User-friendly customer interface for real-time monitoring and dynamic adjustment of furnace atmosphere

Creating a lean sintering atmosphere

Today, most furnace atmospheres in the PM industry are fed a mixture containing nitrogen (as the base gas) and various active gases such as hydrogen, carbon monoxide and hydrocarbons. The aim of these active gases is to control the carbon content and the oxidation process.

These gases can be finely adjusted to create a leaner atmosphere which delivers the desired carbon potential. In other words, keeping all active gases to a minimum so the carburising process can be tightly controlled. The challenge lies in ensuring advanced monitoring and control functionality that allows operators to ensure carbon potential uniformity throughout the furnace.

Linde has resolved this challenge with its unique SINTERFLEX offering. This innovative, automated and user-friendly solution gives operators real-time monitoring and dynamic adjustment capabilities over furnace atmospheres.

Linde AG
Gases Division, Carl-von-Linde-Strasse 25, 85716 Unterschleissheim, Germany
heat-treatment@linde-gas.com, www.heattreatment.linde.com,
www.linde.com, www.linde-gas.com

THE LINDE GROUP

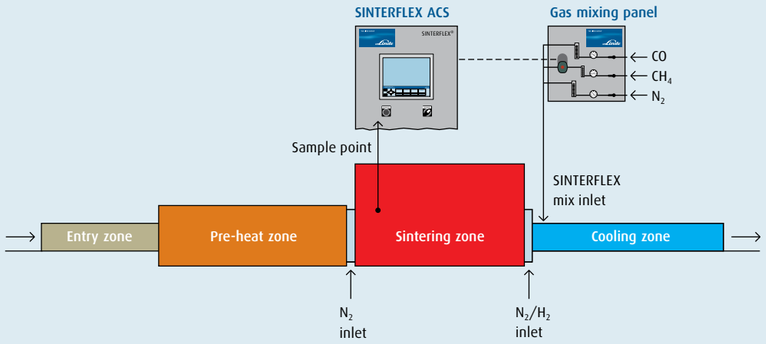
Raising the bar for sintering quality.

SINTERFLEX® dynamic atmosphere control.

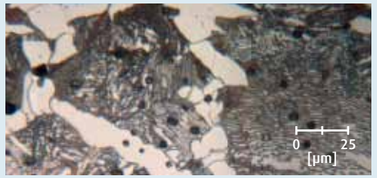
Creating new opportunities for sintered parts. Through online carbon control.

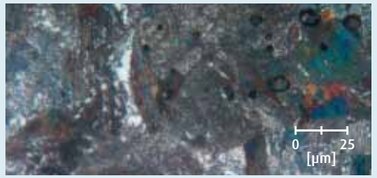
The powder metallurgy (PM) industry is challenged to increase the quality and consistency of sintered parts in order to open up new market opportunities.

Linde has developed a technology to control the sintering process and improve the mechanical strength of sintered parts. A sophisticated, online carbon control system is at the heart of Linde's SINTERFLEX® offering. It paves the way for exciting new market opportunities for sintered parts.



SINTERFLEX – an integral part of the sintering process





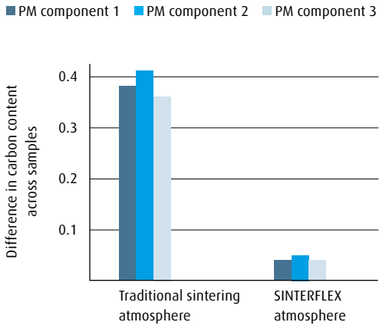
Traditional sintering atmosphere

SINTERFLEX atmosphere

Behind the scenes

SINTERFLEX, a patented technology, works on the simple principle of gas sampling. A gas sample passes through an external, heated SINTERFLEX probe designed specifically for the sintering process and then through the carbon monoxide gas analyser. The results are used to calculate the carbon potential of the furnace atmosphere. The system uses a closed loop method, constantly comparing gas measurements against the C-potential to identify deviations. Operators can then easily and dynamically adjust the gas mixture to maintain constant, optimum carbon control over the furnace atmosphere.

Range of carbon content in parts treated during a production day



Benefits at a glance

- Delivers real-time monitoring and dynamic adjustment capabilities over furnace atmospheres
- Allows faster start-up and reduced switching times between different alloys
- Reduces post-treatment costs for salvaging carbon content of components
- Enables operators to sinter highly alloyed powders (Cr)
- Enables controlled carburisation (up to 150 µm) for greater resistance to fatigue
- Enables consistently high quality of the sintering furnace atmosphere through closed loop control

Precision counts

Working with our partner Höganäs and selected key customers, our Research & Development team ran extensive tests to show that SINTERFLEX helps you to deliver parts which do not vary in quality. These tests demonstrated that the carbon content deviation among parts treated in a base atmosphere and parts treated in a SINTERFLEX atmosphere dropped by more than 80% (see chart page 3). The tests covered a significant number of parts and were extended over different shapes. The positive effect of SINTERFLEX atmospheres can even be clearly seen with a metallographic examination (see microstructures above).