21 Core Technologies Supporting KOBELCO's Materiality and Value Creation

The Kobelco Group possesses a diverse range of technologies cultivated through business activities in various business domains; these are categorized and nurtured as 21 core technologies. Meanwhile, to achieve a sustainable society, the Kobelco Group has identified five materialities (key issues) that must be addressed to ensure profitability, sustainable growth, and ongoing societal significance through the resolution of social challenges and the creation of new value. This special feature focuses on three of these materialities: "contributing to a green society," "ensuring safety and security in community development and manufacturing," and "providing solutions for the future connecting people and technology." It explains how these 21 core technologies are applied in these areas and the possibilities they unlock. Additionally, it provides insights into the historical development, characteristics, and future prospects of each core technology.

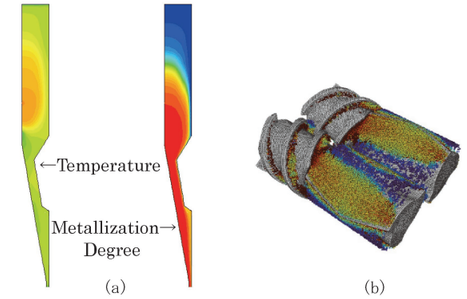

Fig.1 Thermal fluid simulation technology based on CFD and particle methods

Fig. 1 (a) represents the temperature and metallization degree inside a shaft furnace of the MIDREX® process, while Fig. 1 (b) displays the mixing state inside a plastic processing machine. These results have been obtained through simulations using computational fluid dynamics (CFD) methods such as the lattice method and particle method. In addition to these thermal fluid analyses, the Kobelco Group has been using advanced numerical simulation technologies, such as structural analysis and acoustic vibration analysis, to create new products and technologies with exceptional reliability that contribute to a green society.

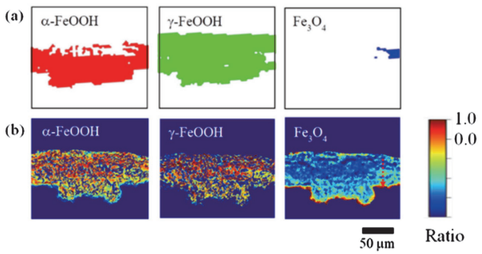

Fig.2 Visualization of the distribution states of various rust components within a rust using synchrotron radiation. (a) Imaging XRD and (b) Imaging XAFS

Fig. 2 depicts the visualization of (a) the distribution of the crystalline structure of various rust components and (b) the distribution that includes both crystalline and amorphous components of rust on steel, using high-brilliance synchrotron radiation (SPring-8). These results have revealed the distribution of crystalline "red rust" and amorphous "black rust," contributing to an understanding of the formation process of amorphous rust. Such insights have been employed in the development of long-lasting corrosion-resistant steel products, contributing to the creation of a safe, secure, and sustainable society as they become available in the market.

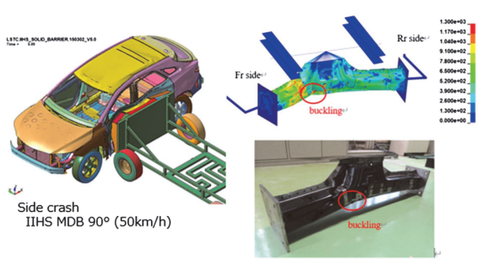

Fig.3 Full vehicle crash simulation and example of a part-unit collision evaluation

Fig. 3 (a) demonstrates a side-impact full-car collision analysis, while Fig. 3 (b) shows a simulation result for component-level (side sill) impact evaluation and a deformation photograph of actual components using the collision test equipment. By leveraging these experimental and analytical technologies, Kobe Steel offers lightweight solutions tailored to meet customer product needs. These solutions incorporate the characteristics of materials such as iron, aluminum, and other materials, such as plastics, providing structural proposals that utilize these features.

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