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# Advantages of high-performance rotary seals for industrial electric motors

By Rachael Pasini | September 1, 2023



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Many industrial sectors, including aerospace, semiconductor, automotive, and biopharmaceutical, require rotary seals as original equipment manufacturers (OEMs) switch from hydraulic to electric motor systems for greener solutions and improved product performance. Globally, the industrial sector is responsible for 33% of greenhouse gas emissions, and in the US, industry is the largest source of energy-related carbon dioxide (CO<sub>2</sub>) emissions.<sup>1</sup> Additionally, electric motors play a key role in working toward the International Energy Agency's goal to reach net zero emissions by the year 2050.<sup>2</sup>

One-third of all electricity is converted into motion by electric motors, and the expectation is that the number of these motors will double by 2040.<sup>3</sup> This demand is causing more manufacturers to focus on achieving IE5 motor efficiency. Currently, there are five International Efficiency class ratings, IE1 to IE5, with each level reducing energy loss in motor operation by 10 to 20 percent. Governments do not require anything higher than IE3, so an IE5 rating is a strong differentiator.<sup>4</sup> High-performance rotary seals can help OEMs achieve an IE5 rating due to their low-friction qualities, which reduce power loss.

As dry-running systems, electric motors operate on reduced lubrication versus their gas-powered wet-running counterparts. Therefore, they require specific sealing solutions to manage friction and heat generation. Electric systems have fewer sealing components but still require long-life sealing products. The seals must protect the motor by keeping oil and grease on the rotating shaft and prevent the ingress of dust and dirt. The type of rotary seal used for high-speed low-friction industrial motors depends on the complexity of the application.

Reducing power loss across the system is another function of the seal, so there is less energy required to power equipment or to convert into performance. Friction from the bearings and the sealing arrangement both affect power loss, so balancing sealing capabilities with the need for minimal friction is a challenge.

## Choosing the right seal

Elastomer radial lip seals are traditionally a primary rotary seal in standard wet-lubricated systems because they have excellent sealing performance and easy installation. However, elastomer radial oil seals struggle to stand up to the conditions of electric motors, such as increased rotary speeds, reduced lubrication or dry running conditions. Elastomer seals also create greater friction resulting in high power loss.

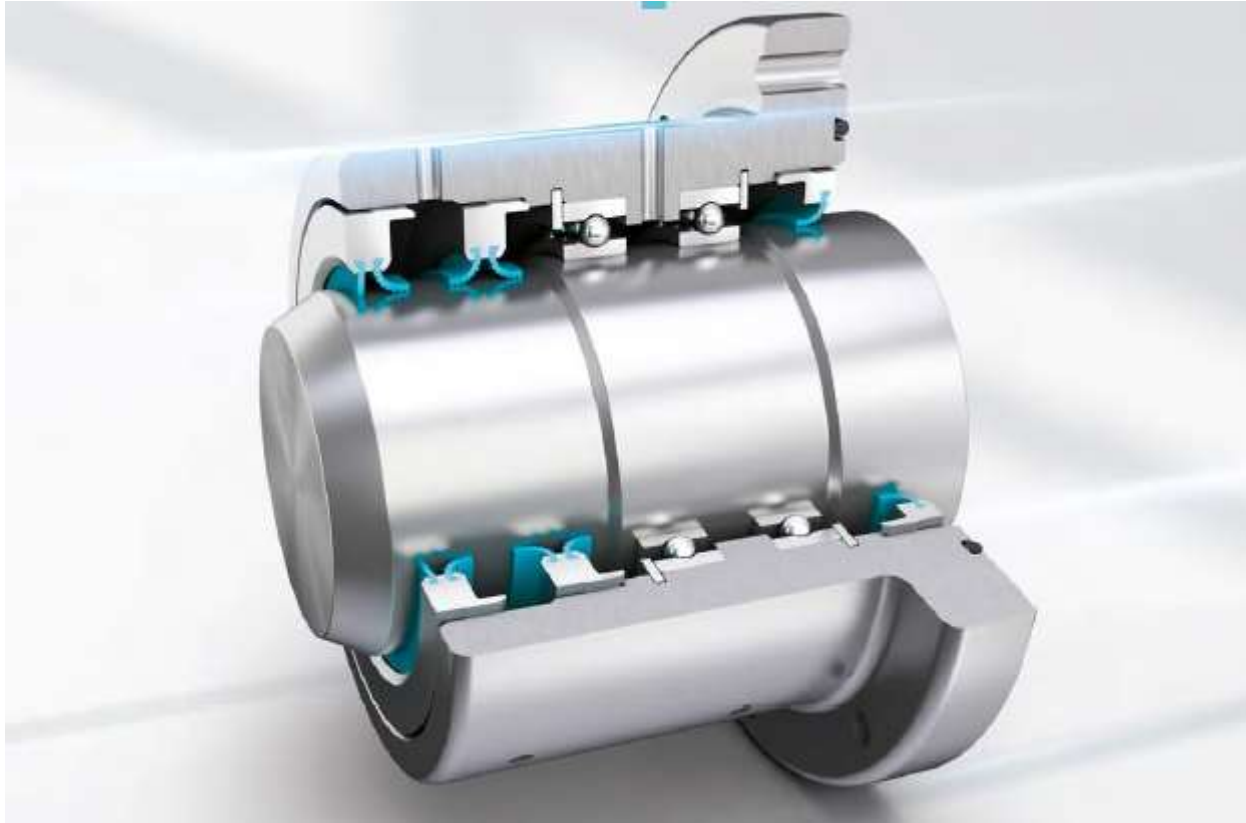
Polytetrafluoroethylene (PTFE) rotary lip seals are an excellent alternative, featuring benefits that suit the demands of electric motors and high-speed, critical environments, including:

- Ability to withstand high speeds of up to 100 m/s
- Extremely low friction performance compared to elastomer radial lip seals
- A wide operating temperature range -148° F to 500° F (-100° C to 260° C)
- Ability to run dry
- Compatibility with most lubricants
- Inertness to most chemicals
- Low break out force and no stick slip
- High wear resistance

PTFE rotary lip seals are proven in applications for leading technologies such as aerospace, semiconductor manufacturing and motorsports like Formula 1, where achieving challenging application conditions to provide long-term performance is critical. They also help meet the new performance challenges in growing markets like e-mobility and other applications utilizing electric rotary motor technology.



electric vehicle applications and industrial automation.



*Trelleborg's proprietary HighSpin PDR rotary seal has a mechanically retained PTFE sealing element and a precision-manufactured metal body. Image: Trelleborg*

To achieve performance requirements, an expert sealing partner will not only offer high-performance rotary seals for industrial motor applications but also the technical services to back them up. This may include having multiple manufacturing facilities globally where experts perform rotary testing and use Finite Element Analysis software to specify the best seal for an application.

### Conclusion

Today's focus on reducing global warming and increasing energy saving drives industrial motor OEMs to switch from hydraulic to electric motors. These motors have specific sealing requirements that can only be met with high-speed rotary seals that protect the motor by keeping oil and grease on the rotating shaft while offering low friction characteristics. An expert sealing partner like Trelleborg can help OEMs by determining the optimal rotary seal for the demands of a given application and providing the capacity to deliver the required project volumes.

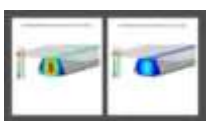
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[trelleborg.com/en/seals](https://trelleborg.com/en/seals)

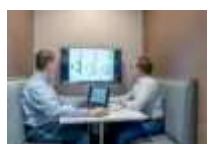
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