ANNALS OF FACULTY ENGINEERING HUNEDOARA
- INTERNATIONAL JOURNAL OF ENGINEERING
Tome IX (Year 2011). Fascicule 3. (ISSN 1584 - 2673)

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ESTABLISHING HOW TO CONSOLIDATE MOLDS IN CASE OF OBTAINING A STEEL CASTINGS IN CRISCIOR BRAD FOUNDRIES

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ABSTRACT: This paper presents the possibility of optimizing technology molding-casting a steel castings in a metallurgical enterprises by establishing how to optimize the mode of the mould consolidate. For this, calculate the pressure liquid metal on the mold and is determined to ballast weight for the part analyzed.
KEYWORDS: castings, model, pressure liquid metal, consolidation mode

❖ INTRODUCTION

The casting alloy in the mould must be taken into account known physical principles, namely:
- ☐ filling the molds with liquid alloy is produced with the principle of communicating vessels;
- ☐ pressure liquid alloy on the mold walls is equal in all directions;
- ☐ alloy liquid pressure exerted on cores from the bottom up the difference between the weight of the core alloy and weight displacement without core marks, according to Archimedes' principle.

These principles make clear that the liquid alloy cast in the mould press the wall mould in all directions with a force that is a function of liquid metal pressure and size of surface over which this pressure is exerted. Therefore, alloy liquid tends to rise higher mould part, which requires measures to consolidate it against the bottom mould part. Otherwise, the liquid alloy flows through the separation surface can cause:
- ☐ rejection of castings
- ☐ obtaining castings with burrs
- ☐ unnecessary increase in the consumption of liquid alloy
- ☐ accidents.

❖ PREZENTATION MOULDING-CASTING TECHNOLOGY THE CASTINGS STUDIED

Casting "*Toothed hub*" studied is cast at Criscior Brad Foundry of cast carbon steel for mechanical construction for general use, mark 340-550 W, whose chemical composition is as follows: C = 0,35...0,45%; Mn = 0,40...0,80%; Si = 0,25...0,50%; P=max 0,04%; S = max 0,04%; Cr = max. 0,30%; Ni = max. 0,30%; Cu = max. 0,30%.

This piece is used to produce a reducing 125kW (is a subset of the reducer). Design models for castings *toothed hub* is based on finished piece design (fig. 1).

Based on finished pieces is done drawing the technological design. This is presented in Fig.2, which indicates the location of the core. The use of such core leads to savings core mixture and wood, due to adopt a technology of short core marks and resize the box core.

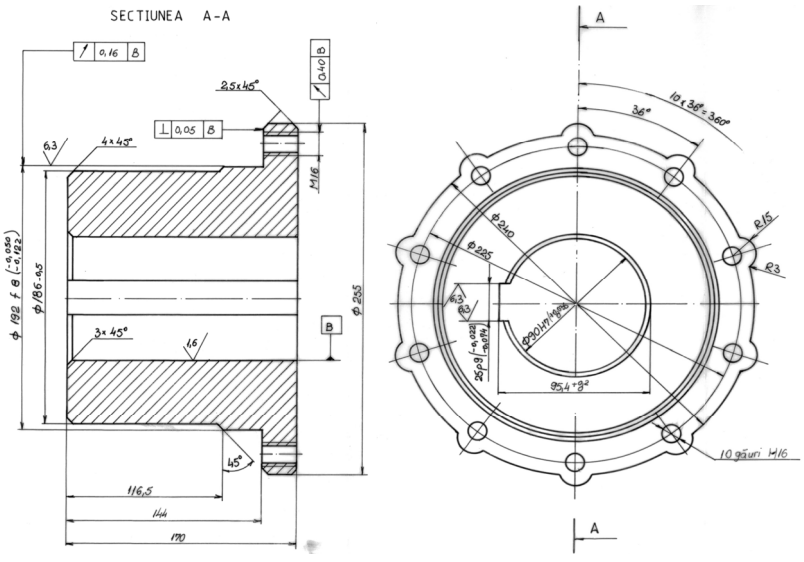

Figure 1. The finished piece design (*Toothed hub*)

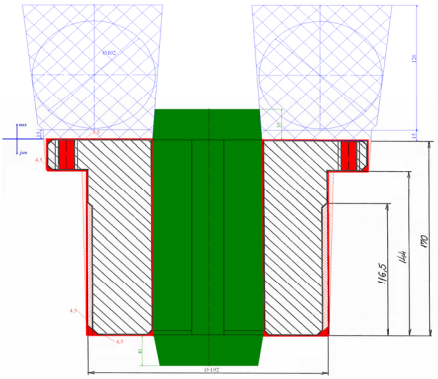

Figure 2. The technological design (core location)

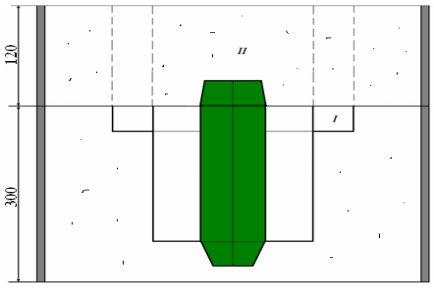

Figure 3. The core

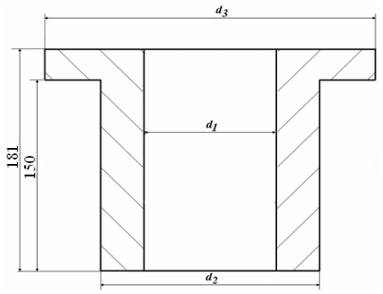

Figure 4. Size castings

❖ CALCULATION OF PRESSURE LIQUID METAL. ESTABLISHING HOW TO CONSOLIDATE MOLDS

Due to inconvenience recorded in the technology of obtaining castings analyzed (*toothed hub*) and optimize the manufacturing process of castings analyzed, in industrial practice should generally consolidation the casting moulds.

The method chosen to consolidate the mould depends on the molding method and size of molds. The manual molding, small forms consolidating weights placed manually and support on the mould jacket.

Regardless of the consolidation mode, the force counteracting the force created by metal liquid pressure exerted by the alloy on upper mould part, must be greater than or at least equal to the thrust of the upper mould part.

Consolidation moulds can be achieved in several ways: with weights, with clamp, by wedge, by tightening screws, and by through strengthened beams with screws.

Knowing the principles presented above, the calculation of forces exerted by the liquid alloy upper mold part can be achieved for any real casting situation (so, force counteracting the force exerted by pressure liquid metal upper mould part). The forces acting for mould parts are: *F* - vertical pushing force; F_1 - force exerted by the liquid alloy upper mould part; F_2 - higher mould part weight.

$$F = F_1 - F_2$$

where: $F_1 = (V_1 + V_2)\rho$, ρ - liquid alloy density; ρ = *7,8 kg/dm*^{3}; V_1 - liquid alloy cylinder volume I; V_2 - liquid alloy cylinder volume II, considered full (to ignore the core).

Dimensions of castings are: d_1 = *81 mm*; d_2 = *201 mm*; d_3 = *264 mm*.

$$V_1 = \pi\left(\frac{d_3^2}{4} - \frac{d_1^2}{4}\right)\cdot h_2\,, \Rightarrow V_1 = 3{,}14\cdot\left(\frac{2{,}64^2}{4} - \frac{0{,}81^2}{4}\right)\cdot 1{,}2 = 5{,}94 \text{ dm}^3;$$

where h_2 is the height of the upper mould part, h_2 = *120 mm*.

$$V_2 = \pi\cdot\frac{d_1^2}{4}\cdot(h_2 + 1{,}81) \Rightarrow V_2 = 3{,}14\cdot\frac{0{,}81^2}{4}\cdot(1{,}2 + 1{,}81) = 1{,}55 \text{ dm}^3;$$

$$V = V_1 + V_2 = 5{,}94 + 1{,}55 = 7{,}5 \text{ dm}^3. \Rightarrow F_1 = (V_1 + V_2)\rho = 7{,}5\cdot 7{,}8 = 58{,}42 \text{ kg};\ F_2 = V_3\cdot\rho_1$$

where V_3 is upper mould part and ρ_1 molding sand density; ρ_1= *1,8 kg/dm*^{3}.

Dimensions upper mould part are ϕ 300 x 120, and

$$V_3 = \frac{\pi}{4}\left(\phi^2 - d_3^2\right)\cdot 0{,}91 + \pi\cdot\frac{d_2^2}{4}\cdot(h_1 - 0{,}91);$$

$$\Rightarrow F_2 = 23{,}55\cdot 1{,}8 = 42{,}3 \text{ kg};\ \Rightarrow F = F_1 - F_2 = 58{,}4 - 42{,}3 = 16{,}1 \text{ kg}.$$

In conclusion, the ballast using a minimum weight of 16 kg.

❖ CONCLUSIONS

Due to inconvenience recorded in the technology of obtaining castings analyzed (*toothed hub*) and optimize the manufacturing process of castings analyzed, in industrial practice should generally consolidation the casting moulds.

Industrial practice has shown that how to consolidate the mould has a particularly important role, leading to prospect for liquid to flow through the surface alloy separation, this phenomenon can lead to rejecting castings, getting the piece with burrs, increased consumption of alloy liquid unnecessary and even accidents.

❖ REFERENCES

[1.] CERNAT CONSTANTIN – Teoria şi practica formării, Tehnologia formării, Lito., Bucureşti, 1980
[2.] ŞTEFĂNESCU, CI. ş.a. – Îndrumătorul proiectantului de tehnologii în turnătorii, Bucureşti, Ed. Tehnică, 1985
[3.] ŞTEFĂNESCU, CL, CAZACU, I.- Tehnologii de executare a pieselor prin turnare, Bucureşti, Ed. Tehnică, 1981
[4.] JOSAN, A. – Tehnologia formării şi turnării aliajelor, Ed. Politehnica, Timişoara, 2002
[5.] SOCALICI, A, ARDELEAN E., ARDELEAN, M., HEPUŢ, T., JOSAN A. – Turnarea şi solidificarea oţelului, Ed. Cermi, Iaşi, 2007
[6.] SR ISO 3755:1995. – Oţeluri nealiate turnate pentru construcţii mecanice de uz general