
You're Getting Colder: Liquid Nitrogen's Role in Improving Metal Part Performance

Eric Will, Industry Engineer, Air Products and Chemicals, Inc.

Today, the use of liquid nitrogen in the treatment of metals is a common and widespread practice in manufacturing. However, questions routinely arise as to why liquid nitrogen is used and how it works in improving metal part performance.

Many types of metal parts, from ball bearings to brake rotors, and aluminum bats to engine blocks, have been treated with liquid nitrogen. While each application may be different, in each case liquid nitrogen is used to achieve properties that improve performance in the things we use in everyday life.

Exposure of metal parts to liquid nitrogen results in microscopic changes to the metal itself. These changes are desired for a variety of reasons. And, while we may not see them with our 'naked eye', we can group the type of exposure into two main types of cryogenic treatment.

In the first type of application, liquid nitrogen is used in a cryogenic chamber for austenite transformation after quenching. As part of the typical heat treating of a part, the metal is quenched, transforming the metal from an austenitic state to the martensitic state which is much harder. However, during quenching some austenite does not transform, instead it becomes trapped inside the martensitic metal. This decreases the hardness of the part. By using liquid nitrogen in a cryogenic chamber, the part can be cooled down below the martensitic transformation point—usually to -120 degrees °F. This enables the remaining austenite to transform to martensite, improving part hardness, and allowing the part to achieve a higher degree of performance.

Liquid nitrogen is also used in a second type of metal part chilling known as sub 300 degree F cooling. This type of cooling is used to improve wear resistance and toughness of metal parts which have already been heat treated. In this application, the metal part is cooled to -300 degrees F for several hours. This deep chilling is much colder than just the austenite transformation, achieving a finer carbide precipitation and imparting residual stresses to the metal part surface. This results in metals parts which last longer in high wear applications.

While these applications may look the same at a quick glance, each provides very different results for the final use of the metal part. Air Products, a leader in both cryogenic technology and heat treating applications with thousands of customers worldwide, can help you determine which process is right for you. To learn more about how to get started using cryogenics or which process can give you the greatest benefit, give us a call at 800-654-4567.

For More Information

Air Products and Chemicals, Inc.

7201 Hamilton Boulevard

Allentown, PA 18195

Tel 800-654-4567

Fax 800-272-4449

Email gigmrktg@airproducts.com

tell me more

www.airproducts.com/metals