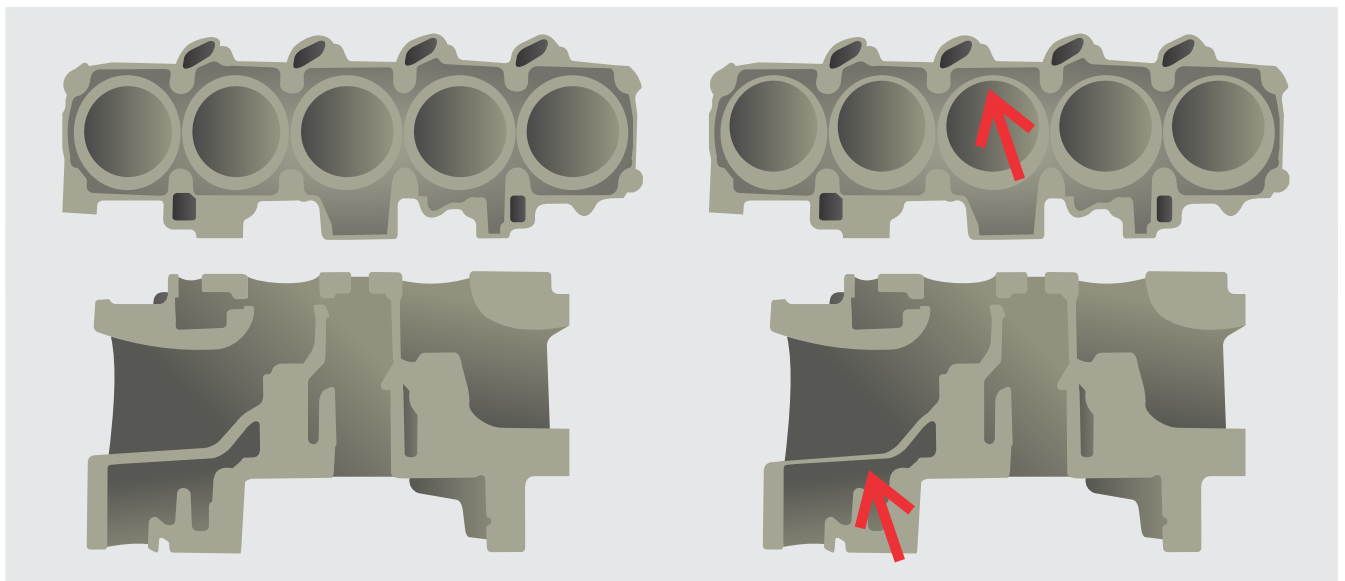


IMPROVING METAL CASTING QUALITY USING LOW THERMAL EXPANSION AGREGATES - PART 2

In recent years, the metalcasting industry has been placing a strong emphasis on near-net-shape and thin-wall castings. Precision sand molds and cores using chemical binders are the primary technology for the production of casting parts with stringent dimensional reproducibility requirements.

The chemical-bonded sand cores dimensional accuracy depends on the ability to maintain its properties during the metal pouring. In other words, it is expected that the core doesn't deform and change its position during the metal pouring and solidification. However, when this happens the casting part is classified as scrap because of a defect known as hot deformation or distortion (Figure 1).

Figure 1 - Arrows in the schematic castings point out the hot deformation caused by high sand thermal expansion.

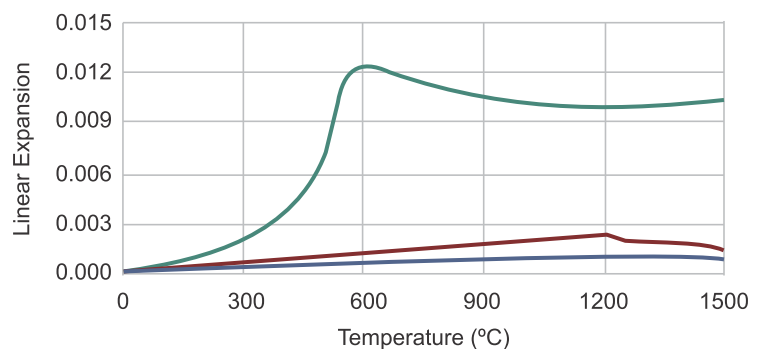


The core dimensional accuracy is a result of a set of factors, being the most important the thermal expansion of sands and the thermal degradation of the resins. Other factors that contribute are binder level, additives, coating type, pouring temperature, pouring time, and metallostatic pressure.

The thermal expansion of sands is a consequence of sand type, grain size and shape and chemical and mineralogical composition, while the thermal degradation of resins depends on resin process, such as cold box, no-bake, hot box, 3D printed, and others.

Considerable researches have been done to understand the core hot deformation defects in the castings related with silica sand thermal properties. Silica sand has been widely used to produce molds and cores in the metal casting process, however, most foundries face many

Figure 2 - Sands linear thermal expansion. Silica sand, CastBall sand and CastBall Premium sand comparison.



Thermal Expansion @ 1100°C		
CastBall Premium	CastBall	Silica Sand
0.077%	0.253%	1.006%



IMPROVING METAL CASTING QUALITY USING LOW THERMAL EXPANSION AGREGATES - PART 2

difficulties in the casting quality, due to its high thermal expansion. All these researches concluded that the higher sand thermal expansion, the greater the core hot deformation.

Stablished techniques to reduce silica sand thermal expansion defects are the addition of or total substitution of silica sand by special sands with lower thermal expansion, sand fluxing methods and burnout components. However, for core hot deformation the accepted technique to solve this problem is the addition or total substitution of silica sand by special sands (figure 2).

Over the past decade Mineração Curimbaba designed the CASTBALL, a special corundum ceramic sand with unique properties that allow exceptional benefits in the cores and mold process for metal casting industries reducing costs, improving quality, increasing production, improving health safety & environment sustainability. CASTBALL is a great solution to guarantee the production of casting parts with high dimensional accuracy.

Selecting a good designed ceramic sand assures the foundries, casting parts productions with stringent dimensional reproducibility.