



BEAMIT Group develops printing process for Nickel-based superalloy René 80 RAM1

The 3D-printed alloy has ideal characteristics for applications in Energy and Aerospace. BEAMIT industry experts will provide insights during Formnext 16-19 November – joint stand with Sandvik- Hall 11.0, stand C21

Fornovo di Taro (Parma, Italy), 27 October 2021 - BEAMIT Group has recently been channeling its efforts into studying new alloys for use in the Energy industry resulting in the development of a printing process for René 80 RAM1. In recent years, Additive Manufacturing has proved to be a trusted ally for the green industry, especially for industries such as Energy, in which components printed with 3D technology, like combustor gas turbines, ensure better combustion efficiency and reduce environmental impact of energy production. Results have been so positive that the industry is no longer talking about only producing components for the most modern applications, but also wants to supply replacement components for previously installed systems.

René 80 is part of the family of Nickel-based superalloys with quite a high melting point and excellent oxidation resistance at high temperatures, making them particularly suited to applications in the Energy industry for turbines and valves, and for the Aerospace industry. Plus, when processed with AM technologies rather than conventional technologies, René 80 is one of the highest performing alloys also at ambient temperature.

The first step in developing the AM process for René 80 was processing the alloy: the chemical composition of Nickel superalloy powder is very complex and a few critical issues often arise during the printing phase. The powder was modified by Elementum 3D using its patented RAM technology. Once the alloy's chemical composition had been modified, BEAMIT Group technicians developed and optimized the LPBF process to achieve good density and a crack-free microstructure.

Heat treatments are a key part of ensuring excellent performance in this case. Thorough research was conducted to identify the most suitable treatment and also to eliminate any cracks in the components.

“René 80 is proving that our one-stop shop strategy succeeds throughout the entire value chain, including when researching and developing new materials. Integrating special processes enables us to devise an otherwise unattainable solution with extraordinary results. The tougher the technological challenges, the more process integration and the innovation of post-processing, made available to highly skilled metallurgists, not only make the difference but become the only way forward. René 80 is one of our first demonstrations of this concept. And we are not done yet because other new advances are already in the developmental phase,” says BEAMIT Group General Manager Andrea Scanavini.

The parameters for René 80 RAM1 treated with HIPing and HIP quenching were characterized and compared with as-built René 80. With the optimized HIP-Q cycle, we recorded a 20% increase in the mechanical properties compared with the aged condition of René 80 produced with conventional technologies. Furthermore, elongation up to 8% was achieved with a 37% increase compared to casting.



Press release

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The advantage of the process parameterized by BEAMIT Group lies in the HIP-Q phase. The treatment can be performed with Quintus technology and enables HIPing to be followed by rapid quenching in Argon to produce a high-performance material with just a one-step heat treatment and ensure a shorter lead-time than treatments using conventional methods.

Finally, tests were conducted at high temperatures and to gage cracking resistance which confirmed a yield strength of 750 MPa at around 900°C. Jacopo Sisti, BEAMIT Group Materials and Special Processes Manager says, "It was a challenge to actually print an alloy that performs so well at high temperatures, but we fine-tuned the AM process and succeeded - plus we achieved high density. The turning point came with the innovative HIP-quenching heat treatment: we avoided the formation of cracks in the material which meant that we delivered better static mechanical properties than the alloy produced with conventional technologies."

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About BEAMIT Group

BEAMIT Group is one of the most advanced Additive Manufacturing (AM) service providers in the world and serves the most demanding industries through its unique positioning as a one-stop shop: the first global AM hub offering a fully integrated value chain. In 2019, **Sandvik Group**, global leader in hi-tech engineering and metal powder with the widest range of alloys for Additive Manufacturing as well as remarkable expertise in AM printing technologies for advanced metal components, acquired a significant stake in BEAMIT. With 24 years' experience in AM with metal powders, BEAMIT Group specializes in high-end metal AM components for many leading OEMs, and holds a considerable number of quality certifications, including AS/EN 9100:2018 for Aerospace, IATF Automotive, NADCAP accreditation for heat treatment and laboratory processes, and NADCAP accreditation for Welding – Additive Manufacturing commodity. BEAMIT Group consists of the original BEAMIT organization, ZARE (acquired in 2020) and 3T Additive Manufacturing (acquired in 2021) as well as a stake in PRES-X, the specialists in high-end post-processing for 3D printing. BEAMIT Group headquarters are in Fornovo di Taro (Parma, Italy). The company now has 130 employees and around 60 dedicated AM systems distributed across 7 facilities in Italy and the UK.

For further information, please visit <https://www.beam-it.eu/> - <https://www.pres-x.com/> - <https://www.3t-am.com/>

Photos:

https://drive.google.com/drive/folders/1xExSWgqP3j_RdKpMsFdXx5yd4ff7zNqI?usp=sharing

- 1) BEAMIT Group Materials and Special Processes Manager Jacopo Sisti analyzes the microstructure of René 80
- 2) René 80 microstructure after the HIP-quenching heat treatment
- 3) René 80 metal powder in BEAMIT Group laboratory
- 4) PRES-X technicians working with the Quintus Technologies system
- 5) BEAMIT Group Lab technician checking René 80 metallographic samples

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