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Challenges in Machining Steel Castings

To achieve the performance and meet the design requirements of the purchaser, steel castings are machined, coated, painted, and finished in various ways. Traditionally and still commonly, steel castings are delivered as castings before the required machining to become the parts needed by the purchaser. The steel casting producer is responsible to meet all the requirements of the purchase agreement embodied in purchase orders, terms and conditions, specification requirements and drawing notes when the casting is certified and delivered to the purchaser.

The practice of purchasing un-machined castings can be problematic. When the purchaser machines the casting, it is common to uncover "porosity" which may be inclusions or other porosity and may render the casting unusable.

The traditional commercial arrangement for supply of steel castings was:

1. The foundry is responsible to meet all the specification requirements in the purchase contract for quality and NDT.
2. If the customer discovers a condition that is non-compliant at receiving, then they should reject the casting.
3. If the casting complies with the purchase requirements and is accepted by the customer and then during machining or other operations, porosity or other conditions that make the casting unusable are uncovered, the foundry is no longer contractually obligated.
4. The common commercial practice when these conditions are uncovered is for the foundry to either process the casting with removal and welding to make it usable by the customer or to replace the casting.
5. The foundry does not cover the costs for the customer's operations since they have no control over these operations and no ability to know or prevent these conditions from appearing in the casting.
6. If the customer wants to avoid this possibility, they can order a casting in the machined condition and hold the foundry responsible to provide a usable machined casting.

The Michigan Manufacturing Technology Center (MMTC) conducts industrial benchmarks and in 2012 reported for foundries that the median value for initial rejects from customers was 0.8%. In an era of high quality expectations, this is a poor performance but is in many ways a reflection of our current commercial practice. Supplying un-machined castings prevents the supplier from finding and resolving issues discovered in machining.

When the casting purchaser uncovers problems in machining, they often tighten surface inspection on the area that will be machined away. There is no inspection technique available to the casting supplier that will find these quality issues before machining. The tighter specification adds cost without consistently reducing the problems found in machining. We end up polishing and inspecting the material that will be removed in machining.

The practice of changing suppliers and making small quantity purchases gives the foundry little incentive to invest in finding a solution. Longer term purchase agreements allows the supplier and purchaser to cooperate to find the most efficient solution. Often the foundry can add additional stock on the machined surface or change the gating to address the problem.

In many ways, the supply of un-machined castings is the root of the problem. If the supplier is responsible for the machined casting, they have a full suite of tools to provide the most efficient solution and eliminate the uncertainty to the purchaser on the quality of the casting. When machined castings are purchased the common experience is that these problems of quality issues of castings are largely solved.



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