

SoftSHOT Technology

A Breakthrough in Die Casting
Process Control

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Visi-Trak Worldwide, LLC.*

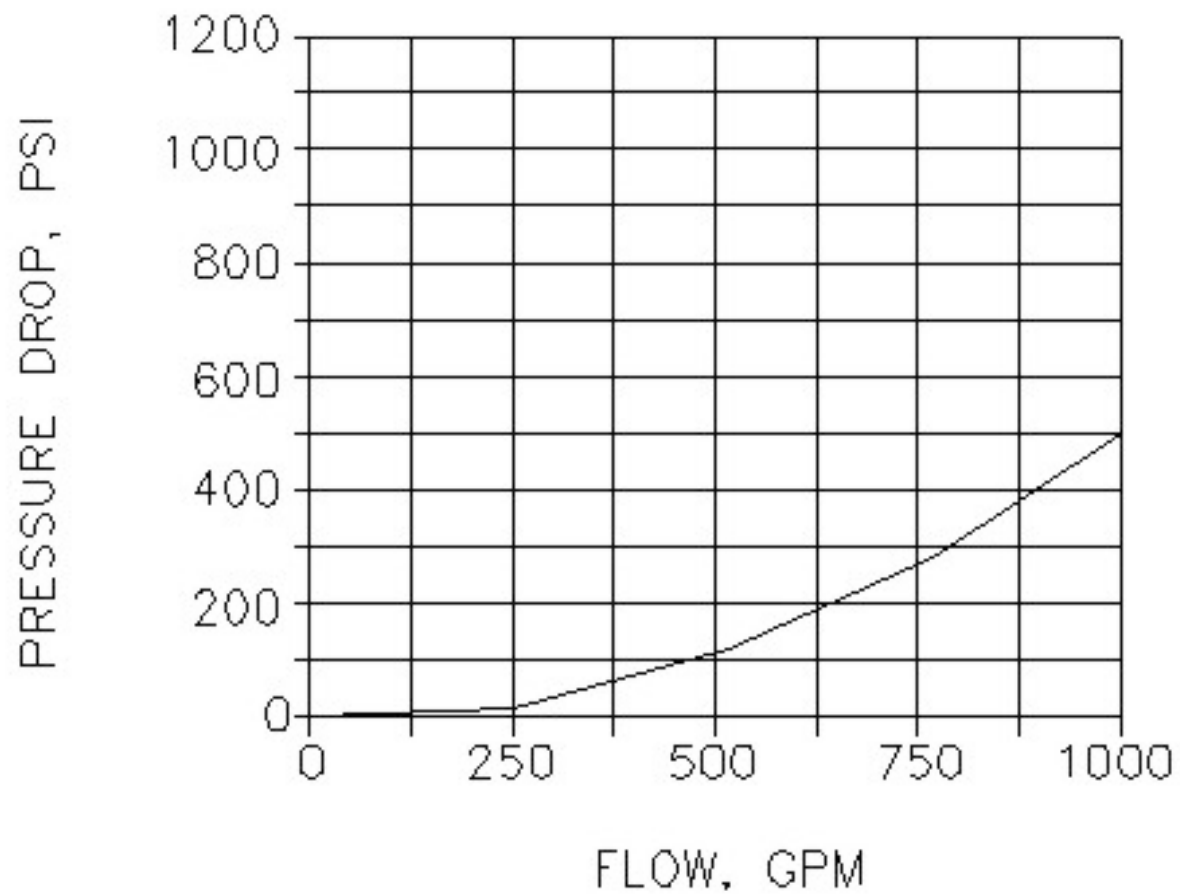


SoftSHOT™ Technology

Is a trade name given to a process in which the overflows on die casting tooling can be sized in such a manner so as to:

- A) Limit the pressure in the cavity area
- B) Decelerate the Shot System
- C) Eliminate FLASH from die cast parts

Flow curve for hydraulic valve







Dry Shot Speed capability always
exceeds maximum speed possible
when pushing metal



Main gate feeding the casting is a restriction- providing resistance



Decreasing gate size further
will reduce maximum velocity
(pushing metal) even further



Therefore, it is logical that we could “Size” a series of (decel) overflows that will stall out the kinetic energy of the shot system




The meaning of “Size” is to:

- A) Establish a specific cross sectional gate area for each overflow, and...
- B) To set an exact pocket volume for each overflow

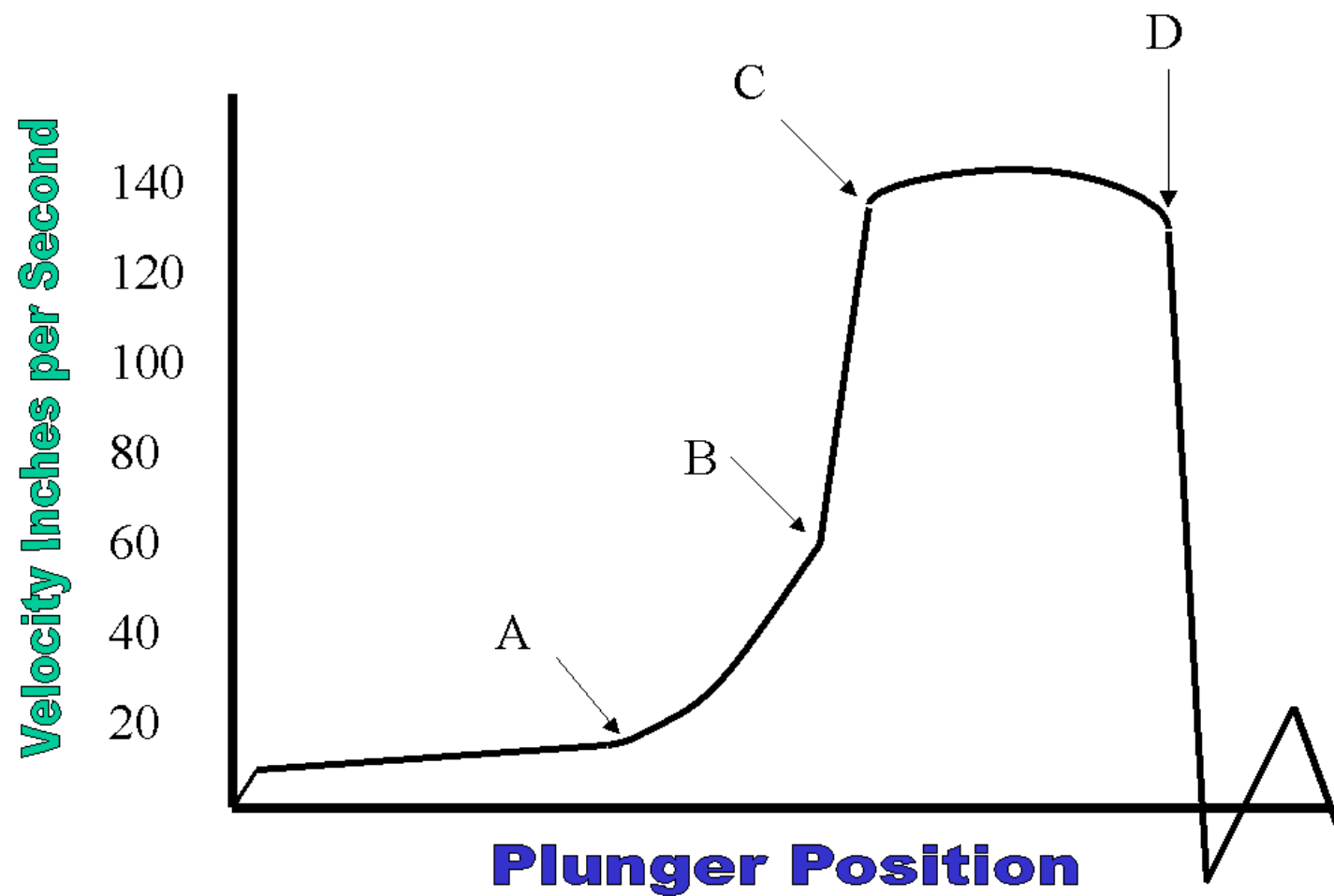
The gate leading to each overflow pocket is a valve

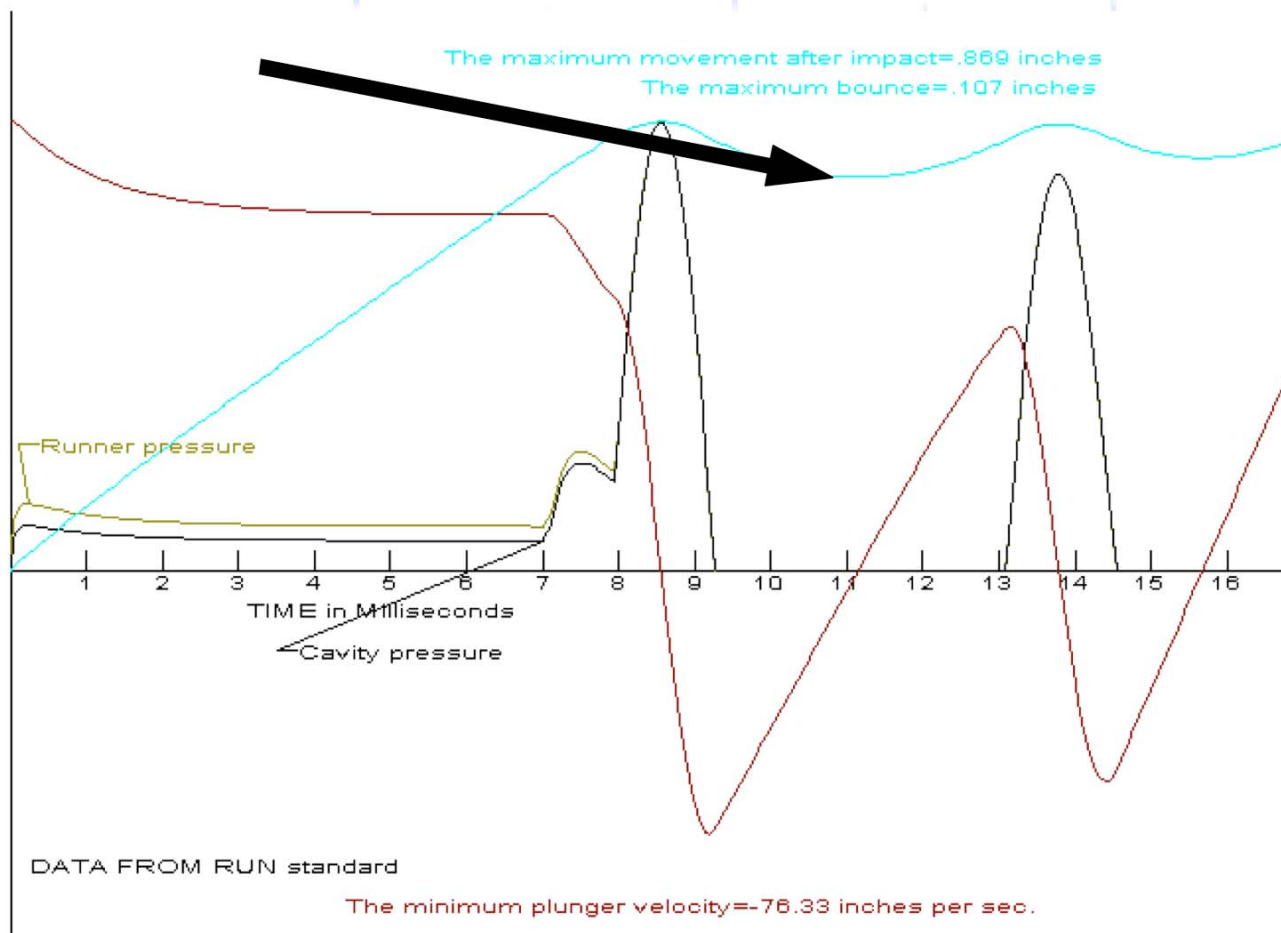
How long each valve is on,
is regulated by pocket volume



The overflows must be
positioned where the final filling
occurs

Figure 1





Over flow
volumes
cubic in.
Vol1=1.136
Vol2=1.136
Vol3=.947
Vol4=1.136
Vol5=1.136
Vol6=1.136
Vol7=.000
Vol8=.000

Orifice
area
sq. inches
Orf1=.050
Orf2=.061
Orf3=.050
Orf4=.050
Orf5=.050
Orf6=.060
Orf7=.000
Orf8=.000

RUN

FINISH

CHANGE

Data File

Weight of the piston, plunger, and tip	= 367 pounds
Plunger velocity at impact	= 220 i.p.s.
The piston diameter	= 7.00 in.
The piston rod diameter	= 4.00 in.
The plunger tip diameter	= 4.50 in.
The accumulator pressure	= 980 p.s.i.
The cold chamber pressure at impact	= 709 p.s.i.
The weight of a trimmed casting	= 1.15 pounds
The number of cavities	= 2
The weight of the runner system	= 3.26 pounds
The ratio of mold expansion to molten metal compression	= 2.00
Casting Metal	Magnesium

**Note— Other parameters such as the equivalent flow area of the main gate and the restrictive effect of the hydraulic system are determined from above parameters.*



SoftSHOT™ (Program)

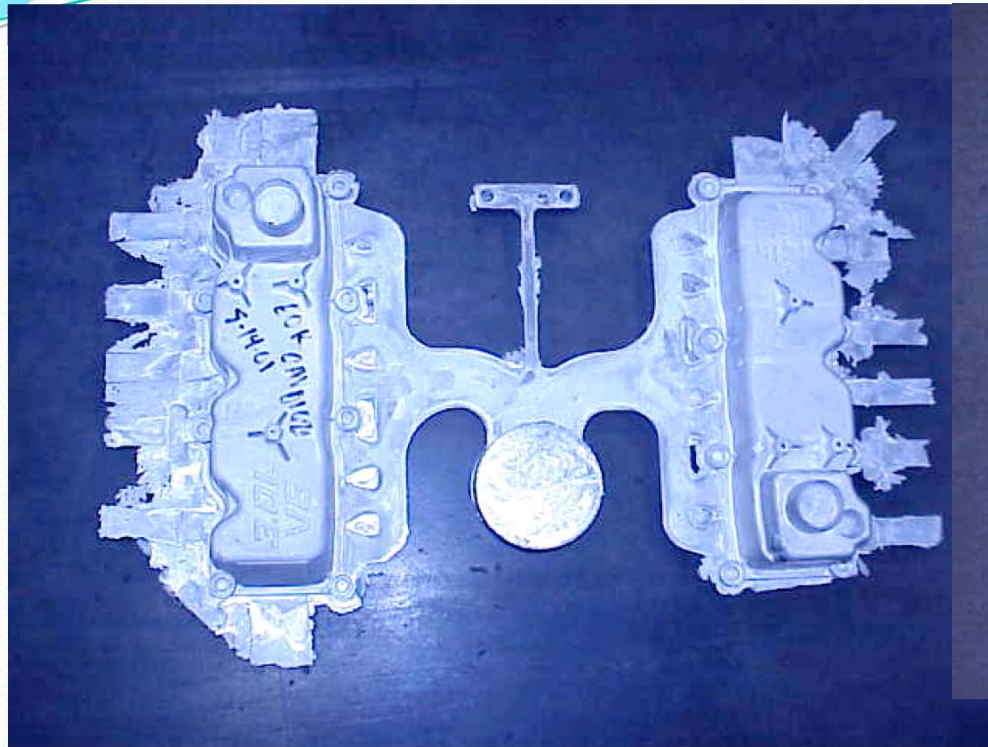
is a mathematical model of the behavior of the shot system and the pressure in tooling, beginning at point D on Figure 1



SoftSHOT™ Technology

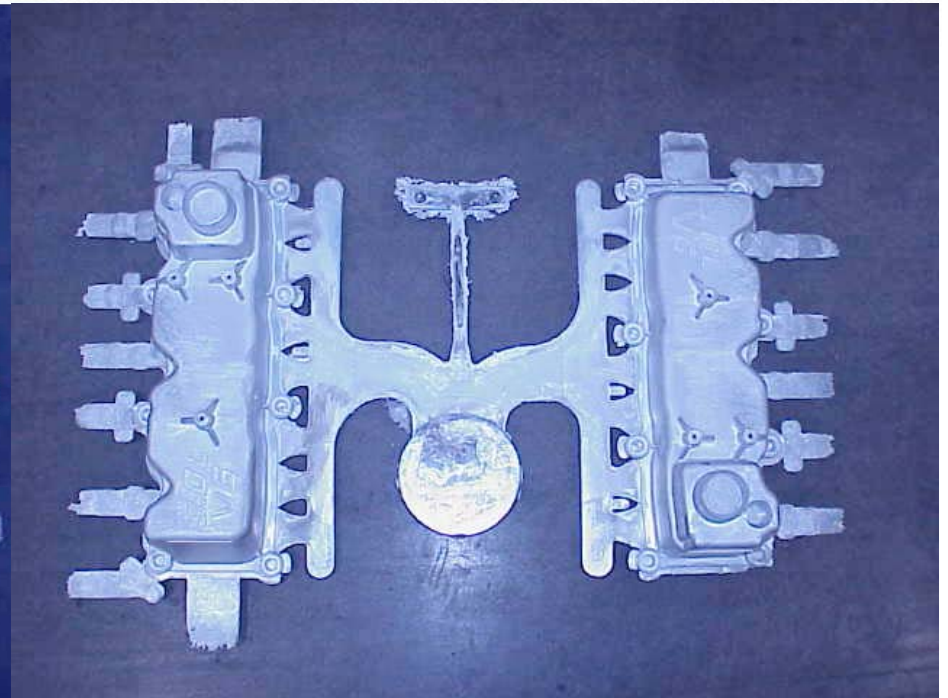
empowers the user to establish a set of overflows that will:

- A) Limit pressure in the cavity
- B) Decelerate the Shot System
- C) Eliminate FLASH from die cast parts



Before

Left side shows flash extending to the edge of the insert



After

FORD – Two cavity rocker arm cover



Before

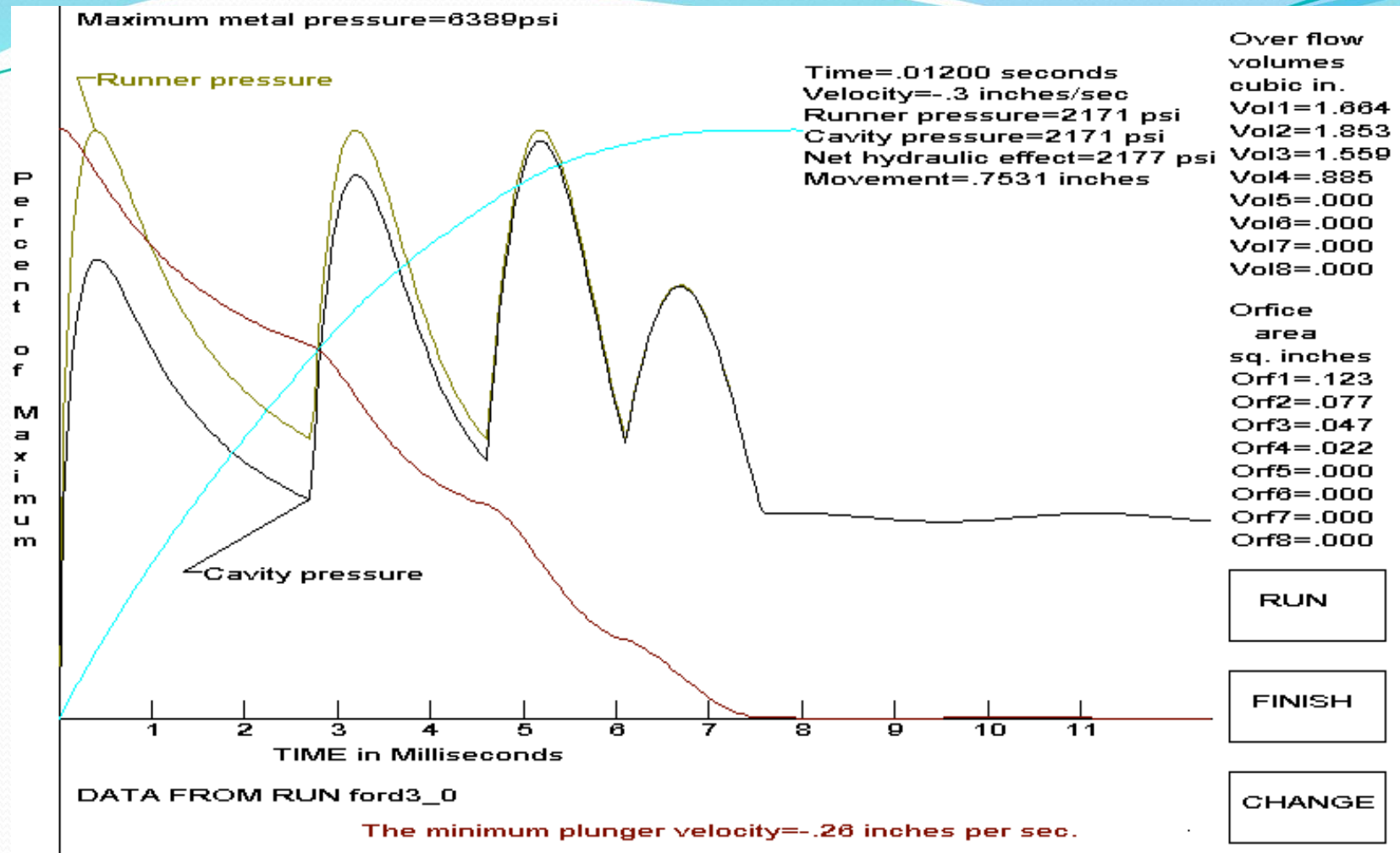
Left Hand 0.040" overflow gates



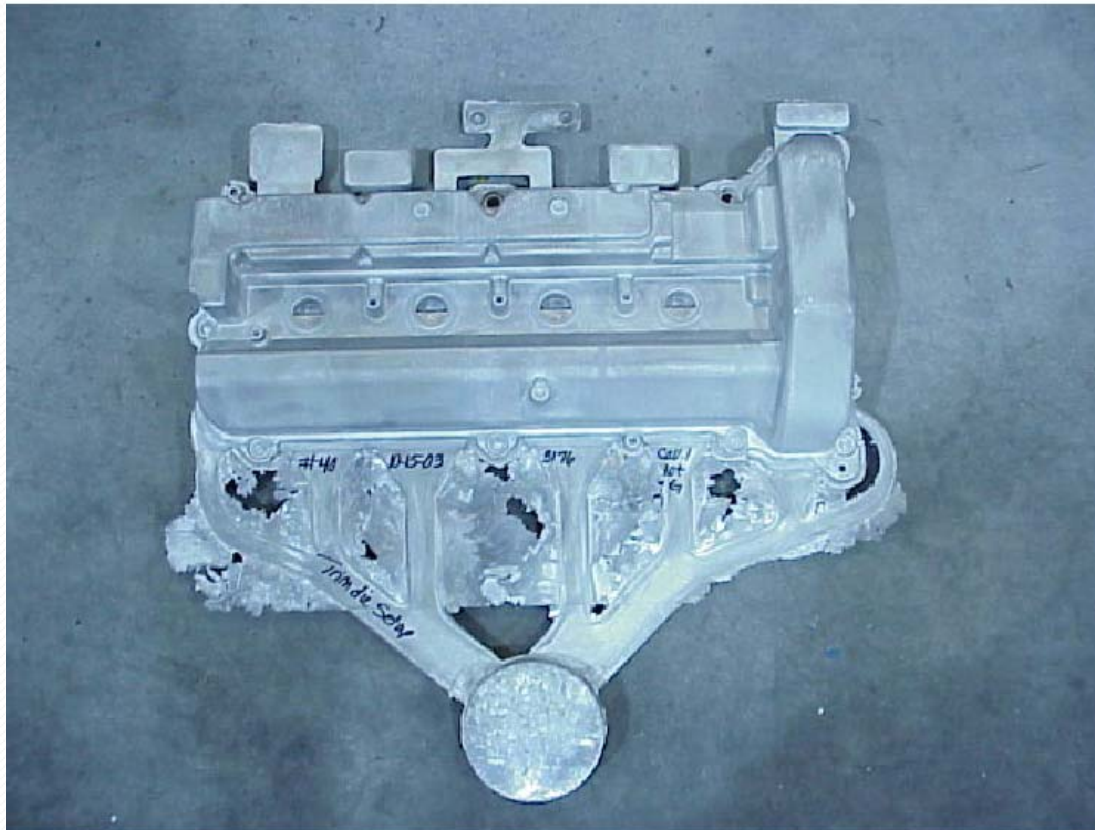
After

Right Hand 0.015 overflow gates

GM "Northstar" – 8 cylinder valve cover



Full SoftSHOT™ implementation (optimized overflow set) for the
“Next Generation Northstar Cam Cover”



After Next Generation GM "Northstar"

With full SoftSHOT™ Application

Final Filling Velocity 220 IPS

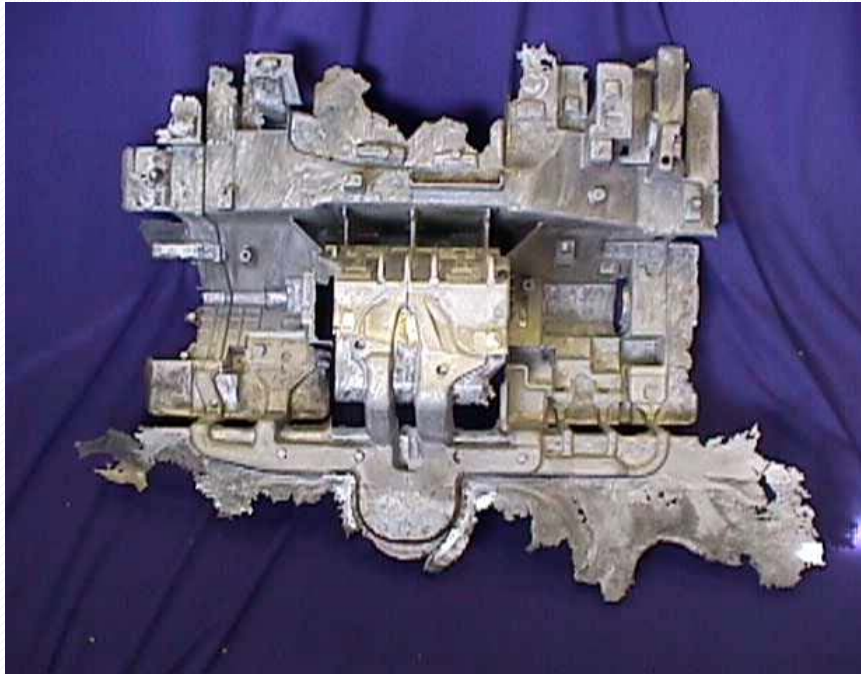


Before

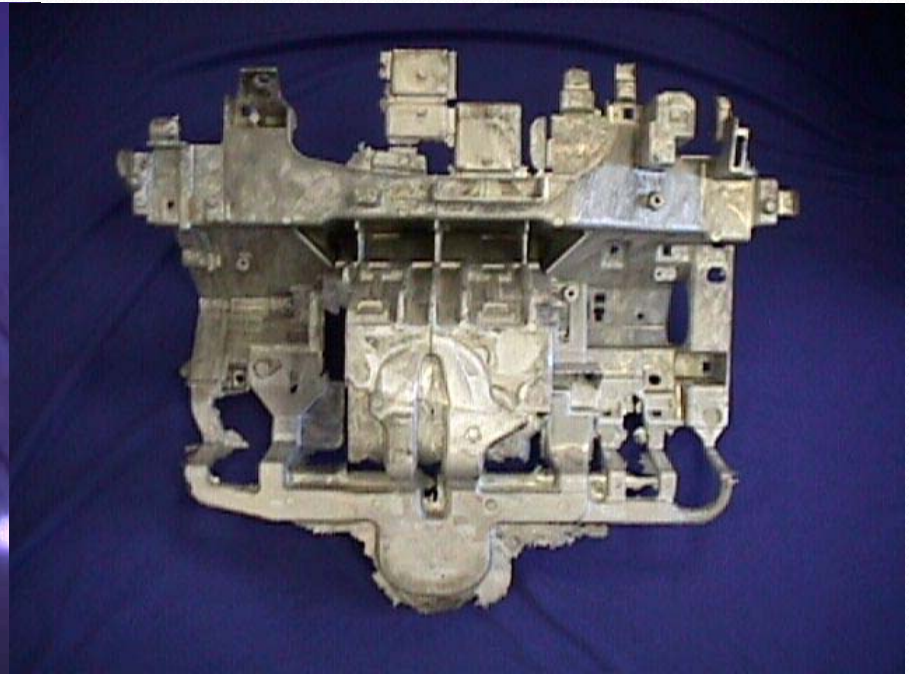


After

Toyota Corolla - Cam Cover



Before



After

Cadillac - Instrument Panel





Port City Group is a Licensee.

Front Differential Case

First Tool Run 84,000 Shots


The tool was retired with badly blown slide facing an expensive repair or to be run very inefficiently (downtime)



New Die with SoftSHOT™ Overflows 230,000 pieces

SLIDE IN GOOD CONDITION

Two Complete Tool Build Cycles Eliminated



After the successful initial trial run, Port City Group began to focus full implementation primarily on slide tools, where flash buildup in slides created quality and downtime concerns.

It didn't take long before the flash related issues were eliminated and PCG began to see the major benefits by further controlling process variation in the tools.

SoftSHOT™ Before



SoftSHOT™ After



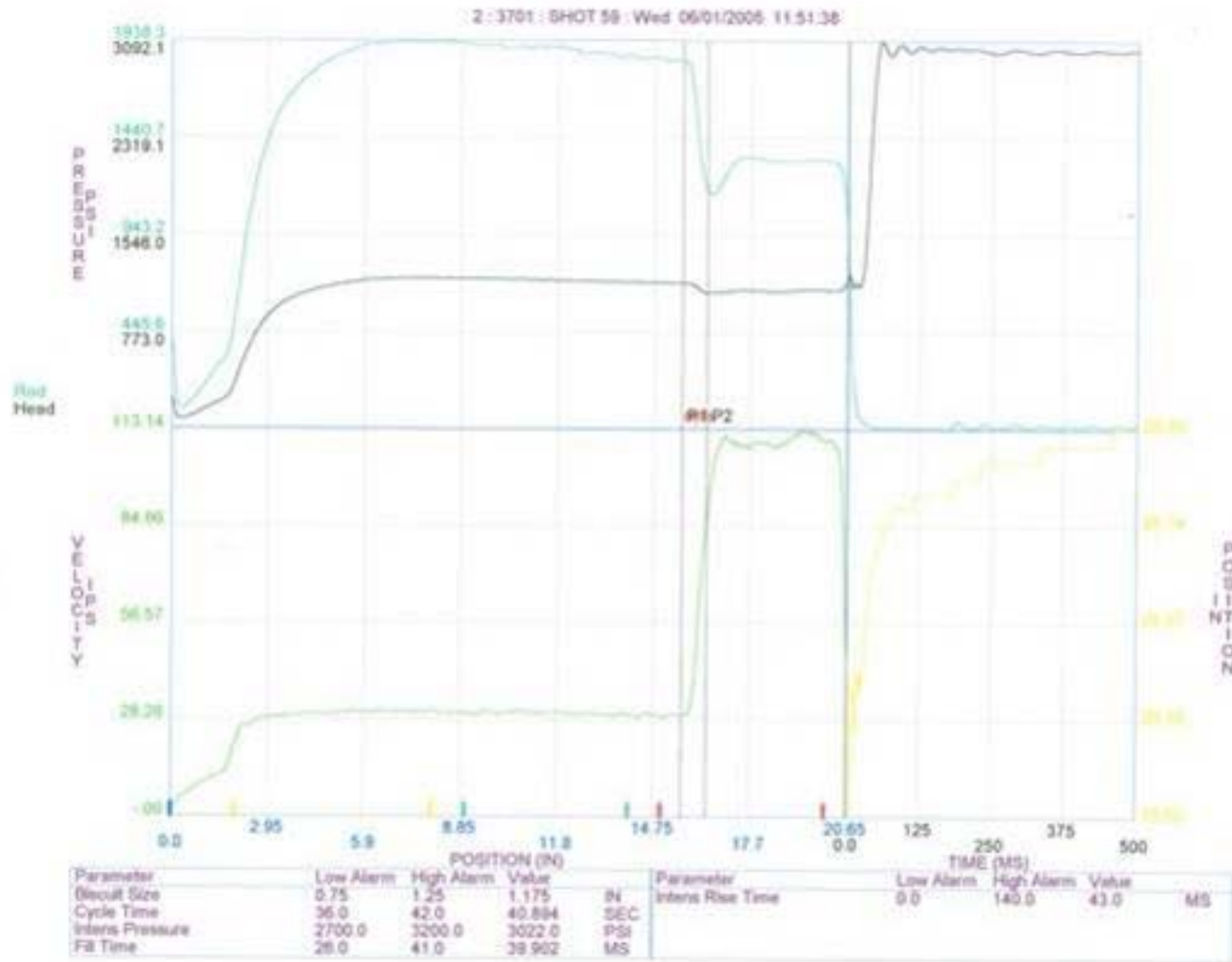



PCG discovered process variations that could be controlled with the implementation of SoftSHOT. These include:

- Biscuit thickness
- Intensifier response time
- Plunger squeeze distance

These parameters were verified with the shot monitor to be more controlled and showed great improvements in the reduction of variation.

Visi-Trak Trace





Another significant benefit of SoftSHOT™
Technology
was realized during the process of validating and
correlating vent size between the MAGMAsoft
Simulation and actual tooling.



Dies were now being held shut and were therefore, FLASH FREE.

Die splitting was no longer an issue. Average cavity pressure at impact was reduced by 50%



Peter Olmsted suggested that the vent sizes could be cut much larger with SoftSHOT™ Technology integration.

This allowed much better venting of the cavity area, reducing gas porosity in the castings. Accuracy of the simulation data was improved



Implementation of SoftSHOT Technology has enabled improvements in process control.

- Problems with flash have been eliminated.
- Impact pressure is controlled and very consistent.
- Machine uptime has increased, especially on tools with slides
- Reduction in variation in other process parameters



Scrap has been reduced and part quality has improved.

The greatest payback has been that after two years of SoftSHOT Technology implementation, there has been a significant increase in tool life.