

ALUMINUM MOTORCYCLE WHEEL - SCRAP REDUCING CASE STUDY WITH HIGH THERMAL CONDUCTIVITY DIE STEEL



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Article Takeaways:

1. Resolving shrinkage issues to reduce scrap
2. Reducing die build time by eliminating heat treating

the highlighted area. Insufficient cooling resulted in serious porosity due to shrinkage problem and a high scrap rate. A third H-13 cooled core pin was added, but the high scrap rate due to shrinkage persisted. The H-13 cooled pins were changed out for Thermo cooled core pins.

Result: The scrap rate due to shrinkage went to zero.

Reduction of Die Build Time – Piston

The die for this piston were previously made from H-11 heat treated to HRC 46-48. Manufacturing time for the die, including heat treat, was 4 weeks. The motor scooter manufacturer changed the die to Toolox 44 at HRC 45. By eliminating the need to heat treat they reduced manufacturing time to 3 weeks. They also eliminated additional time spent tweaking the die to correct any distortion caused by heat treating.

Result: Reduced manufacturing time to only 3 weeks.

Additional unexpected results were the die running 65 degrees cooler in service with the same cooling as the H-11 die. This reduced thermal shock and delayed heat checking resulting in 20% prolonging of die life. Additionally, part quality was



A manufacturer of an aluminum motorcycle wheels was suffering with a rejection rate of 45%. The majority of the rejects were caused by shrinkage around the center core pin for the axle area. The original pin was made out of H-13 at HRC 49 and nitrided. The caster was unable to get sufficient cooling of the H-13 pin to eliminate the shrinkage problem.

By changing the pin to DHA Thermo, HRC 47/48, nitrided, with the same cooling, the in service operating temperature of the center pin was lowered by 50 degree C.

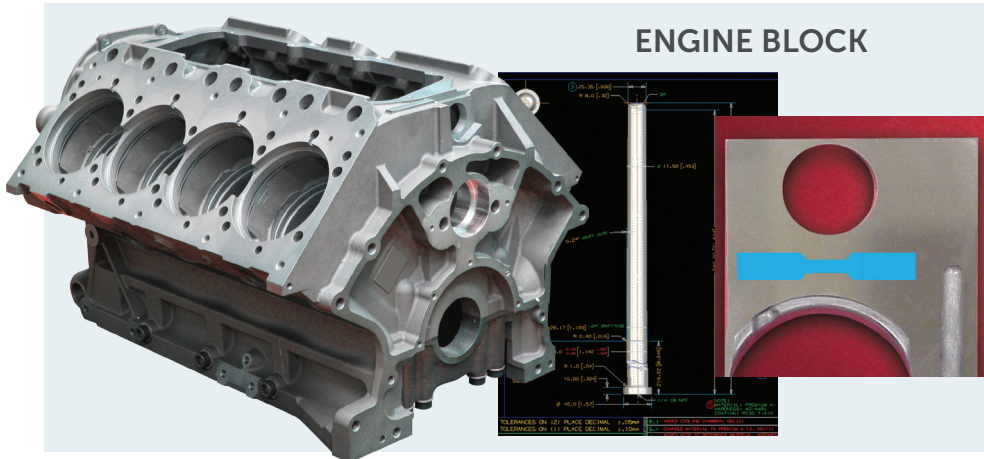
Result: The reject rate due to shrinkage was reduced to zero.

Resolving Shrinkage Issues to Improve Yield Rates

Figure 1 is a motorcycle cylinder head cover. The original design called for two cooled core pins in



Fig. 1 Head Cover



ENGINE BLOCK

Original casting was failing to meet required tensile properties in the journal bearing area.

Core in the area was changed from H-13 to Toolox 44 tool steel.

Result: Due to faster cooling with the Toolox 44 core, tensile properties of casting were enhanced to the extent that minimum specified property levels were met.

improved due to improved chill zone and reduced porosity.

Reduction of Die Build Time – Die for a furniture component

Originally the die was made out of H-13 ESR. The manufacturing time was approximately 30 days. Twelve days to machine, seven days for heat treatment, and 11 days for adjustment after heat treat. The die was changed to Toolox 44. The raw stock was delivered on February 20, 2013. The die was finished March 10, 2013, and trial shots run on the 11th. The total manufacturing time was 16 days, including waiting 4 days for a mold base. The time savings correspond to the elimination of heat treatment and the following adjustment of the die to its final geometry. The Toolox 44 did not require stress relieving during machining because of its great stability.

Result: The total manufacturing time was 16 days – die successfully completed and the desired production of 250,000 pieces.

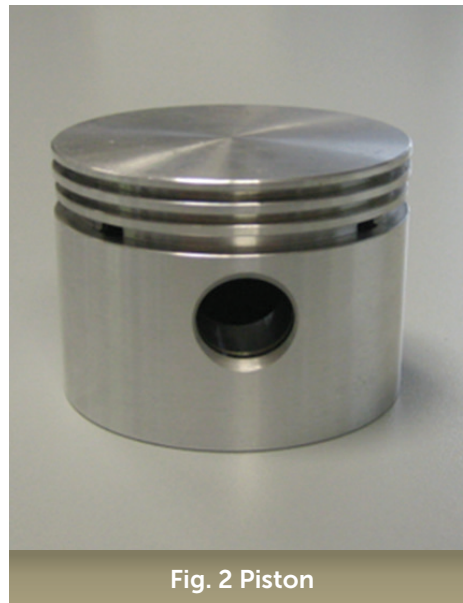


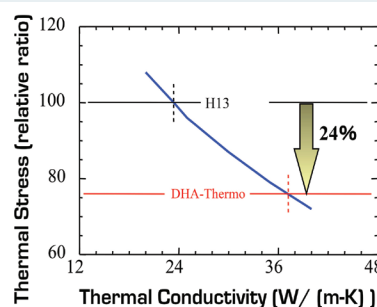
Fig. 2 Piston



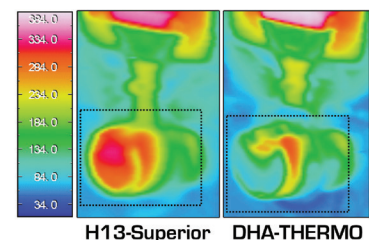
Fig. 3 Component Die

REDUCTION OF CYCLE TIME

When using a high thermal conductive for shot blocks or sprue cores, the more rapid cooling and solidification of the bisquit allows for decreased cycle time, when compared to H-13 with the same cooling method.



DHA-THERMO cools faster than H13. Temperature difference: 120°C



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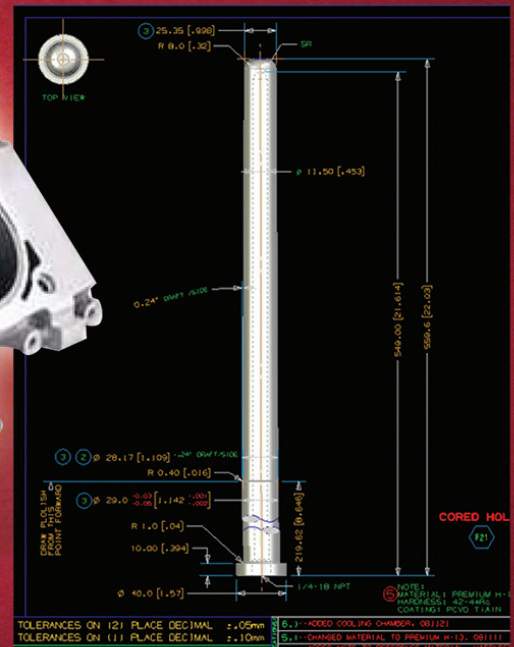
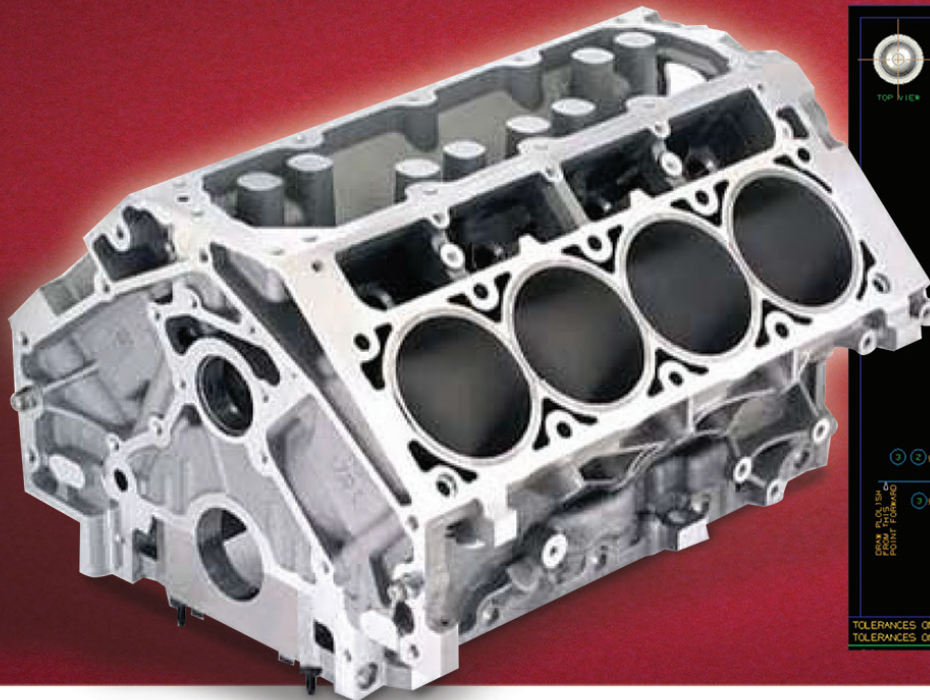
*** Have a question? Go to the Moderated Die Casting Forum. All questions are answered quickly!**

H-13 (46-48 HRC) Toolox 44 (45 HRC)

High Thermal Conductivity Tool Steel

Description

Automotive engine block casting



Experience

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Due to faster cooling with the Toolox 44 core, tensile properties of casting were enhanced to the extent that minimum specified property levels were met.

