Contribution ID: **313** Type: **Presentazione orale**

Development of a railway component made by PBF-LB manufacturing

Wednesday 2 September 2026 15:00 (15 minutes)

Additive Manufacturing (AM) is commonly associated with lightweight components design thanks to the increased design freedom it offers, enabling flexibility and promoting a more effective material distribution in design space. Another advantage of AM, especially for machinery and transportation components, is a competitive technology for reducing the lead time of parts replacement.
The objective of this work is to show the successful application of AM to a railway component, i.e. the connecting arm transferring the forces from the train bogie to the coach anti-roll bar. The component is currently produced by forging, a technology well-suitable for high-volume production. Therefore, the conversion from forging to AM could represent a promising strategy to support the digital inventory of small-series parts.
We started with the selection of a material suitable for the AM process with powder bed fusion-laser beam (PBF-LB) technology and the following application, i.e. the austenitic stainless steel AISI 316L. Then, the process qualification was carried out in accordance with the ESA ECSS-Q-ST-70-80C standard. The testing campaign to define the material properties included: tensile tests, axial fatigue tests (at different stress ratios and surface finishing) and propagation tests.
The railway component was assessed in compliance with EN 17149, the European standard for the strength assessment of railway structures which is based on FKM-Guideline (for wrought alloys). The S-N curves at different stress ratios provided the experimental stresses referred to the target fatigue life. Defect criticality models were employed additional factors to be considered for AM: defect size and surface quality. Fracture-based models showed a dependence on stress ratio very different from the one of wrought austenitic steels.
After determining the material allowables under fatigue regime, the design of the forged component was slightly modified for PBF-LB technology. The manufacturing and testing of full-scale prototypes confirmed that the fatigue performance of the component meets the operational requirements.

Primary author: TRAVERSO, Riccardo Pavel (Politecnico di Milano, Department of Mechanical Engineering)

Co-authors: Mr RAITI, Stefano (Hitachi Rail, Head of Carbody Engineering); Prof. BERETTA, Stefano (Politecnico di Milano, Department of Mechanical Engineering)

Presenter: TRAVERSO, Riccardo Pavel (Politecnico di Milano, Department of Mechanical Engineering)

Session Classification: Ferroviario

Track Classification: Ferroviario