

SHOT SLEEVE

The shot sleeve plays a crucial role in the die casting process by containing the molten aluminum as it is pushed into the mold by the plunger tip. Here are some key benefits:

- ▶ Reduces scrap and unscheduled downtime: Ensures a more efficient production process.
- ▶ Aids consistent shot velocity: Helps maintain uniformity in the casting process.
- ▶ Extends life of shot sleeve and plunger tip: Enhances the durability of these components.
- ▶ Cooling can be automatically controlled: Allows for better temperature management during casting.

With the Thermally Controlled Shot Sleeve, Castool again sets a new standard of excellence in the die cast industry.

WATER JACKETS

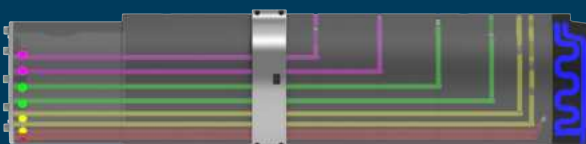
Medium diameter shot sleeves can benefit significantly from thermal control, especially at the pour end where temperatures are highest.

External cooling saddles help maintain the integrity of the shot sleeve by reducing high temperatures and preventing excessive erosion.



Pour End Water Saddle with

By placing a cooling jacket on the die end of the shot sleeve we can also enhance the solidification of the bicuit and runner. This can be very useful for Giga sleeves.



Die End Water Donut with Runner

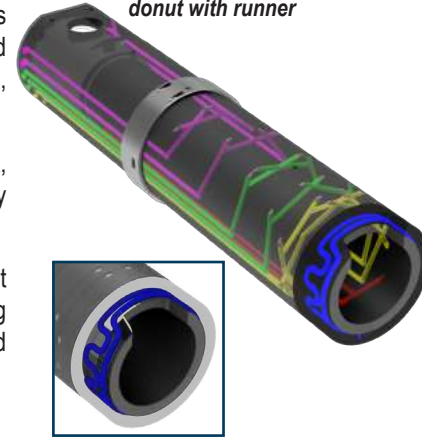
GUN-DRILLED

Using thermally controlled shot sleeves is crucial in maintaining consistent thermal expansion, especially for larger sleeves. The gun-drilled holes along the length of the shot sleeve, positioned under the pour spout and around the die end, facilitate this control.

By connecting these holes to a thermal control unit, typically using oil as the medium, you can effectively manage the temperature and flow.

This setup ensures better control over the shot sleeve's temperature and dimensions during production, enhancing the overall quality and consistency of the process.

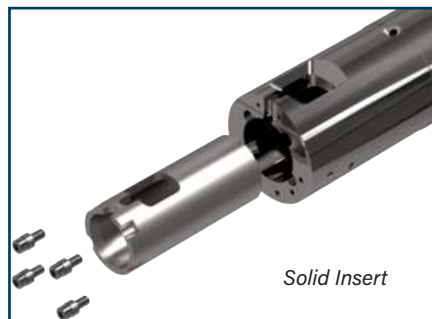
Gun-drilled with Insert and split collar, and cooling donut with runner



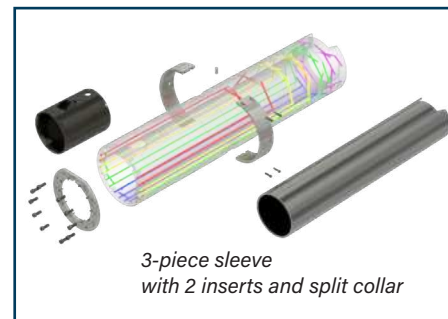
INSERT

Castool's approach to enhancing shot sleeves for Giga Presses is quite innovative. By using gun-drilled shot sleeves with replaceable wear inserts, they ensure better durability and efficiency.

The 5-axis machining for cross-drilling helps in achieving conformal cooling, which is crucial for reducing cycle times and solidifying the biscuit.



Solid Insert



3-piece sleeve with 2 inserts and split collar

Post Nitride Oxidation (PNO)

The PNO post-nitriding process significantly extends the life of the inserts, addressing erosion issues effectively.

Additionally, the use of Tuff Temper material for inserts further enhances their performance and longevity. This combination of advanced manufacturing techniques and materials ensures optimal performance without the fit problems experienced in the past.

M-LOOP

Using a partial or complete M-Loop is indeed a safe alternative to gun-drilling in shot sleeves. This method involves embedding copper tubes in the outside diameter of the shot sleeve, which helps manage thermal expansion and maintain the integrity of the sleeve during the die casting process.

By stabilizing temperatures, the M-Loop design ensures a round and straight shot sleeve, allowing the plunger to move smoothly and consistently, thereby reducing wear and improving overall productivity.

This approach is particularly beneficial for larger shot sleeves, where thermal expansion can be more pronounced.



M-Loop Cooling

PRESSURE TESTED

The demand for light metal die castings is indeed growing rapidly, driven by the need to reduce vehicle weight and improve energy efficiency. A 10% weight reduction in cars can lead to a 5% energy saving, making aluminum an attractive alternative to steel for many car parts. This shift is creating significant opportunities for the die casting industry, especially for large castings like frames, engine cradles, and gearboxes.

To meet this demand, die casters are upgrading their equipment, moving from machines with 3,000 to 4,000 tons capacity to those with 6,000 to 9,000 tons. These larger machines come with bigger shot sleeves, which present new challenges in terms of thermal expansion and maintaining the critical gap between the plunger tip and the shot sleeves. Effective temperature control is essential to address these issues.

Additionally, ensuring the integrity of these large shot sleeves is crucial. They require extensive cooling lines, which can be prone to leaks. Therefore, each shot sleeve is tested for leaks and flow rate before shipping, with tests typically conducted at 500psi/35Bar and 300°F/150°C. The results are recorded in a SQL database, and reports can be provided to customers as needed.



Shot Sleeve Testing Unit

The testing unit is designed to check for leaks and flow rate in the shot sleeve. The test cycle is approximately two minutes long. The time stamped reports can be shared with the customer as needed.



All gun-drilled Shot Sleeves are flow tested and pressure tested at 500 psi/35 Bar and 300F/150C

HEAT TREATMENT AND NITRATION

It's impressive how Castool has refined its heat treatment processes over the years to ensure durability and performance across different regions.

Vacuum hardening and quenching hot work tool steel to achieve optimal microstructure is a meticulous process, and having an in-house metallurgist to examine and document the chemistry and microstructure adds a layer of precision.

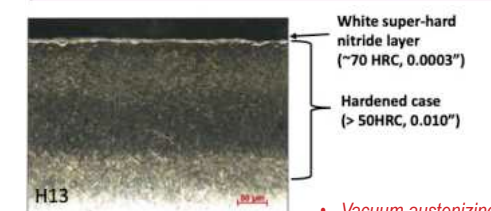
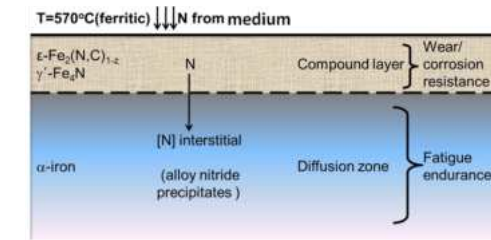
The additional post-heat treatment processes like nitration and PNO further enhance wear resistance and longevity, showcasing a commitment to quality and innovation.



Nitriding System

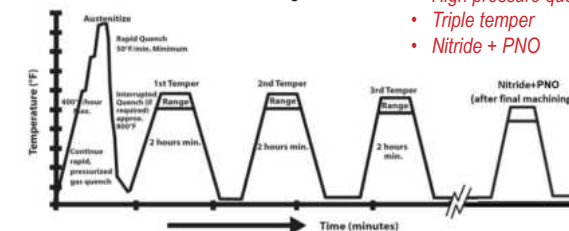


Vacuum Furnace



Nitriding

- Vacuum austenizing
- High pressure quench
- Triple temper
- Nitride + PNO



MATERIAL

The advancements in material science are truly impressive! The development of Tuff Temper (TT) steel and Con-Duct materials are a great example of how innovative solutions can tackle specific industrial challenges.

By enhancing properties like thermal conductivity, toughness, and tempering resistance, these materials significantly improve the performance and durability of shot sleeves in high-temperature die casting processes. It's fascinating to see how these advancements not only address issues like deformation and wear but also extend the lifespan of critical components.

Material science continues to push the boundaries of what's possible in industrial applications!

LUBRICATION

By applying lubricant only where needed and using a controlled dosage injection pump, you can minimize costs and prevent workplace pollution. Ensuring that no non-metallic substances enter the mold is crucial for maintaining the quality of your castings. This careful approach not only enhances efficiency but also protects the integrity of the final product.

CLS-200



CLS-200 is a vegetable ester based lubricant that is biodegradable. It is blue in colour, remains as a solution and has a high flashpoint. It is also low smoke, and very well priced.

CLS-200 tip lubricant is formulated for lubrication of all types of plunger tips : beryllium copper, bronze, steel and all diameters.



LUBRICANT SYSTEMS

All lubricants used in combination with our dispensing units

ALD (Allper Lube-Drop)

CRL (Castool Rod Lube)



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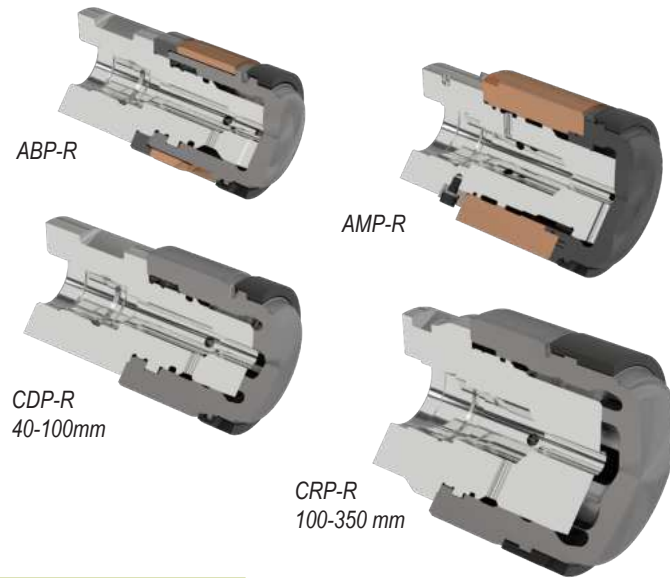
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PLUNGER TIPS

The plunger tip is indeed a crucial component in the aluminum die casting process. Its effectiveness relies heavily on its interaction with a stable shot sleeve, which must be straight, thermally stable, and dimensionally consistent.

Castool's plunger tips, initially developed by Allper of Switzerland, were originally made from high-quality copper alloys. These alloys were refined, heated, cast in a high vacuum, forged, and thermally treated to ensure high fatigue resistance, hardness, heat resistance, and thermal conductivity.

Today, most plunger tips are made from Con-Duct, a material known for its excellent thermal conductivity and toughness. This evolution in materials has significantly enhanced the performance and durability of plunger tips in die casting.



ROD LUBE

Castool's plunger rod lubrication system is designed with precision and efficiency in mind.

By applying a small, measured amount of lubricant only where it's needed, it helps maintain the quality of the casting and reduces unnecessary costs and pollution.



Excessive lubrication can indeed lead to issues like moisture and gases affecting the casting soundness, as well as potential porosity from graphite-based lubricants. Ensuring that only the necessary amount of lubricant is used can significantly improve the longevity and safety of tooling components.

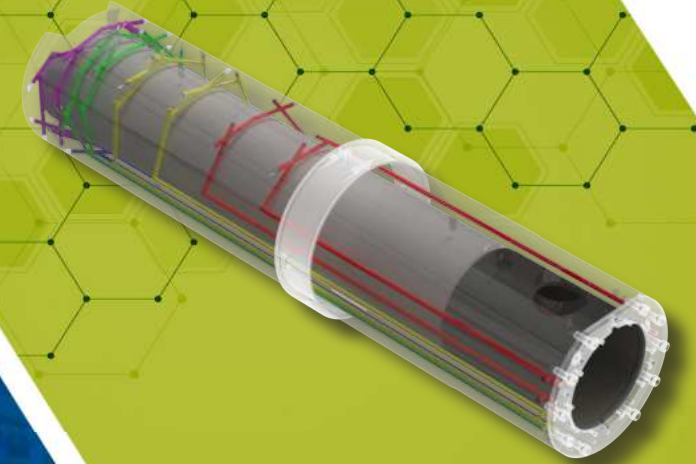
This approach not only enhances the casting process but also promotes a cleaner and more cost-effective operation.



Lubrication Methods



SHOT SLEEVES



The shot sleeve is a crucial component in the die casting process, serving several important purposes.

PURPOSE

- ▶ Stabilize Temperatures : Maintaining a consistent temperature helps keep the shot sleeve round and straight, ensuring the plunger tip can seal properly against the sleeve wall. This also extends the tooling life.
- ▶ Smooth Plunger Movement : A stable temperature allows the plunger to move smoothly and consistently through the shot sleeve, reducing scrap and improving casting quality.
- ▶ Longevity: Proper maintenance and temperature control provide a long life for the shot sleeve, minimizing unscheduled downtime.
- ▶ Prevent Alloy Penetration: By maintaining a secure seal, the shot sleeve prevents alloy from penetrating between the sleeve and plunger, which prolongs the tooling life.
- ▶ Minimal Lubrication: The plunger can move smoothly with minimal lubrication, enhancing casting properties.
- ▶ Effective Vacuum Seal: A secure seal with the shot sleeve wall is necessary for drawing an effective vacuum, which reduces porosity in the final product.
- ▶ Quick Biscuit Cooling: Efficient cooling of the biscuit helps reduce cycle times, increasing overall productivity.

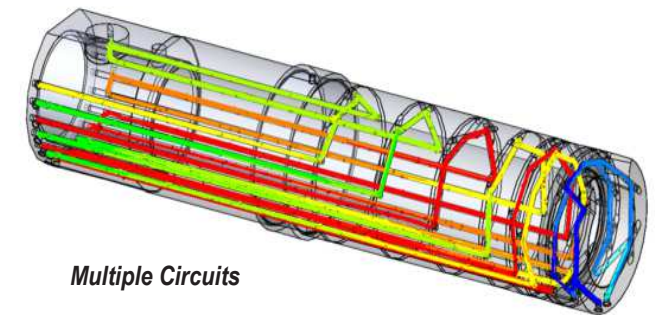
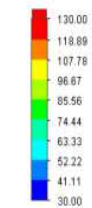
FUNCTION

These functions are essential for maintaining the integrity and efficiency of the die casting process.

TEMPERATURE

Ensuring the plunger moves smoothly and steadily through a perfectly round, straight shot sleeve is crucial for both productivity and the longevity of the equipment. However, the challenge arises when the shot sleeve is exposed to high temperatures, causing the metal to expand and potentially distort, especially when partially filled with molten alloy.

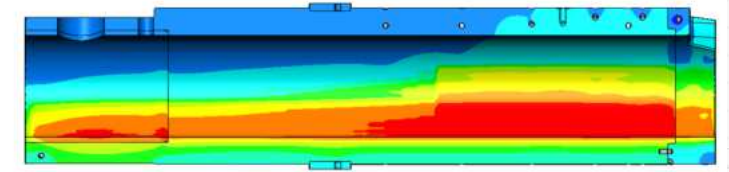
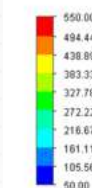
Flow Temp. [°C]



Multiple Circuits

This distortion can lead to inconsistencies in the casting process and affect the quality of the final product. Implementing effective cooling systems and using materials with high thermal stability can help mitigate these issues.

Sleeve Temp. [°C]



Thermal Simulation

CASTOOL MAKES DIECASTING BETTER