

Intelligent Nitrogen Die Cooling System for Aluminium extrusion process



Controlling the flow for optimal aluminium profile manufacturing

Air Products' Intelligent Die Cooling System (IDCS) is used to control the flow of liquid nitrogen used for cooling and inerting during the extrusion process. Increasing both the production rate and obtaining a high surface quality, it has become the "go-to" solution for improving the extrusion process.

Air Products IDCS can be integrated within an extrusion press's own control system to adjust the profile temperature during the process automatically. The IDCS can operate and switch between three different modes to control the flow of nitrogen, fine-tuning temperature, time or ram position control, plus an additional option for manual operation.

Higher extrusion speeds can be achieved for hard alloys that require specific and stable temperatures at the exit point of the press in order to obtain the desired mechanical properties. Additionally, high surface quality and smoothness which can be obtained with liquid nitrogen is very beneficial for post-processes such as painting and anodizing. Cooling of extrusion die can prolong its operating lifetime and increase productivity.

Common challenges with aluminium extrusion

A typical aluminium extrusion production process involves preheating an aluminium billet to a given temperature, usually between 500°C and 520°C. Next, it is squeezed through the extrusion die at a given speed and under the pressure from the hydraulic extruder press. An aluminium part profile with a specific structure cross-section and properties is then formed.

During the process, heat is being generated from both, deformation and friction which can result in die overheating and exceeding extrusion temperature. To avoid this negative effect, extrusion speed has to be reduced. The use of liquid nitrogen is to cool the die and reduce the overall process temperature leading to an increase and maintaining a high speed of extrusion.

Typical issues that can be overcome with the use of liquid nitrogen:

- Wrinkles, cracks, scratches, and other defects including “out of tolerance” dimensions
- Pick-ups and sand-like effect
- Oxidation that affects the surface quality of the final part
- Reduced production capacity and speed due to exceeded process temperature

Advantages of using liquid nitrogen in aluminium extrusion

- Rapid cooling of heat generated during the process to increase extrusion speeds
- Inerting profile to improve surface quality
- Better profiles quality reduces rejects from painting and anodizing
- Grain refinement and improvement of yield, tensile strength, and elongation
- Increase accuracy of product dimensions
- Significant improvement of the die life cycle



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