

New Product Spotlight...

Improved Aluminum Extrusion Lubrication System

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Lubrication is necessary in the extrusion process to improve product quality, tooling life, and productivity. Surface blisters, random streak lines, and surface pitting are all associated with excess lubrication on the press and tooling and with the type of lubricants used. Most lubricants contain some volatile compounds that generate fumes or smoke when applied to a hot surface. Also, the burnt lubricant can get trapped at the boundary of the dead metal zone causing subsurface defects and blisters. The sheared die surface is often contaminated by stray lubricant from the shear blade. As a result, the billet-to-billet weld or transverse weld is usually defective.

Current Lubrication Systems

Grease or Oil-Based Graphite Suspensions: Graphite-based lubricants require an organic compound to mix with the graphite particles. The added organic compound is flammable and burns when it touches the hot surface of the tooling. The smoke and soot cause blister holes in the aluminum profiles. Graphite is also highly conductive and can create a short circuit for any electrical equipment nearby. Furthermore, graphite suspensions are messy and need repeated application in every cycle, which can only be applied manually.

Boron Nitride: Boron Nitride powder has a similar material crystal structure to graphite, which provides excellent lubrication. The powder needs to be electrically charged in order to adhere to the billet surface. It needs to be very fine for a proper charge, however, and it is hard to confine the airborne boron nitride powder during spraying, as the fine particles will float in the air for quite a distance. The airborne particles can be inhaled by operators, which is a safety concern. Also, the powder has to be stored in a dry area. Typically, it is mixed with a boric oxide binder, which will absorb moisture in the air. Only dry air or nitrogen can be used for spraying the powder.

Acetylene: Acetylene gas is burnt fuel rich, which generates a black carbon (soot) that is deposited on

the back end of the billet in order to act as a release agent. The fine carbon block is a well-known carcinogenic substance and health hazard. In addition, it can cause black marks on the profile surface that will interfere with anodizing.

New Lubricant and Lubrication System

Castool Tooling Systems in Ontario, Canada, developed a new lubricant and lubrication system designed to improve product quality, while being safe for operators and the environment. The new Alu-ject lubricant is made of a blend of sodium-based acids and salts that are water-soluble. The lubricant has very high wetting temperatures to adhere onto a hot surface. It contains no suspended graphite in the solution, therefore the risk of blisters on the extrusion profiles is very low.

Spray Nozzle: The Alu-ject ultrasonic nozzle is engineered to deliver finely atomized droplets onto the hot surface of extrusion tooling in order to overcome the Leidenfrost effect (Figure 1). The finely atomized spraying nozzle is capable of

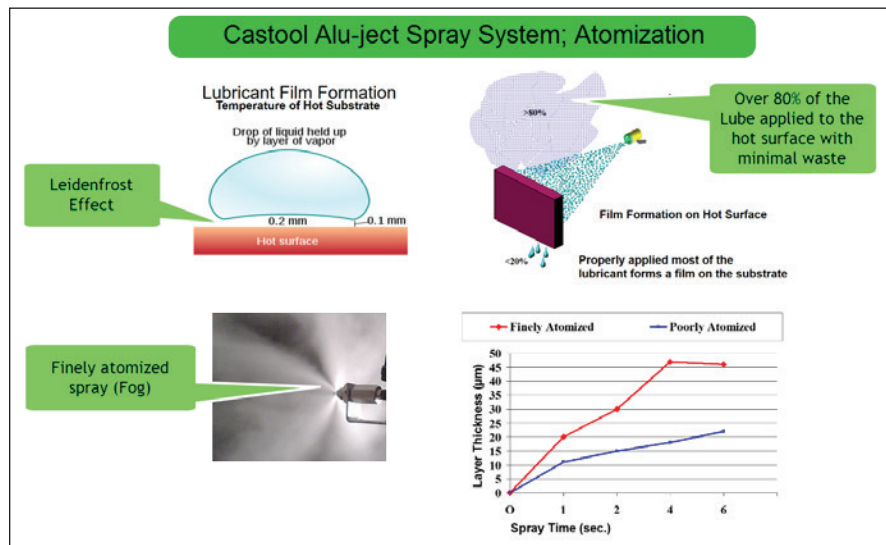


Figure 1. The Alu-ject spray system delivers finely atomized droplets to prevent the Leidenfrost effect.

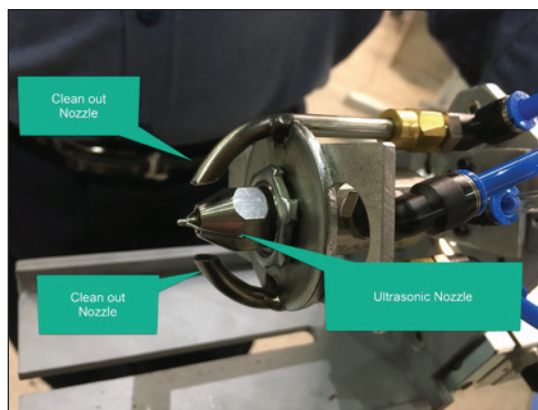


Figure 2. The Alu-ject spray nozzle.

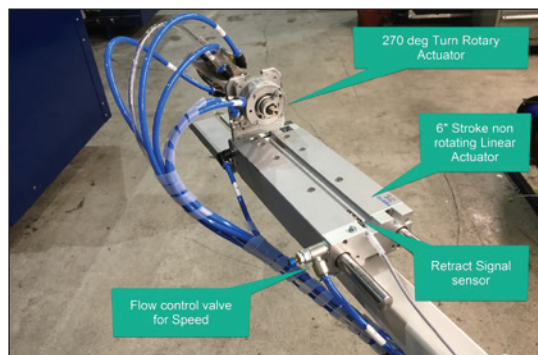


Figure 3. The 270° actuator adapts to billet lengths.

applying over 80% of the lubricant onto a hot surface. The nozzle can deposit two times better boundary layer coverage than a conventional nozzle (Figure 2), thus, preventing the aluminum from soldering to the steel.

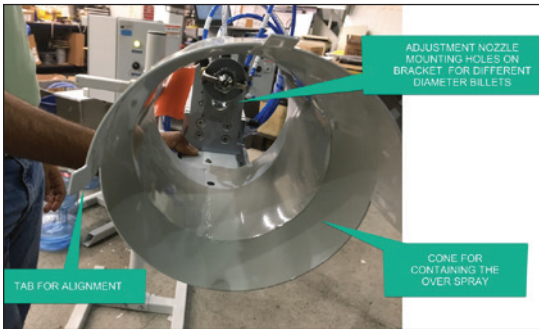


Figure 4. A tapered shroud helps contain the spray to the billet surface.

The linear actuator motion of the nozzle provides excellent flexibility to adapt to different billet lengths (Figure 3). The ultrasonic nozzle is able to perform a 270° rotation to deliver maximum coverage of the lubricant. A tapered spraying shroud creates a guide to align to billet surface and container over spray (Figure 4).

Two additional clean out nozzles generate a burst of pressurized air and water to clean the spraying nozzle periodically. The clean air/water cycle ensures the spraying nozzle does not clog.

Only a very thin film of the Alu-ject lubricant is needed to provide a good barrier between billet and dummy block. When properly

sprayed, Alu-ject will have such a thin film on the billet as to be almost invisible by the naked eye (Figure 5). The thin application of the lubricant provides lower consumption requirements (Table I).

Stick Lubrication: In addition to the liquid lubricant, Alu-ject can also be molded into stick form to apply to hard to reach areas, such as the shear-blade or container sealing face. The stick has a higher melting point than wax and, thus, doesn't drip like wax (which usually causes mess and contamination). The Alu-ject stick also produces less smoke than wax and graphite grease.

Tablets: Alu-ject tablets are the non-pigmented lubricant in tablet form, which can be dissolved into water prior to use. It is designed for easy transportation and reduced inventory and storage space.

Conclusion

Castool has re-invented the extrusion release agent and lubricant. Alu-ject lubricant is made of a blend of water-soluble sodium-based acids and salts and is applied

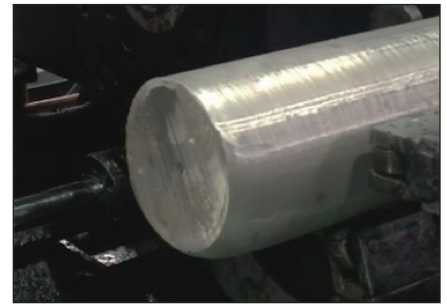


Figure 5. A billet surface showing proper application for good lubrication and low contamination.

Billet Sizes	Suggested Spray Volume (mL)
5-6"	3-4
7-8"	4-5
9-10"	5-6
11-12"	6-7

Table I. Typical Alu-ject lubricant consumption required for various sizes of billet.

by a system with an ultrasonic nozzle engineered to provide finely atomized droplets onto hot surfaces. Together, the improved lubricant and lubrication system are less harmful than graphite to extrusion profiles (providing improved product quality), while being cost effective and benign to the environment.