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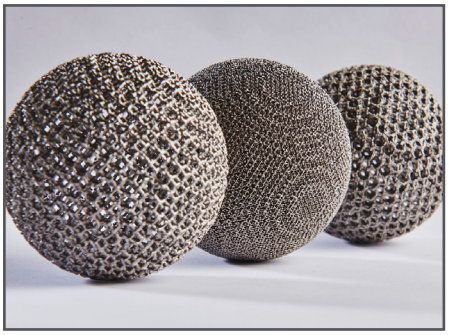
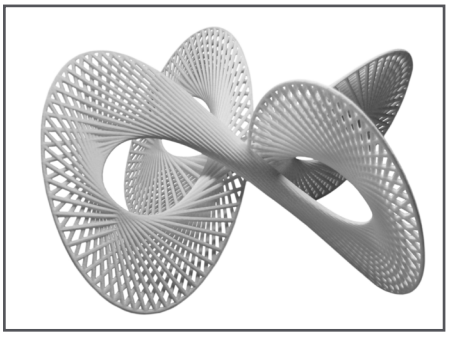
Oxygen Analysis in Additive Manufacturing

Additive Manufacturing (AM), also known as 3D printing, refers to a manufacturing process, which creates 3D objects by adding multiple layers of material to form components, parts or products.

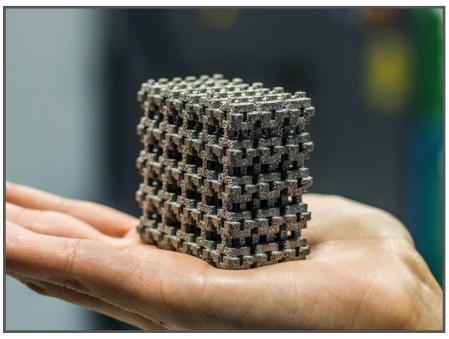


There are many advantages of opting for AM over conventional manufacturing processes. 3D objects can be formed in such a way that traditional manufacturing processes cannot achieve. For example the creation of unique, intricate and sometimes miniature components is easily achieved, for a multitude of applications including industrial, medical, automotive and aerospace to name a few.



MANUFACTURING PROCESSES

Selective laser sintering (SLS) or selective laser melting (SLM) are processes which can be used with a high-powered laser to form 3D objects from metal powders, such as titanium, aluminium, stainless steel and others. SLS fuses metal powder together on a molecular level, allowing for the porosity and other properties of the finished object to be customised, whereas SLM melts the powder together to form the 3D object.



WHY ANALYSE OXYGEN LEVELS?

In order to ensure that the metal powders don't react with contaminants such as oxygen, the build chambers of AM machines are flooded with an inert gas such as argon or nitrogen. Oxygen analysis throughout the process enhances quality control and ensures safety during manufacturing.

Oxidisation can occur when oxygen and metal react, which

can lead to build failures or components ultimately failing to meet the quality standards required. Interstitial absorption of any oxide embrittles the weld and may render the component useless. As the majority of companies commissioning AM manufacturing methods are within the aerospace, defence and automobile industries, identifying and reducing the chances of oxidisation during the build process is essential.

All powders, including seemingly benign examples such as flour or sugar, are highly flammable due to the large surface area to volume ratio. Therefore it is very important to ensure that the level of oxygen does not reach such a level to allow the powdered metals to combust or potentially cause an explosion. Oxygen analysis prevents this from occurring and ensures safety throughout the AM process.

Tighter quality control is maintained within the soldering process by using a closed-loop process to control the nitrogen level in the solder reflow ovens. The closed-loop system is an innovative method for reducing nitrogen consumption by maintaining a pre-set PPM level of oxygen within the reflow tunnel.

This is particularly true for applications such as fine-pitch and double-sided assemblies, as well as bare copper PCB's. In addition, advanced technologies such as flip chip, which uses ultra-low residue fluxes with very low levels of activity, produce improved results when processed in a nitrogen atmosphere.

As a privately-owned company, staffed by highly skilled technologists, Cambridge Sensotec is perfectly placed to react to its customers specialised gas analysis requirements. Dynamic and flexible, the company are able to design and supply solutions to suit a variety of gas analysis applications. For further information please visit our website.

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