

Superior Material for 3D Printing of Aluminum Die Cast Dies — Fast, Easy, Reliable, Affordable, Safe

CHALLENGE

Selecting the Correct AM Powder to Meet Requirements of Application

Utilizing LPBF Additive Manufacturing to build Aluminum Die Cast Dies presents a myriad of advantages to the industry including design freedoms, conformal cooling, lower part cycle times, higher part quality, and longer die life. However, H-13-type tool steels, the industry's traditional mold materials, generally crack on the most common 3D printing technology, laser powder bed fusion (LPBF).

To pursue the advantages of AM, some aluminum die casters have chosen to print with M300 Maraging Steel. While M300 prints well on LPBF platforms, its inherent material properties are not optimal for this application. And, in certain cases, the use of M300 material has contributed to a rapid deterioration in mold integrity.

MacLean Additive's L-40 Tool Steel Powder offers performance that meets or exceeds the requirements of aluminum die casters and significantly outperforms M300 powder (*see details other side*).

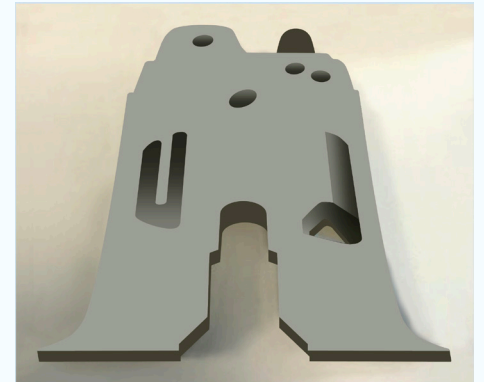


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Let's redefine what's possible in additive manufacturing. Talk to our experts today!

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Cross section of Aluminum Die Cast Die printed with MacLean Additive's L-40 Tool Steel Powder

MATERIALS SUMMARY

L-40 Tool Steel Powder

Superior to M300 on LPBF AM:

- **Reliability:** Less prone to crack formation
- **Performance:** Longer die life; excellent polish-ability
- **Efficiency:** "Print and use"; no heat treatment required
- **Sustainability/Safety:** No Cobalt
- **Value:** Affordable, instant availability

H13

Traditional wrought material for application. Generally leads to crack formation on LPBF 3D Printers.

M300

Sometimes utilized as LPBF material with suboptimal performance.

Case Study

Compression Dies: Laser Powder Bed Fusion

INDUSTRIAL EXAMPLE

Goal: Short delivery times, complex design, >50,000 shots

Segment: Automotive

AI Die Cast Mold Size:

US: 7x7x6 in

SI: 18x18x17 cm



Not actual mold, illustratively similar

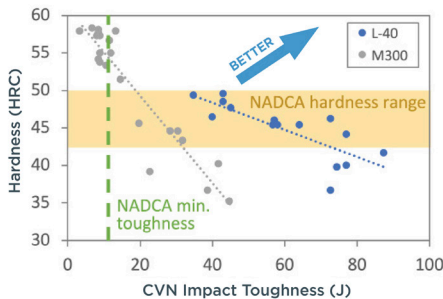
Mold printed with M300 failed at 2,000 shots

Same design printed with **L-40** still operating at 50,000+ shots

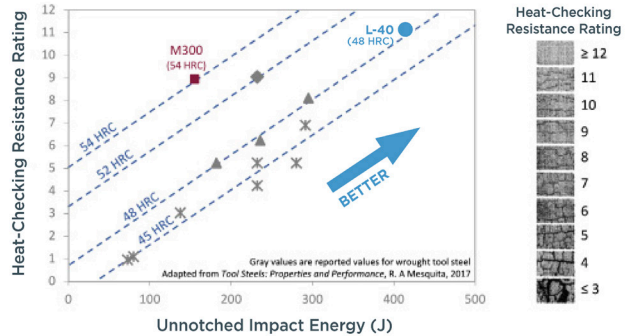
L-40 mold built and delivered in less than 2 weeks.

L-40 — INHERENT MATERIAL PROPERTY ADVANTAGES*

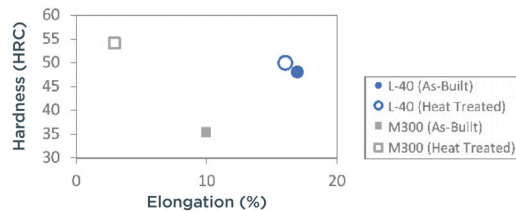
Graph 1: L-40 lower crack formation than M300 as evidenced by superior hardness/CVN impact toughness combination



Graph 2: L-40 lower heat checking and longer die life vs M300 due to its higher toughness at a given hardness



Graph 3: L-40 less die lead time due to die direct usability without further aging heat treatment enabled by material's high hardness and elongation "as printed"



*North American Die Casting Association, Special Quality Die Steel & Heat Treatment Acceptance Criteria for Die Casting Dies, NADCA publication #229, 2016

SOURCES: All data from above from literature, competitive data sheets and internal testing.