

Hydrogen extraction equipment with a purity of 99.9998% for 60m³/h in metal injection/sintering process

XITE successfully supplied and commissioned 2 hydrogen plants in 2022 for a large global supplier of precision engineered products.

Why sintering with hydrogen.

Pure hydrogen (H₂) is often the most effective atmosphere for high temperature sintering (i.e., the hot melting of powders to form a solid during compaction, usually at temperatures near the melting point) of many powder metallurgy (PM) components.

Customers purchased hydrogen in cylinders from the market in the early days, and the cost of hydrogen from distributors was very high. The large consumption of cylinders (about 200 cylinders per day) was the reason why the customer explored on-site hydrogen production and found XITE. Handling such a large number of cylinders was also a major safety concern. Therefore, the conversion to on-site hydrogen production was an important priority.

The customer purchased two sets of hydrogen equipment from XITE with the following specifications.

Technology: Bipolar PEM (Proton Exchange Membrane) technology

Capacity: 60 m³/h (2 Nos. × 30 m³/h each)

Application: Sintering

Purity: 99.9998% purity of hydrogen from both generators



Metal Injection (MIM) is a metalworking process by which finely powdered metal is mixed with a certain amount of binder material to form a "raw material" that can be processed by plastic processing equipment through a process known as injection molding. The MIM process is often interpreted as four distinct processing steps (mixing, forming, debinding and sintering) to produce the final part, which may or may not require a final finishing operation.

Of the four unique processing steps, sintering is the most important step in heat treating the metal through a high purity hydrogen generator.

Benefits of using hydrogen in a continuous furnace for the sintering process.

Industrial gases, such as hydrogen for furnace atmosphere, are characterized by high purity (>99.9995%). This purity is usually sufficient for many processes involving various materials.

Stainless steel parts represent a major part of the metal injection process, but some other high-performance alloys, such as tungsten carbide and other tungsten alloys, also require high-temperature sintering in hydrogen.

One of the reasons that such high temperatures are required when sintering stainless steel in hydrogen (in addition to trying to achieve a density comparable to that of forgings) is to reduce surface oxides and strip impurities such as silicon dioxide (SiO_2) from the alloy.

A pure hydrogen atmosphere provides the highest possible atmosphere quality for stainless steel parts, and the lower dew point results in more reducing conditions and in many cases better furnace atmosphere performance.

The application of high-purity, high-pressure hydrogen to metals is an extremely practical, safe and economical way to grind metals into powders that can then be processed by sintering and subsequent procedures. In particular, it is important to avoid metal oxidation during the sintering process, which reduces the aggregation rate of the powder and is eventually eliminated by redox reactions, in order to obtain workpieces with excellent mechanical quality and to allow bright surfaces in the furnace cooling zone in an oxidant-free atmosphere.

The high purity hydrogen atmosphere allows significant savings in the sintering procedure, which also reduces the risk of air pollution and personnel.

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