

FAME Symposium 2026 Abstract

LPBF of 42CrMo4 Nitriding steel in Wärtsilä

How Wärtsilä is validating the use of 42CrMo4 LPBF printed parts for its applications on engine

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Abstract

This study investigates the application of Laser Powder Bed Fusion (LPBF) for manufacturing components in 42CrMo4 nitriding steel, a low-alloy steel widely used in high-performance mechanical systems. The industrial interest in such steels lies in their excellent combination of strength, toughness, and surface hardenability, making them suitable for demanding applications such as fuel systems. The work was carried out at Wärtsilä Finland using an EOS M280 LPBF system, focusing on process validation and material characterization. The investigation includes a detailed analysis of microstructure and hardness before and after quench and tempering, as well as direct tempering after printing, highlighting the influence of LPBF and subsequent thermal processing on the final properties. Furthermore, a fuel system use case was successfully manufactured and analysed, demonstrating the feasibility of additive manufacturing for critical engine components. This research highlights the potential of LPBF for low-alloy steels in marine and energy applications, paving the way for cost-effective and high-performance solutions.

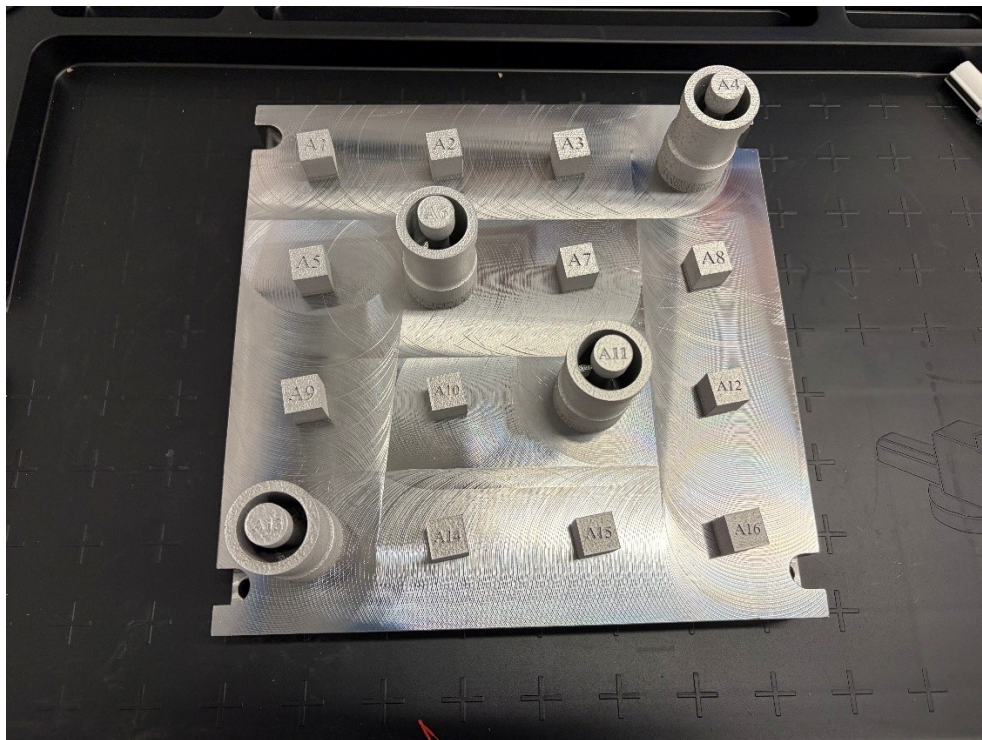


Figure 1. First 42CrMo4 print job done with EOSM280 in Wärtsilä Finland

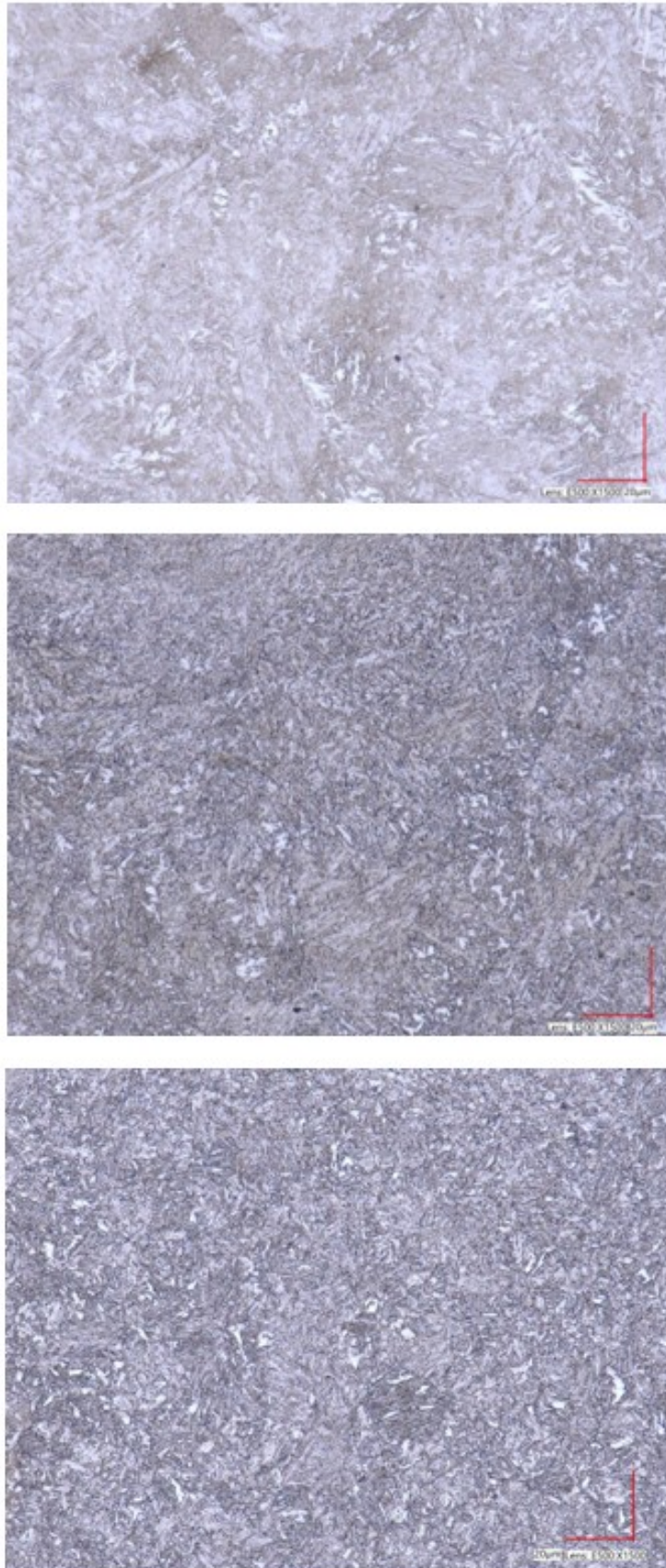


Figure 2. Microstructure investigation of 42CrMo4 samples made by LPBF in as-printed (top), tempered (middle), quench and tempered (bottom), conditions