



FORMETRIX™

APPLICATION NOTE

Formetrix L-40 Powder for Aluminum Die Cast Dies

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

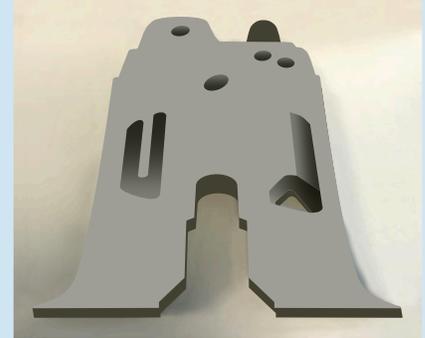
CHALLENGE

Selecting the Correct AM Powder to Meet Requirements of Application

Utilizing L-PBF 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, H13-type tool steels, the industry's traditional mold materials, generally crack on the most common 3D printing technology, laser powder bed fusion (L-PBF).

To pursue the advantages of AM, some aluminum die casters have chosen to print with M300 Maraging Steel. While M300 prints well on L-PBF 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.

Formetrix'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). Contact Formetrix for information and application details.



Cross section of Aluminum die cast die printed with Formetrix L-40

MATERIALS SUMMARY

Formetrix L-40

Superior to M300 on L-PBF AM:

- **Reliability:** Less prone to crack formation
- **Performance:** Longer die life; excellent polishability
- **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 L-PBF 3D Printers.

M300

Sometimes utilized as L-PBF material with sub-optimal performance.



INDUSTRIAL EXAMPLE

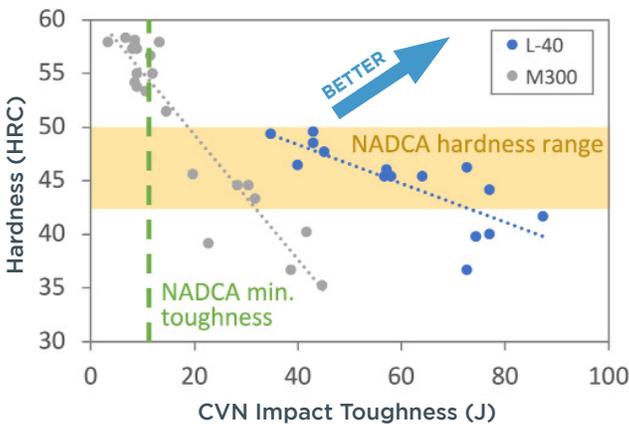
- **Goal:** Short delivery times, complex design, >50,000 shots
- **Segment:** Automotive
- **AI Die Cast Mold Size:**
US: 7x7x6 inch
SI: 18x18x17 cm



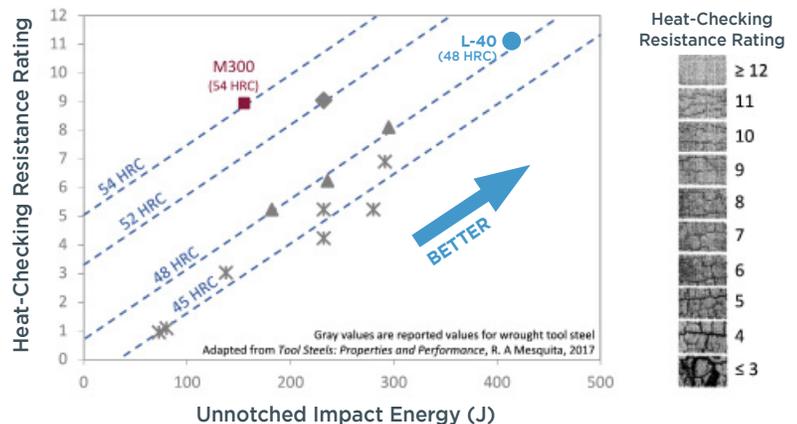
Not actual mold, illustratively similar

- Mold printed with **M300** failed at 2,000 shots
- **Same design** printed with **Formetrix L-40** still operating at 50,000+ shots
- Formetrix mold built and delivered in less than 2 weeks

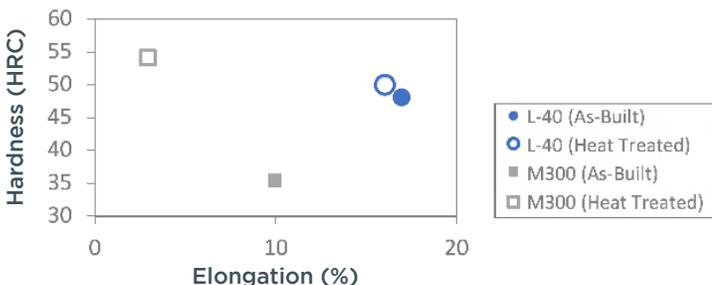
L-40 — INHERENT MATERIAL PROPERTY ADVANTAGES*



Graph 1: L-40 lower crack formation than M-300 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"



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

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