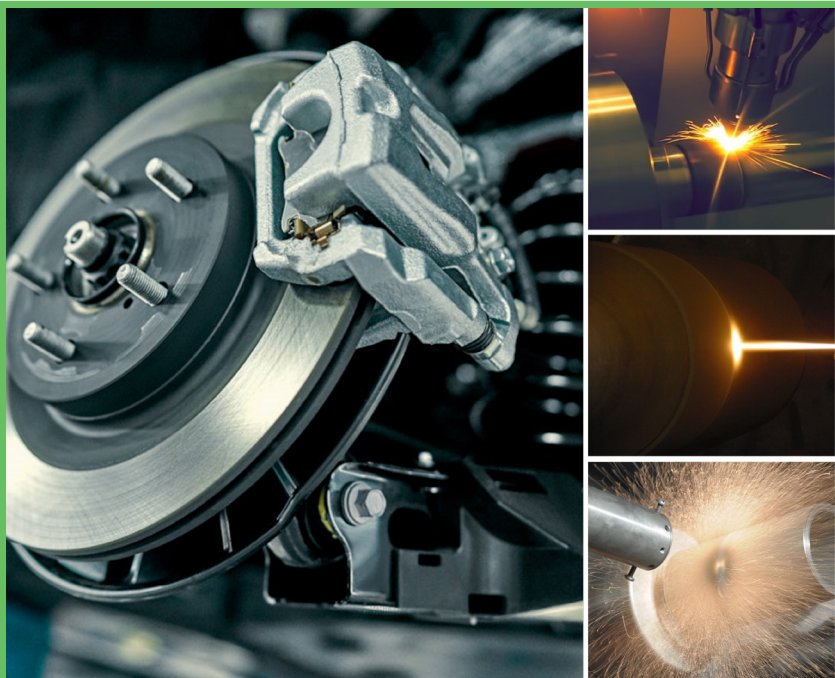



BRACE: BRake pArtiCles Emission Reduction

Abstract:

BRACER aims to develop an industrial solution for low particle emissions from braking and clutching operations, using advanced high-speed laser metal deposition and thermal spray technologies. These technologies address the challenges of the Euro 7 standard and the need for cleaner air in Europe. The project will focus on specific products for the markets served by industrial partners, following a robust engineering methodology to overcome technological obstacles. By comparing existing solutions with proposed ones, BRACER will integrate the resulting technology into partners' product lines, advancing cleaner, more sustainable manufacturing practices.



Countries involved


Application sectors
 Automotive, Railway, Consumer goods, Capital goods

Research and innovation domains
 Advanced manufacturing processes, Person-machine collaboration, Sustainable manufacturing

Total cost in M€ (millions)
 2.652 M€

Starting date
 01/01/2024

Duration (in months)
 36 months

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Project participans
 VZÚ Plzeň [cz]; University of West Bohemia (UWB) [cz]; Frenos Sauleda, S.A. [ES]; Goizper Industrial [ES]; Instituto Politécnico de Coimbra (IPC) [PT]; SVÚM a.s.[cz]; VSB – Technical University of Ostrava (VŠB-TUO) [cz]

RATIONALE OF THE PROJECT

Clean air is essential for human health and environmental sustainability, yet pollution causes over 300,000 premature deaths annually in the EU. The Euro 7 standard aim to reduce both exhaust and non-exhaust emissions, including those from brake and tire wear. A key target is reducing particulate matter (PM10) emissions from 7 to 3 mg/km by 2035, with brake dust being a major contributor.

Grey Cast Iron is widely used for brake discs due to its cost-effectiveness, but its poor wear and corrosion performance remains a challenge. The BRACER project aims to address this by developing advanced coating technologies, such as High-Speed Laser Melting Deposition and Thermal Spray, to reduce brake dust emissions and improve the durability of braking systems. Additionally, industrial clutches will be redesigned to reduce backlash and vibrations, further decreasing indoor particulate matter.

BRACER seeks to gain a strategic advantage by addressing regulatory challenges proactively. The project focuses on sustainable manufacturing technologies that align with the UN Sustainable Development Goals, promoting energy-efficient production methods and reducing logistical emissions. By focusing on transportation and industrial sectors, BRACER contributes to both climate action and air quality improvement. The BRACER consortium includes end users Frenos Sauleda and Goizper, technology providers Quantal, VZÚ Plzen, and SVÚM, as well as research centers UWB, IPC, and VSB-TUO.

TECHNOLOGICAL INNOVATION, ACHIEVEMENTS AND RESULTS

The BRACER project focuses on developing advanced coating technologies to minimize wear, improve corrosion resistance, and reduce particulate emissions in automotive and industrial systems. These technologies will be applied to components like brake discs, pads, and clutches to ensure enhanced performance while addressing the rising concern of particle emissions, especially ultrafine particles not covered by current regulations. The project's innovative approach combines material science, mechanical design, and production scalability to provide environmentally friendly and cost-effective solutions. By leveraging synergies between research and industrial partners, BRACER aims to disrupt the current state-of-the-art technologies in braking systems, offering alternatives that reduce environmental impact while maintaining high efficiency. BRACER main goals and expected results are:

- 1) Development of coating technologies like HSLMD and Thermal Spray to improve wear resistance and reduce particulate emissions.
- 2) Exploration of alternative friction materials and counter-materials, tailored for compatibility with new hard coatings, to ensure reduced wear and constant friction performance while minimizing emissions.
- 3) Optimization of mechanical design in industrial clutches to reduce emissions caused by backlash and unwanted friction.
- 4) Successful collaboration between research institutes and industrial partners to validate coatings and components in real-world test conditions.

MARKET POTENTIAL

The BRACER project offers significant market potential in both the industrial brake-clutch and automotive brake systems sectors. The global industrial brake-clutch market, valued at USD 1.3 billion in 2020, is expected to reach USD 1.6 billion by 2026 with a CAGR of 3.6%. Key drivers include increasing manufacturing and construction activities, particularly in emerging economies such as China and India. China's market alone is forecast to grow at a CAGR of 4.8%, reaching USD 328.5 million by 2026.

In the automotive sector, the brake systems market is projected to grow from USD 22.2 billion in 2022 to USD 28.1 billion by 2027, driven by rising demand for electric vehicles and stringent environmental standards like the Euro 7. The shift towards sustainability and more efficient brake solutions presents a unique opportunity for BRACER to contribute to this growing market.

IMPACT POTENTIAL

The BRACER project aims to revolutionize friction-based systems in industries like automotive, aeronautics, and rail by developing low-particulate-emission technologies. With the Euro 7 regulation targeting transportation emissions, BRACER's innovations in braking systems support Europe's sustainability and air quality goals. The project also enhances worker safety and competitiveness by creating cleaner, more efficient systems. Through advanced manufacturing technologies, BRACER strengthens Europe's leadership in transportation, ensuring industrial adoption through collaboration between tech providers and large users, aligned with the SMART-Eureka program's vision.

