



Linde to Launch Laboratory for Advanced Research into Manufacture of Metal Powders

- Atmospheric gases are vital to the atomization process which creates metal powders for additive manufacturing
- Increasing demand for innovative metal powders is driving Linde's research into gas parameters to optimize the atomization process
- Linde is building a unique atomization test bench to study gas structures during atomization
- Results from research will enable greater process stability and increased yields in metal powder production

Unterschleißheim, Germany, March 21st 2022 – Linde today announced it is developing a new, dedicated laboratory to advance the understanding of the parameters and behaviour of atmospheric gases used in the manufacture of metal powders. As innovative additive manufacturing technologies have made significant advances to the process itself, the demand for novel metal powders has grown significantly. The new laboratory is due to become operational mid-2022.

While being vast in size, and requiring multi-million-dollar investments, standard metal powder atomizers are unsuitable for the observation and analysis of gas behaviour as parameters are adapted.

The focal point of Linde's new laboratory will be a much smaller scale version (1.60 meters high) of a typical atomizer with specially adapted windows, lighting, high-speed cameras and schlieren imaging¹ allowing for surveillance and data capture of each change of gas parameter. It will not rely on the introduction of molten metal, instead using data from the simulated process to provide evidence of gas behaviour under certain conditions. The different parameters to be assessed include gas type, volume of gas, pressure and temperature, with the miniature atomizer able to rapidly switch over to analyze hundreds of combinations within minutes.

The laboratory will enable Linde to develop new technologies to improve the atomization process – particularly increasing yield and process stability. Linde will also collaborate with powder manufacturers and OEMs to help them test specific gas behaviours on the test bench, allowing them to then scale up the results on their large atomizers.

“As demand grows for new metal powders, more research into the parameters of the gases which are integral to their manufacture is needed to ensure their role is optimized”, said Pierre Forêt, Associate Director Additive Manufacturing, Linde. “Linde's new laboratory will be the only one of its kind and is testament to Linde's status as the leading authority on gases for additive manufacturing.”

For the atomization of metals to create powders for additive manufacturing, a key challenge is to maintain a large volume of gas (2,000 cubic meters per hour), under high pressure (60 bar or higher) and temperature (up to 400°C), even for a short period of time. When adding in factors such as metal type and gas composition, the variable parameters are immense and to analyze them requires not only the most advanced equipment, but reliable gas supply and expertise.

¹ Schlieren photography is a visual process that is used to photograph the flow of fluids of varying density.



A further key variable is the nozzle design which is responsible for injecting the specific gas or gas mixture at the required pressure and temperature. Linde will be able to offer powder manufacturers testing services to ensure optimal nozzle designs by 3D printing prototypes and testing them in the new lab.

While some academic institutions can undertake research into gas behaviour for the manufacturing of metal powders, Linde is the only organisation with the capacity to draw on a readily available supply of gases.

About Linde

Linde is a leading global industrial gases and engineering company with 2021 sales of \$31 billion (€26 billion). We live our mission of making our world more productive every day by providing high-quality solutions, technologies and services which are making our customers more successful and helping to sustain and protect our planet.

The company serves a variety of end markets including chemicals & energy, food & beverage, electronics, healthcare, manufacturing, metals and mining. Linde's industrial gases are used in countless applications, from life-saving oxygen for hospitals to high-purity & specialty gases for electronics manufacturing, hydrogen for clean fuels and much more. Linde also delivers state-of-the-art gas processing solutions to support customer expansion, efficiency improvements and emissions reductions.

For more information about the company and its products and services, please visit www.linde.com

Media contacts:

Susan Brownlow
Public Relations Consultant
Linde
Telephone: +44 7739 456292
Email: susan.brownlow@wordsforindustrypr.com