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TruStory

Mazda MX-30 e-SKYACTIV R-EV: Extended range with lightweight rotary engine innovation

Car manufacturer relies on HVOF Thermal Spray solutions from Oerlikon Metco

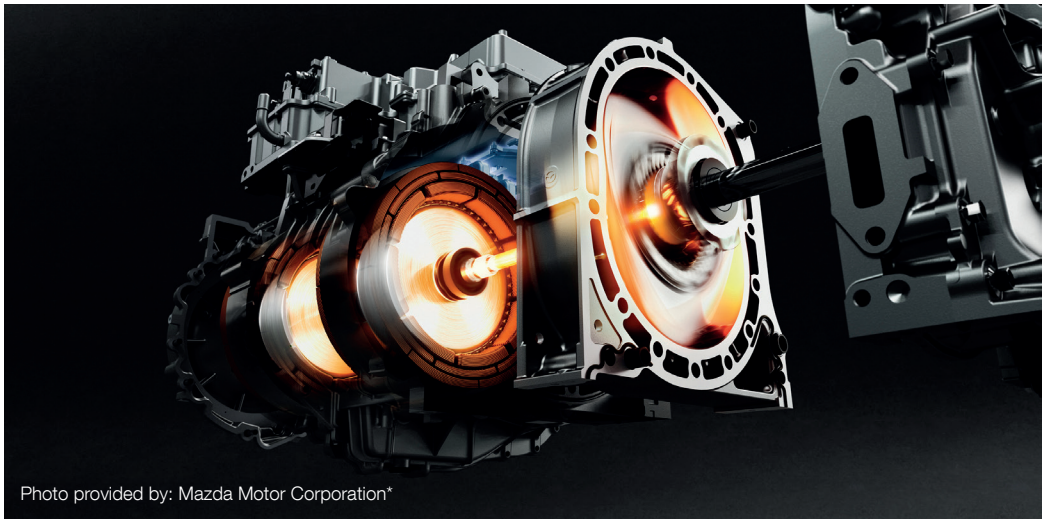

Photo provided by: Mazda Motor Corporation*

Innovation in the automotive industry has been a driving force for change towards sustainability and efficiency. The MX-30 e-SKYACTIV R-EV exemplifies Mazda's innovative approach to automotive design. By repurposing the traditional rotary engine (Wankel) as a range extender in a plug-in hybrid powertrain, Mazda leveraged compactness and lightness to extend the vehicle's range significantly.

However, the pioneer in automotive engineering, faced a unique challenge with its MX-30 e-SKYACTIV R-EV project: the car maker aimed to optimize the rotary unit of this model by transitioning from cast iron to aluminum, seeking to reduce weight by 15 kg while maintaining durability and performance. Oerlikon's advanced thermal spray solution using HVOF technology played a pivotal role in Mazda's transformation.

With a reputation spanning decades in the Japanese market, Oerlikon Metco emerged as the preferred choice for Mazda. Renowned not only for superior equipment quality and material supply but also for localized support in application development.

For this project, Oerlikon delivered its full turnkey automated production system based on its MultiCoat™ architecture including conveyors and dust collectors, showcasing its commitment to providing end-to-end solutions tailored to Mazda's needs.

Factbox

Mazda, founded in 1920 in Hiroshima, Japan, is a renowned automotive manufacturer known for innovation and performance with global production facilities.
www.mazda.com

Challenge:

- Integrate a rotary engine with a compact design and low fuel consumption to charge the Plug-in Hybrid MX-30 R-EV for extended range
- Reduce weight of the rotary engine by over 15 kg transitioning side housing construction from cast iron to aluminum

Objective / goals:

- Preserve robust design, hardness and wear resistance properties
- Improve fuel efficiency and driving experience with extended range
- Extend significantly range of existing BEV model
- Increase quality and durability of sliding surface

Solution:

- Oerlikon Metco WOKA carbide material to coat side housing
- Utilize High Velocity Oxygen Fuel (HVOF) coating technology
- Turn-key solution MultiCoat GF system, incl. robot, spray booth, conveyors, and dust collectors

Oerlikon provided comprehensive support throughout the project, from prototyping assistance to optimizing spray parameters and designing the production system. The delivered coating solution included WOKA carbide material.

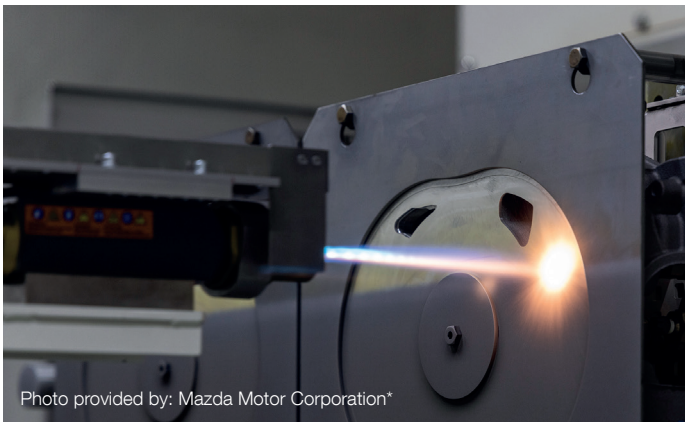
Photo provided by: Mazda Motor Corporation*

The thermal spray technology (HVOF) applied to the side housings of the 830 cm^3 (Type 8C) rotary engine offers significant benefits, particularly in reducing wear. By transitioning the side housings to aluminum, wear caused by sliding side seals and oil seals, as well as aggravated oil consumption, was a concern. However, the application of carbide coatings using high-speed flame spraying ensures high wear resistance and compatibility with oil seals, minimizing wear and frictional resistance while maintaining oil seal functionality. This innovative coating technology forms a dense film on the surface, enhancing surface hardness and durability, even with the material change from cast iron to aluminum. Ultimately, the thermal spray solution optimizes performance and durability, providing long-term benefits for the rotary engine's efficiency and reliability.

Features and benefits:

- HVOF enabled reduce rotary unit weight by over 15 kg, enhancing the vehicle's overall efficiency and performance
- Carbide material enables a light, durable coating of the side housing
- Mazda highlights rotary engine's minimal vibration and silent operation, coupled with the electric motor driving the wheels, enjoyable driving experience with extended range
- HVOF coating provides exceptional wear resistance and lubrication.
- Outstanding coating hardness and adhesion
- Improved sliding characteristic of side seals and oil seals
- Higher engine efficiency, lower consumption, higher durability of sliding surface

Mazda's MX-30 e-SKYACTIV R-EV achieved remarkable efficiency metrics, boasting a combined fuel efficiency of 1.0 liter of petrol per 100 kilometers, with CO_2 emissions of 21 grams per kilometer and an electrical energy consumption of 17.5 kWh per 100 km.

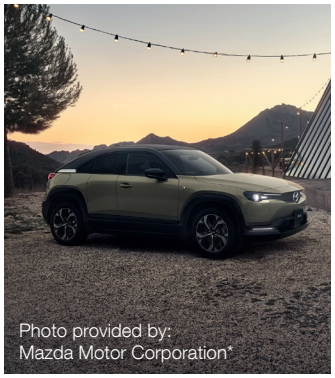
Photo provided by:
Mazda Motor Corporation*

Through collaboration with Oerlikon, Mazda achieved another innovation in its long-year automotive engineering tradition by optimizing performance and efficiency in the MX-30 e-SKYACTIV R-EV allowing significant longer distances. This partnership underscores the power of innovation and technology to develop a balanced and efficient solution for longer distances in the automotive industry.

About the Oerlikon Surface Solutions Division

Oerlikon is a leading global provider of surface and additive manufacturing solutions and services. The division offers an extensive portfolio of market-leading thin-film, thermal spray and additive manufacturing technologies, equipment, components and materials. Emission reduction in transportation, maximized longevity and performance of tools and components, increased efficiency and intelligent materials are hallmarks of its leadership. Pioneering technology for decades, the division serves customers with standardized and customized solutions across a worldwide network of more than 170 sites in 37 countries.

With its technology brands – Oerlikon Balzers, Oerlikon Metco and Oerlikon AM – the Oerlikon Surface Solutions division focuses on technologies and services that improve and maximize performance, function, design, reliability and sustainability, which are innovative, game-changing advantages for customers in the automotive, aviation, tooling and general industries and in the luxury, medical, semiconductors, power generation and oil & gas markets.

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