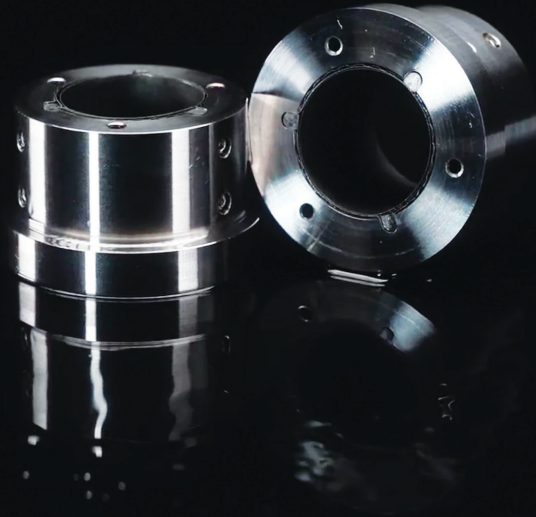


# Advanced Foil Bearings

Combination of Aerodynamic and Aerostatic Bearings *by OAV*



In this exclusive Bearing News Interview, Murat Erturk, Chief Executive at OAV Air Bearings, discusses his company's newly designed foil air bearings for frictionless and high-speed precision motion applications. Mr. Erturk provides a detailed overview of the higher generation products that will impact the air bearing market that is set to surpass \$13Bn by 2030. Through this comprehensive interview, understand how the new aerodynamic bearings improve load-carrying capacity and dynamic stability, and why companies are replacing conventional oil-lubricated bearings with OAVs products. With a wide range of applications, OAV Foil Air Bearings are in continuous demand due to low maintenance cost and high-efficiency speed and accuracy.

**Can you tell us more about your background and current activities at OAV Air Bearings?**

I am Chief Executive and Leader of Innovation and Technology at OAV Air Bearings. Also the Chairman of the Board of OAVCO and an Advisory Board member in several other groups and companies. OAV

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**Higher-generation bearings have been developed, to further improve the load-carrying capacity and dynamic stability.**

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was originally founded to produce machine components in 1964. In 2001, the company evolved into an aerospace-oriented manufacturer of mechanical devices supporting the aerospace and defence industries – primarily but not exclusively in manufacturing precision bearings. OAV Air Bearing launched after, focusing on developing air bearings for frictionless and high-speed precision motion applications.

### **What are advanced foil aerodynamic bearings?**

The rigid bore aerodynamic bearings primarily experience two major problems: low load-carrying capacity and instability arising from self-excited air whip and modal vibrations. To eliminate these issues, the aerodynamic bearings have compliant surfaces that have been specially designed. Bump-type foil bearings are one such compliant-bore aerodynamic bearings, known for their high load-carrying capacity and improved stability of rotors supported on them.

In the first-generation bump-type foil bearings, the symmetrical stiffness

behaviours (in circumferential and axial directions) of the supporting compliant foils have been employed to achieve better stability. To further improve the load-carrying capacity and dynamic stability, higher-generation bearings have been developed. The foil geometry and stiffness variation in either axial or circumferential direction has been altered in the second-generation bump-type foil bearings. In contrast, in the third-generation bearings, the customizations have been made synergistically in both axial and circumferential directions.

The OAV team has gone one level higher to develop higher-generation advanced bump-type foil aerodynamic bearings to enhance their load-carrying capacity and dynamic performance several times higher than the other conventional bump-type foil bearings.

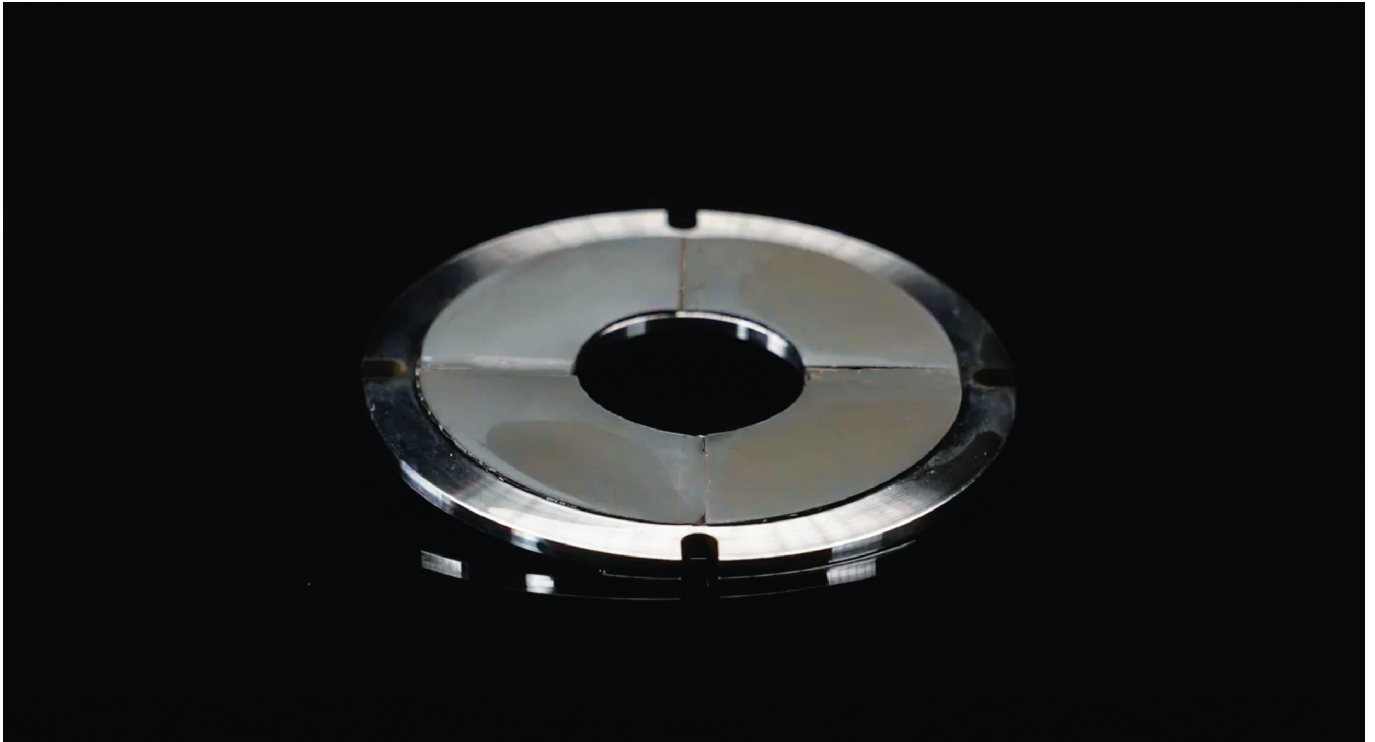
### **Can you tell us more about the new design?**

The development of foil air bearings began in the early 1970s to provide rotational guidance for gas turbine shafts. Foil bearings, also known as foil air bearings,

are a type of air bearing where the surface is supported by a compliant, spring-loaded foil journal lining. Once the surface is spinning fast enough, the air pushes the foil away from the surface so that no contact and no wear occur. The surface and foil are separated by the high pressure from the air, generated by the rotation that pulls gas into the bearing via the viscosity effects. OAV Foil Air Bearings can operate under the most demanding systems without the requirement for external supply. OAV's advanced method makes the OAV foil air bearings unmatched. OAV's novel design is for OAV to focus on eliminating the adverse effects of rotational speed, unbalanced eccentricity, and rotor mass on the non-linear response. We use a combined approach that treats air and structure as two computational areas to solve common issues, reach higher load capacities, better the damping effect and the start-up, and eliminate the concerns of foil air bearings. The OAV foil bearings are classified into two categories: OAV thrust foil bearings and OAV radial foil bearings. Based on load direction, customers can choose from thrust and radial foil bearings. The next-generation OAV foil bearings have modified

*Murat Erturk  
Chief Executive at OAV Air Bearings*





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foil characteristics (shape, number, etc.) to match the industry's current needs. With these new design changes, OAV foil bearings can accommodate a slight misalignment in the rotor without considerable changes in the bearing performance. Additionally, a special coating on the top foil surface enhances the life of OAV bearings by minimising friction and wear at the start and stop of the rotor.

#### **Which are the main applications for these types of bearings?**

With the target of achieving 'net zero,' the

high-speed turbomachinery industries are replacing conventional oil-lubricated bearings with greener air bearings. Thus, OAV is committed to providing next-generation oil-free foil bearings having several orders of higher load-carrying capacity and much better dynamic stability to the industries. Typically, these bearings are widely used in air cycle machines of fighter and commercial space crafts, turbo-pumps of space launch vehicles, cryogenic turboexpanders, high-speed automobile turbochargers, medical centrifuges, miniature gas turbine engines, fuel cells, spindles of textile and food processing industries, and many more.

#### **Are there any other benefits and innovations connected to the new design?**

Since OAV has standardized the sizes of its thrust and radial foil bearings, these products are offered off-the-shelf with quick delivery time. OAV Foil Air Bearings do not require any major overhaul/maintenance

since there is no contact between the rotor and the bearings during their operation. The OAV foil bearings have a distinguished advantage in their operating temperature range from cryogenic -40 °C to extremely hot 650 °C environment.

#### **How do you predict the market and usage of this new technology in the near future?**

The air-bearing market is estimated to surpass the valuation of US\$ 13 Bn by 2030—advanced designs in air bearings to accommodate high loading and provide more damping are a driving factor for the market to surpass. Continuously increasing demand for air bearings because of low maintenance cost and high-efficiency speed and accuracy is a driving factor for immense boost.

*More information about OAV Air Bearings can be found on the OAV website [www.oavco.com](http://www.oavco.com).*

