

Dr. Die Cast



Die Casting Defects: Nothing is New, or is There?

When it comes to defining defects, we're reminded that "beauty is in the eye of the beholder". After all, on the positive side, what defines a "good" casting? There are as many acceptance criteria as there are applications. Recognizing and fully understanding the requirements and expectations of the customer is critical. It is not unusual for expectations to greatly exceed the requirements. Improved communication between the die caster and the end user is essential. Often, the end user is not involved in the quoting process, so effort must be made to learn as much as possible.

The NADCA publication: "Product Specifications Standards for Die Castings" (Product code #402) or download (#402-D) outlines general, plus very specific guidelines for acceptance.

The publication includes a "Checklist" for various criteria including many described below. The important point when using the checklist is to understand the performance requirement of the end-use of the casting. As the designer or purchase, avoid over-specifying and don't under-specify. Over-specifying drives up costs unnecessarily and under-specifying could lead to casting failures or adding costs during launch because the requirements were not fully defined.

There are standards for "pressure tightness" that could have different requirements for gases such as freon, natural gas or propane, liquids such as gasoline, diesel, water, anti-freeze, motor oil and power-steering fluid.

Test pressures may range as low as 14 PSI (0.965 Bars) or up to 1,000 PSI (68.94 Bars) or higher.

While X-ray can be useful during product development, a pressure-decay leak test is frequently the only 100% guarantee for pressure-tight castings. Usually these tests use "shop air" but some require high pressure tests that require pressure intensifiers or special high-pressure compressors. If the castings are machined, then an additional leak test is required. The amount of machining stock removed is a key factor on pressure-tight castings. "Less is more." The closer you can produce the casting to net shape, the better leak test performance you will achieve after machining. In some cases, this will require you to hold tighter dimensional positional tolerances but the benefit of preserving as much of the casting skin as possible pays huge dividends. Reducing machine stock is also beneficial when visual micro-porosity has been defined as unacceptable. Improving cooling channel design has been demonstrated to increase the skin thickness and density and this will improve leak test performance.

Cosmetic or Decorative castings require a high degree of polish throughout the process. Special handling or packaging is required to insure that "show-faces" are not damaged during processing. Traditionally decorative castings have been produced in zinc but weight reduction efforts in automotive has driven much of this market to

aluminum and/or plastics. Designing thinner-walled castings can greatly reduce the casting weight and make it competitive. While the main criteria are visual, the castings still need to meet minimum strength performance standards.

Structural castings have become more common as the automotive industry continues its campaign to improve fuel economy though weight reduction. Additionally, die castings can often consolidate numerous features that would have required additional components and weldments when fabricated out of steel. Since most structural components are "safety critical" components, strength requirements may include CT scan, crack detection testing, fatigue testing, test to failure and environmental testing such as salt spray/corrosion testing. NADCA also publishes a manual for "Standards for High Integrity and Structural Die Casting Process" available as a book (#403) or download (#403-D).

Quality is not about an occasional acceptable casting resulting from 100% inspection or "yield". Real quality is found in a repeatable, stable process. This is only achieved though process development and 100% full time process monitoring that will immediately scrap any part that was produced out of process standards. It's not free, but it's more economical than failure.

See you at the next turn!

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