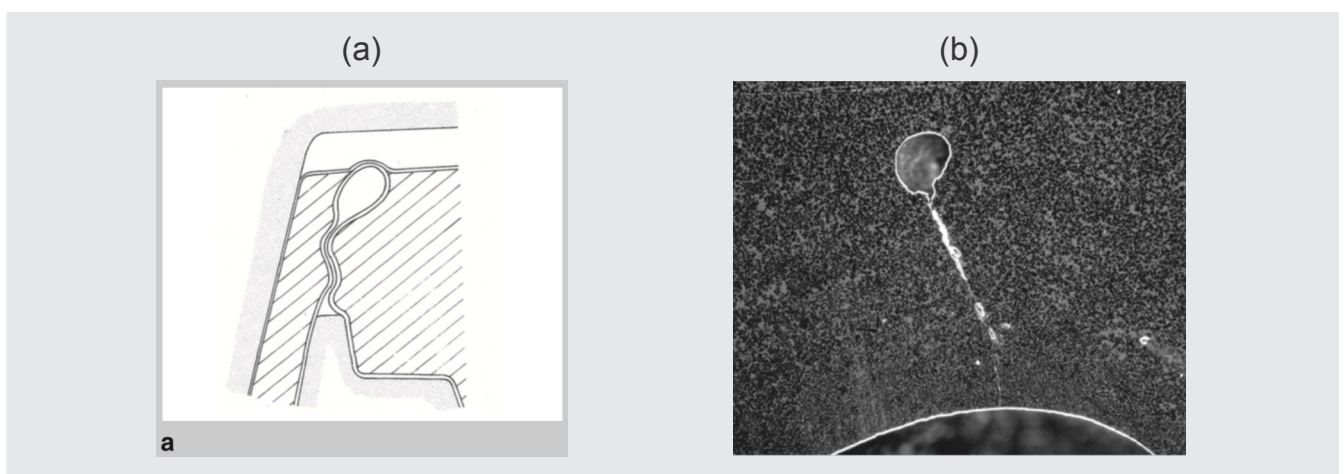


# IMPROVING METAL CASTING QUALITY USING LOW THERMAL EXPANSION AGREGATES - PART 3

One of the most aggravating defect types encountered in the casting production is related to blow holes in the parts. These defects are not easy to avoid, since sometimes they only may be detected during the machining step. Hence, in order to assure quality to the casting parts, this paper presents a quick understanding about the formation mechanisms of these defects and how to prevent it effectively.

Gas porosity (or blow holes) is generally considered to be originated from gases precipitated during the solidification of the metal and from entrained gas during the mould filling. Entrained gas can arise from different sources, such as from air present in the mould cavity before casting, from steam produced from water in the green sand, from gases produced by metal-mould-core reactions, and from gases produced by decompositions of the coatings, binders or sand additives in moulds and cores. As moulds and cores are heated by the metal, high local pressures can occur because of the gases produced. If the gas pressure exceeds the metal head pressure, the gas evolved can be forced into the metal and be trapped inside the casting. If the metal is completely liquified when the gases are evolved they may not remain trapped, but they can still damage the casting by leaving oxide trails, dross and dissolved gas.

Considerable researches have been done to understand the core and mold contribution for the gas defect formation and which solutions can be applied to eliminate or control it. All of them try to reduce the gas pressure into the mold and the most common solutions used are: reducing the resin or water content in the cores and molds; changing or reducing the high-loss on ignition (LOI) coating; eliminating or reducing the high-LOI sand additives; drilling vents into the solid cores and molds; improving the filling system; using sands with higher permeability. Figure 1 shows a schematic drawing for gas defect mechanism and an example of this type of defect in a casting part.



**Figure 1 - (a) A scheme of a core blow from a raised core, and (b) a macrograph showing the bubble trail arising from the core blow with the associated oxide film (adapted from Prof. John Campbell's Ten Rules for Making Reliable Castings, by Mark Jolly, 2005).**

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Sometimes, the foundries face difficulties to implement some of these solutions to eliminate the gas defect. For instance, reducing the resin content consequently reduces the core and mold resistance. Drilling vents into the core and molds are sometimes unfeasible because of the core position or size. Reducing the coating or sand additives may increase veining and sand penetration defects. For these cases, the most suitable solution is the use of high-permeability sands.

Focusing this foundry market, Mineração Curimbaba designed CASTBALL, a special high-corundum ceramic sand with unique properties that allows outstanding benefits in the cores and molds processes for metal casting industries. CASTBALL is a great solution to eliminate the gas defect of the casting parts. Due to its proper grain size distribution, CASTBALL leads to high-permeability cores and molds. Table 1 presents the benefits of using CASTBALL.

**Table 1. Gas defects solutions and the CastBall application advantages.**

Common solutions for gas defects	Negative Impact	Using CASTBALL
Drilling vents into the core and molds.	Unfeasible depending on the core or mold position and core size.	Venting can be achieved by using CASTBALL, which presents a high-permeability cores and molds. By eliminating this operation, it provides productivity increases and the cost is reduced.
Reducing the coating or the amount of high-LOI sand additives	It may increase veining and sand penetration defects.	CASTBALL shows low thermal expansion and LOI. In this case, it is possible to reduce or change the coating and eliminate the sand additives.
Improving the filling systems	In some cases, the cast geometry is so complex that the filling system does not guarantee a good performance. In other cases, it is time consuming and costly to change the tools.	CASTBALL is a solution for these cases, avoiding the cost of tooling changes and assuring a good performance for complex geometry castings.

Selecting CASTBALL grant the foundries the improvement in the quality of the casting parts productions, productivity increase, cost reduction, apart from occupational health and safety.