

PRESSURE TESTING



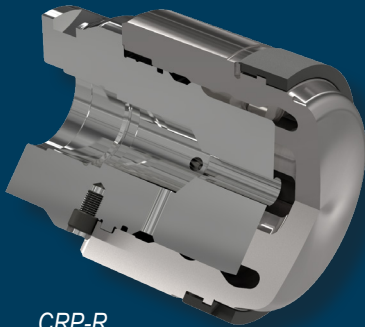
PROCEDURE

- ▶ The shot sleeve is loaded into the testing chamber
- ▶ The flow and pressure tests are run using a recipe system
- ▶ The hydraulic oil is kept at a constant temperature to ensure repeatable results by maintaining the fluid viscosity level

Firstly, a flow test is executed to check for any clogs in the system (100 lpm max limit). Then a pressure test is run after successful completion of the flow test. The pressure is taken up to 300 psi (depending on design requirements)

Pressure drop is monitored to ensure there are no leaks. After the testing is completed, the air is used to purge the oil. Visual inspection is also conducted by the operator.

All variables are logged to a database and a report is generated.



CRP-R

BIGGER CASTINGS - BIGGER PROBLEMS

The cautionary title might better have been "Bigger Castings Greater Opportunities", because the market for light metal die castings is expanding more rapidly than ever before, and much of this opportunity lies in large castings. This escalating market is primarily in the automotive sector.

It is an accepted fact that for an average-sized car, a 10% reduction in weight will result in a 5% reduction in energy consumption. Automakers are naturally anxious to reduce the weight of their vehicles by replacing steel components with aluminum, wherever it is economically feasible. Some of these will be quite large castings, frames, engine cradles and blocks, gear boxes, dashboards, and so on. Since about 20 million vehicles are produced in North America each year, the potential for the light metal die casting industry is considerable.

Anticipating this market, some die casters who previously used 3,000 to 4,000 ton machines with 5"-6" diameter shot sleeves, 36" to 42" long, are adding 6,000 to 8,000 ton machines with 8"-10" diameter shot sleeves, 68" to 70" long.



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 unit has maximum capability of 1500 psi. Today, shot sleeves are typically tested at 80 psi to 100 psi, the new standard will be 300 psi. The tests are logged to a SQL database. The time stamped reports can be shared with the customer as needed.

FATEFUL .004"

To attain maximum productivity, and also maximum operating life for both the shot sleeve and the plunger tip, the plunger must move smoothly and at a constant speed through a perfectly round, straight, shot sleeve. The clearance between plunger and shot sleeve cannot exceed 0.004" (0.10 mm). If the clearance becomes greater than this, the alloy can penetrate as flash or blow-by. This will cause excessive wear.

The clearance between plunger and shot sleeve never remains constant. At the pour end, at the start of the casting cycle, the sleeve is very hot, and the plunger tip quite cool. As the plunger moves forward toward the die end, the tip becomes hotter. At the end of the stroke, the sleeve dissipates heat to the platen and the die, and cools. The tip therefore expands, while the shot sleeve contracts. If the initial clearance at the pour end is small enough to prevent penetration of alloy past the tip of the plunger, the plunger may seize in the sleeve before reaching the end of the stroke. The chance of this happening increases with the length of the shot sleeve.

PERFECT CASTINGS FASTER

To even approach the ultimate goal of efficiently and economically producing a large, perfect, light metal casting, the plunger, perhaps aided by an expanding wear ring, must first seal, and then pass through a round, straight, completely lubricated shot sleeve. Both shot sleeve and plunger will be adequately cooled to control thermal expansion and maintain the necessary gap. Air will be positively removed from the die cavity and the shot sleeve by an effective vacuum system.

The quality of the product will be consistently excellent. Delivery will always be on time. The price will be competitive. The customer will be satisfied. The die caster will make a profit.



QUALITY



SAFETY



ENVIRONMENT

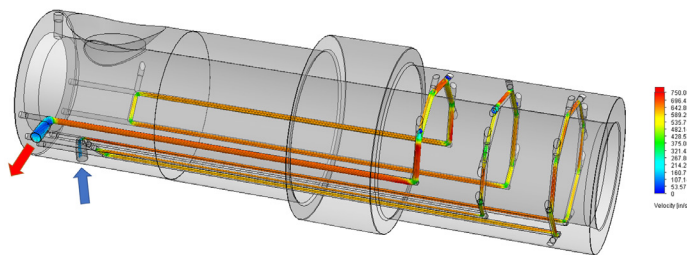
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SHOT SLEEVE



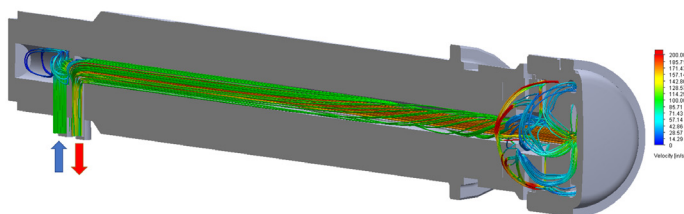
Typically, a shot sleeve may become 270 F° (150 C°) hotter at the bottom under the pour hole, than at the top in front of the hole. If the temperature of the sleeve is much higher at the bottom than at the top, unequal expansion will cause it to become oval instead of round. This will also cause the sleeve to become slightly bowed instead of straight. Either or both of these conditions will cause premature wear of both plunger tip and sleeve. The extent of ovality and distortion is directly related to both the diameter and length of the shot sleeve. To avoid too much variance in thermal expansion, the bottom of the shot sleeve should be cooled so that the difference in temperature, bottom to top, does not exceed 90 F° (50 C°).

Cooling shot sleeves may be done with either water or oil. The advantage of oil is that it can be used for heating as well as cooling. By preheating the sleeve, the die caster can minimize the tip and sleeve wear, and reduce the scrap which normally occurs while the sleeve is heating up to operating temperatures.

Unusually high shot sleeve temperatures often result from short cycle times, high filling ratios, and thin sleeve walls. The wall thickness should be at least 1/3 of the inside diameter of the sleeve. The size of the pour spout should be less than 70% of the bore of the sleeve. The unsupported portion of the sleeve should be as short as possible to avoid bending.

For large casting machines, effective cooling of the shot sleeve is essential.

PLUNGER TIP



The face of the plunger tip is in direct contact with the alloy after the pour. Unless the plunger tip is adequately cooled as it moves forward, it will expand much more rapidly than the sleeve. Binding may result.

Most problems in satisfactorily cooling the plunger tip result from an inefficient transfer of heat to the cooling water, and often simply an insufficient flow of water. A plunger tip should be designed for maximum cooling.

A forged Con-Duct tip is supported by a stainless steel holder which lies in full contact with the inside face of the plunger, and absorbs the total shot pressure. This allows the face wall of the plunger to be very thin, which makes for an extremely efficient heat exchange. This exchange is assisted by cooling channels in the tip face. These channels are designed in such a way that the flow of coolant becomes turbulent. This turbulence prevents filming or stratification, thus improving the transfer of heat to the coolant.

Castool has developed the CRP to provide a low cost, easy to use plunger with predictable life. The Con-Duct material has reasonable thermal conductivity (better than H-13 and less than BeCu) and the method of cooling is very effective.

SCHMELZMETALL

HIGH VACUUM COPPER ALLOYS



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