

**IC-MPPE
Integrated Computational
Materials Process and Product
Engineering.**

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Centers for Excellent Technologies

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Structural components in aircraft, manufactured by voestalpine Böhler Aerospace, Image: voestalpine BÖHLER Aerospace

FEWER FORGING STEPS – LONGER AIRCRAFT SERVICE LIFE

MCL AND VOESTALPINE AEROSPACE REDUCE THE NUMBER OF REQUIRED FORGING STEPS IN THE MANUFACTURING OF SAFETY-CRITICAL AIRCRAFT COMPONENTS

In pursuit of the Sustainable Development Goals defined by the United Nations, the aerospace industry is increasingly focusing on energy and resource efficiency. Achieving improvements in this area, while meeting and even exceeding the strict quality and safety requirements for aircraft, requires close collaboration between scientific and industrial partners. One such partnership between the Materials Center Leoben (MCL) and voestalpine BÖHLER Aerospace GmbH & Co KG has recently achieved a breakthrough in this field.

Together, the partners developed a material model for 15-5 PH, a so-called maraging steel used in structurally critical aircraft components. Manufacturing these components requires an

extremely energy-intensive forging process with several forging steps. The model takes into account how this process influences different aspects of the steel's microstructure, which are crucial for its mechanical properties.

One example is the change in grain size caused by recrystallization, the formation of a new grain structure in the steel in response to deformation. Another is the effect of the process on micrometer-scale non-metallic inclusions in the steel. Both factors play a key role in determining the material's fracture toughness, that is, its ability to resist crack propagation.

SUCCESS STORY

Impacts and Potential Applications

By applying the model developed at MCL and making optimal use of the state-of-the-art screw press at voestalpine BÖHLER Aerospace GmbH & Co KG, the forging process was optimized to such an extent that two of the most important forging steps could be combined into a single step while simultaneously improving the material's toughness.

Eliminating an entire forging step significantly reduced both energy use and production time. This

resulted in annual cost savings of more than €300,000, with the potential to exceed €1 million per year if the approach is applied to similar aircraft components.

In the future, the model developed in this project can also be used to design new, highly efficient component geometries, further strengthening the global competitiveness of voestalpine BÖHLER Aerospace GmbH & Co KG.

Project Coordination (Story)

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Project Partners

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- Montanuniversität Leoben, Austria
- BÖHLER Aerospace GmbH & Co KG, Austria

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