○ Portable Oxygen Concentrator (POC) Air Compressor

Jeff Ribley & Joan Maldonado January 2025

LIFE SCIENCE LOW FRICTION & WEAR LEAKAGE CONTROL DRY RUNNING

Environment

Portable oxygen concentrators (POCs) are equipped with air compressors, which force air through molecular sieves to absorb nitrogen and leave remaining air that is concentrated with oxygen. These compressors generally use a “wobble” design and piston cup seals. The piston moves up and down in the cylinder to drive the piston rod off center, while the cup seal twists in the cylinder on each stroke – hence where the term “wobble” comes from.

Piston cup seals are critical due to two functions. Firstly, the seal must function as a bearing. If the seal is removed from the hardware, the piston will hit against the cylinder wall. Secondly, since compressors need to run completely dry, the seal provides leakage and wear control.

Given the typical motor rpm of thousands of cycles, the flexural stress on the seals is quite high; therefore, it is important for the POC to run thousands of hours without maintenance or failure. Consumers expect that they can rely on the POC running for up to five hours before recharging. In addition, low frictional loads are beneficial to reduce power consumption.

Challenge

Customers are focused on improving their consumer's overall experience. Desired POC enhancements include:

- Extended battery life
- Silent compressor motor
- Lighter weight equipment for easier mobility
- Packaging such as smaller ergonomic equipment



As a result of these current expectations, piston cup seals are relied upon for consistent and high quality performance. In order to meet these critical requirements, the part must withstand high wear, handle temperature variance, maintain a dry running environment, and operate as both a low friction bearing and seal.

Solution

Both material and manufacturing process are key to creating a quality piston cup seal for portable oxygen concentrators. Our Rulon® cup seals are custom designed to perform in various air compressors in the medical market, successfully providing long life battery service with excellent wear and leakage control in a dry running environment. The seals are manufactured with proprietary blends of our Rulon® fluoropolymers that offer excellent wear, chemical and corrosion resistance, and low weight solutions. In partnership with customers, there are several ongoing R&D projects, including testing of unique materials and fillers to improve current material offerings for POCs. This is developed on a coordinated global basis with our R&D centers and engineering experts.

**Rulon® piston cup seals assure OEMs
and consumers peace of mind**

Benefits

Providing quality air and reliable functioning of portable oxygen concentrators for the consumer is invaluable – a goal we help customers achieve to improve patient care and wellbeing. Extending life of the equipment also improves the end user's overall experience. In the future, there will be a need for newer materials and smaller, custom seal designs, which will be developed to enhance current equipment functionality. This pioneering direction is truly connected to our team's mission to go beyond the boundaries of possible.



Omniseal Solutions
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Need Help To Solve The Insoluble?
Contact Our Experts!

Design Expertise & Tailor-made Solutions for Your Critical Applications

Omniseal Solutions is a global engineering leader with over 65 years of historical legacy, relentlessly dedicated to the design and manufacture of precision sealing and wear and friction control solutions that protect critical applications in the most demanding environments and passionately driven to push “Beyond the Boundaries of Possible.”

Contact Our Life Science Team



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boundaries of **possible**

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