

SOME ASPECTS CONCERNING THE PHYSICAL PHENOMENA AT THE CONTACT ALLOY – SAND MOULD

SIMIONESCU GHEORGHE, CIUCESCU DORU

University of Bacau

Abstract: In the foundries is very important to understand and to control the physical phenomena at the contact alloy – mould. One very important phenomenon is the expansion of the sand mould. This paper is an attempt to present some aspects concerning the physical phenomena at the contact alloy – sand mould under the influence of the temperature.

Keywords: liquid alloy, sand mould, heat transfer, expansion, surface defects, exfoliation, deformation, fissure.

1. INTRODUCTION

The mould is expanding at heating; the maximum expansion is at the contact alloy – sand mould, due to the allotropic transformation of the quartz α in quartz β . The expansion is less when the layer of the mould is remoter from the liquid alloy.

In this paper it is trying to present some aspects concerning the relations between the expansion of the moulds and the surface defects of the casts.

2. MECHANISM OF SURFACE DEFECTS

Because the sand grains are expanding in different moments, in the layer from the wall mould appear strains oriented in all directions (fig. 1). The maximum values of strains (sometimes of 130 daN/cm^2) were determined at about 884 K .

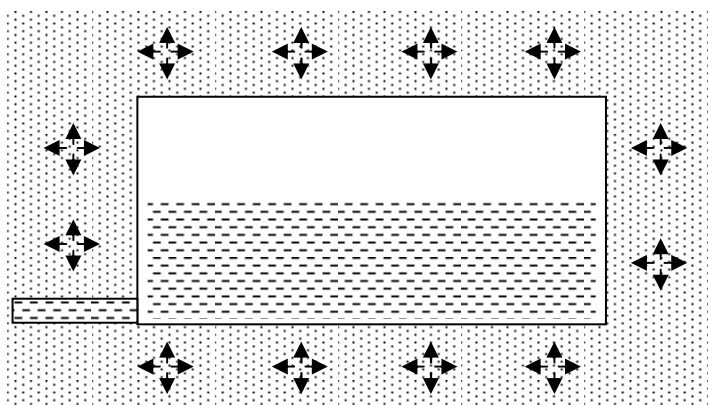


Fig. 1. The orientation of the strains in the sand mould

In the most cases, at heating, the refractory component of the mould is expanding, while the binding component is contracting. Due to these phenomena, both at the level of the grain and at the level of the mould appear strains, particularly at the surface of the alloy – mould contact, where the heating is more intens.

The main technological parameters taken into consideration and used to control these phenomena are:

- the nature and the thickness of the film of the binder;
- the humidity content;
- sand granulometry (base fraction).

Any of these parameters can not realize the complete elimination of of strains and, consequently, the exfoliations in the surface layers of the mould walls. Practically, it is impossible to control the interdependence between the mechanical resistance of the mould and the internal strains appearing in any type of mould. What differs from one binding system from another is only the size of the the strain (fig. 2, 3).

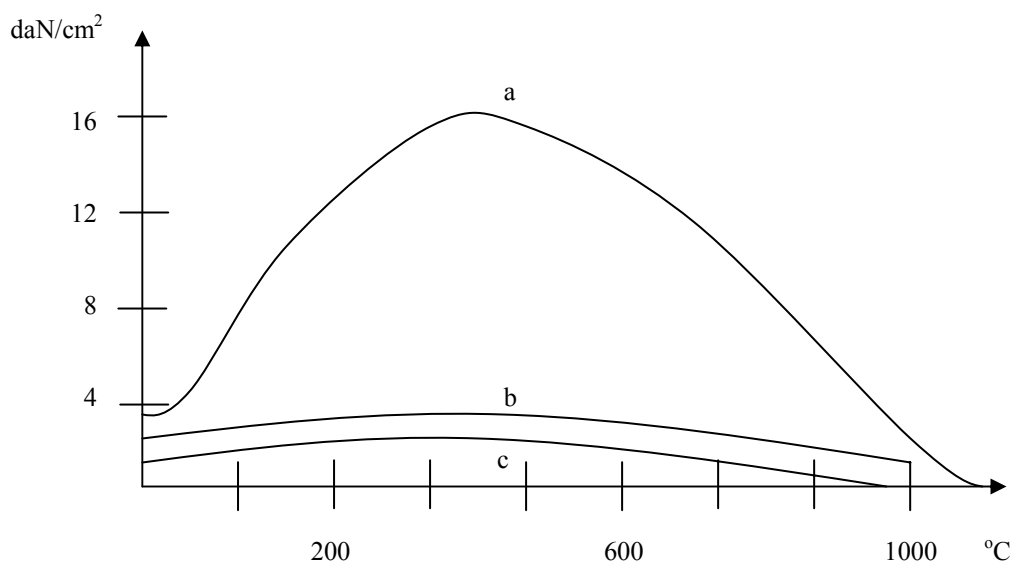


Fig. 2. The strains in the mould due to the heating

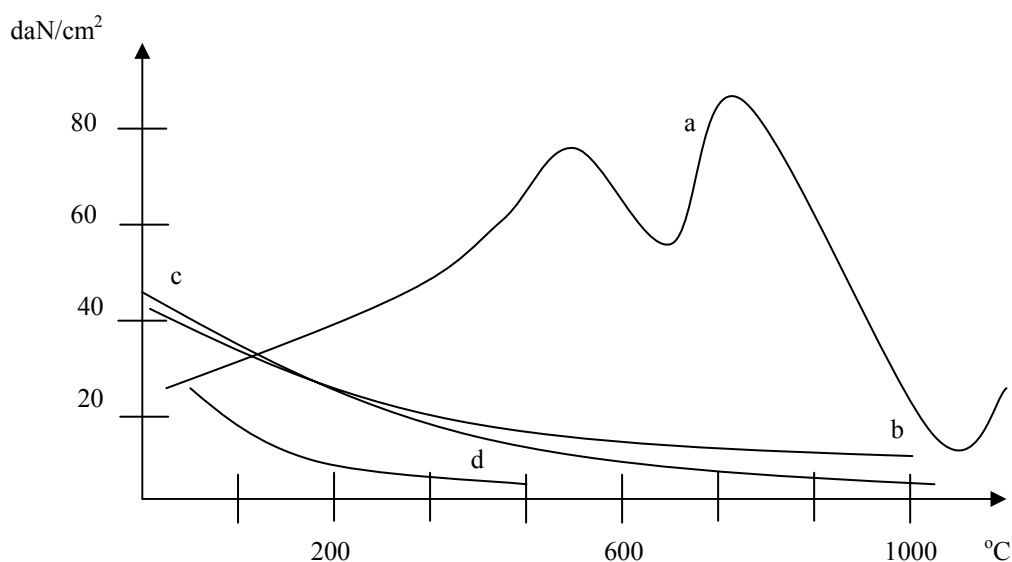


Fig. 3. The variation of bending resistance for some moulding sands

a. slicium silicate; b. formaldehyde resin; c. urea – formaldehyde resin; d. phenol – formaldehyde resin.

From the figures 2 and 3 it is clear that at high temperature the values of strains are greater than those for bending resistance.

The appearing of strains in sand mould is the cause of producing the defects like expansion scab and surface folding. When the values of strains are exceeding the values of bending resistance, may appear exfoliations and crushes.

To diminish the tendency of appearing of these defects it is necessary to increase the heat resistance. The mechanisms of formation of some surface defects are presented in fig. 4.

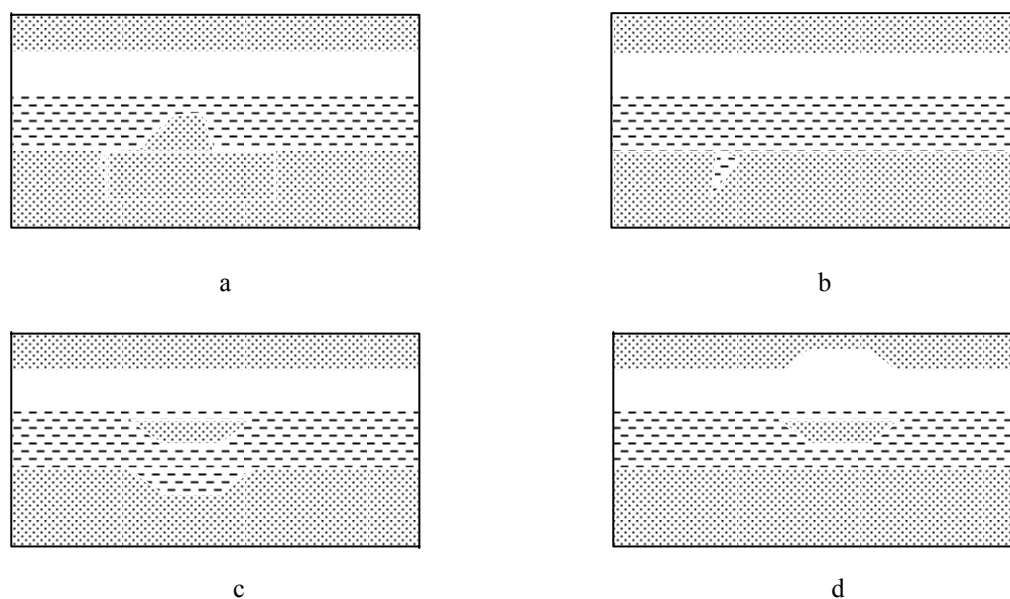


Fig. 4. Some surface defects of the mould sand
a. deformation; b. fissure; c. bottom fracture; d. upper fracture

The deformations of the casts depend on the geometry of the mould (fig. 5).

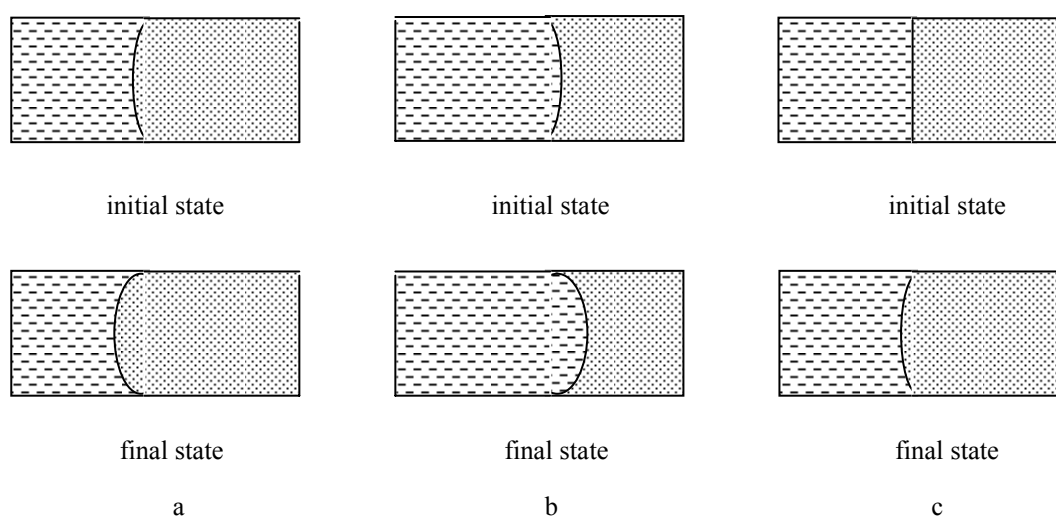


Fig. 5. The sense of deformation of the walls of the mould/cast
a. convex mould wall; b. concave mould wall; c. plane mould wall

3. CONCLUSIONS

To prevent the appearing of surface defects are recommended the following measures:

- components which are thermally stabilized (the quarz in the form of tridimit);
- mould sand well prepared;
- good ramming;
- high permeability;
- the great walls of the mould in vertical or inclined position during pouring;
- materials with great refractivity.

REFERENCES

- [1] Simionescu, Gh. (2000). *Ingineria proceselor de formare*, Ed. Elvarom, București.
- [2] Simionescu, Gh. (2001). *Interacțiunea aliaj lichid-forma de turnare*. Ed. Elvarom, București.
- [3] Simionescu, Gh. (2001). *Analiza calității materialelor tehnologice pentru turnătorie*, Ed. Plumb, Bacău.
- [4] Simionescu, Gh. (2003). *Utilajul și tehnologia elaborării și turnării aliajelor*, Ed. Elvarom, București.