Making our world more productive

Flying high with Linde

Liebherr-Aerospace Toulouse SAS relies on Linde to advance and optimize AM processes.

Highlights

- Precise, granular control over the O_2 concentration in printer chamber
- Higher levels of quality and durability through improved monitoring and control
- New technology strengthens reputation for fabrication excellence

Customer

Member of the Liebherr Group, Liebherr-Aerospace Toulouse SAS develops, supplies and services innovative air management systems for the aerospace industry. With over 60 years of experience in aeronautical engineering, the company employs over 1,300 people.

Covering the entire air management loop from engine bleed air ports to cabin pressure control systems, Liebherr-Aerospace Toulouse provides flight-critical systems for over 1,500 commercial, industrial and military aircraft every year. The company's fabrication facilities are designed to the highest standards of excellence so it can meet the extreme quality levels demanded in the aerospace industry. It also invests heavily in R&D to keep its products and production processes ahead of the curve.

Challenge

Reflecting its commitment to cutting-edge innovation, Liebherr-Aerospace Toulouse was keen to explore the productivity, quality and flexibility benefits of additive manufacturing (AM) – also known as 3D printing. In particular, it was looking to integrate the fabrication of printed parts into an automated workflow and enhance production efficiency. Through AM, Liebherr-Aerospace Toulouse was hoping to realize huge time gains and also reduce the number of components manufactured.

As this was a new fabrication technology for Liebherr-Aerospace Toulouse, it decided to launch a development project on aluminum components. It thus installed a 3D metal printer at its manufacturing center located in Campsas, north of Toulouse. The initial results were promising, but showed that the oxygen levels fluctuated during printing. This impacted the quality of finished parts – especially parts using aluminum alloys.

"We know that gas purity during fusion has a direct impact on the mechanical and metallurgical properties we can expect to achieve – especially with aluminum alloys. So we needed a dedicated solution to help us improve atmosphere control in the printer," explains Frédéric Letrange, Additive Manufacturing Project Leader.

Solution

Liebherr-Aerospace Toulouse turned to its long-standing and trusted partner Linde to help it stabilize and control oxygen concentrations in the printer chamber. Not only is Linde regarded as the leading gas and application technology provider for all additive manufacturing processes, the company has also been meeting all of Liebherr-Aerospace Toulouse's gas-related needs – delivery systems and piping included – for almost twenty years.

The two companies decided to extend their existing supply agreement and embark on a collaborative project to explore and optimize the benefits of additive manufacturing for a pilot bleed air valve. Linde supplied its ADDvance® O_2 precision solution – a first-of-its-kind measuring and analyzing unit that guarantees the perfect mix of gases within the printer chamber – and Liebherr-Aerospace Toulouse installed it in its 3D printing equipment. The two companies then worked closely to optimize printing outcomes. "Having looked at the various oxygen measurement and control systems available on the market, it quickly became clear to us that ADDvance O_2 precision was the most mature, so it was a natural step for us to expand our partnership with Linde into the additive manufacturing space," continues Letrange.

Benefits

ADDvance O_2 precision has exceeded Liebherr-Aerospace Toulouse's expectations, giving the company precise, granular control over the oxygen concentration in its printer chamber. It can now test different oxygen levels and see how they impact the printed parts. Improved monitoring and control enables the company to guarantee that parts are fabricated to even higher levels of quality and durability. "This research project demonstrates our strong commitment to cutting-edge research and innovation, also strengthening our reputation for excellence and perfection in fabrication," adds Letrange.

Highlights include a feedback loop with dynamic adaptation, which means that operators can define a setpoint value and maintain purity levels at that value. One of the unexpected benefits that Liebherr-Aerospace Toulouse has realized is the ability of ADDvance O_2 precision to also measure humidity – another critical variable in the production process – in the chamber. This capability is unique to ADDvance O_2 precision.

Looking ahead

Building on the positive results achieved with this pilot project, Liebherr-Aerospace Toulouse continues to enjoy close relations with Linde and is keeping an eye on evolving developments – in particular on Linde's work to develop new and bespoke gas mixtures for different AM processes.

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