Using lateral cores to casting of carbon steel parts, of drive wheel type, in a metallurgical enterprise

A Josan¹, C Pinca Bretotean¹, E Ardelean¹ and M Ardelean¹

¹ Politehnica University of Timisoara, Department of Engineering and Management, 5 Revolution Street, 331128 Hunedoara, Romania

E-mail: ana.josan@fih.upt.ro

Abstract. This paper presents the possibility of obtaining castings using the lateral cores. Steps are presented for obtaining the lateral core of the piece type drive wheel. This piece is cast carbon steel 230-450W, according to ISO 3755-95, and is part of a drive train. Using in industrial practice of such types of cores leads to significant reduction of the processing workmanship for castings, with a direct effect on the price of production.

1. Introduction

The correct realization of a castings involves strictly complying of moulding-casting technology, starting from correct dimensioning of all components. Thus, for casting of parts is required to manufacturing of set of pattern, which comprises the pattern, the core box (or boxex core, if necessary), the pouring gate, the venting, the rising head etc. With de help of the pattern is obtained a cavity in the upper in lower mould parts, and with de help the core box is obtained the core, witch ensure obtaining cavity inside of the casting. The core fixing into the mould with two extensions, called core marks [1], [2], [3].

The core marks are introduced into the space of the mark, so that it is not possible to move the core during the assembly of the mould or during the casting of the liquid alloy. With pattern mark is realized the cavity mark in moulding batch. The core mark is makes in core box, with core [1], [2], [3].

All these elements must be dimensioned corectly so that the set of pattern be made to dimensions the finished part that are to obtained by casting.

2. Making the pattern for castings, drive wheel type

An example of a technology that uses lateral and internal cores is used to castings of wheel type. The design of set of pattern for casting drive wheel is making based on the finished piece design (Figure 1).

Figure 1 presents a drive wheel cast of carbon steel in according to ISO 3755-95 [4]. This wheel is part of the drivetrain – waggon funicular. The wagon is suspended on a cable and drivetrain (besides welded constructions that connect the wagon bucket and raceway) has assembled 2 or 4 such rolls (depending on model and capacity). In the hub are mounted the bearings and spindle and the outside (where it is processed the concave profile) runs on cable.
To establish the optimal casting position is necessary the analysis of the emplacement the separation plan. Thus, the separation plane for such a piece is shown in Figure 2. According to this sketch the separation plane of mould is a curved line. This line follows the pattern configuration and casting position is horizontal (Figure 2) [1], [2], [3].

To establish the pattern dimensions taking into account the dimensions obtained after establishing the added shrinkage and application the added processing. After establishing the size of added shrinkage, constructive inclinations and marks a core dimension is determined the configuration and dimensions of the pattern. The pattern is made of wood and is presented in Figure 3 [1], [2], [3].
Figure 3. The pattern of wood intended for the casting.

For dimensioning of centre riser takes into account the height of the piece wall on which it is applied (i.e. 120mm). Thus, for studied casting is used a riser centrally disposed (Figure 4), whose height is 108 mm [1], [2], [3].

Figure 4. The pattern of piece and placed the centre riser.

3. Making the lateral and central cores for casting. Making the cores marks

Of the technological point of view, for piece analyzed is chosen the achievement of two cores:

- a central core, to obtain the internal hollow of piece;
- a lateral core, to determining the lateral configuration of piece.

The marks represent the technological extensions of patterns and cores, created in order to achieve internal hollow castings. The pattern mark is an extension, with which is achieved a hollow in the mould, where is fixed to the core mark. The core mark is dimensioned to resist at the stresses core, during filling the mould hollow with liquid metal. In the case too small marks is possible mould deformation, which lead to the appearance of the dimensional aberrations of the casting and the excessive size of the marks lead to an excessive consumption of core mixture, large areas for drying, amplifying dimensions of mould jackets, etc. [1], [2], [3].
For judicious of moulds dimensions and a cores conicity are used the standard provisions for horizontal and vertical marks. Generally, the cylindrical and vertical core mark, used for manual moulding, are presented in Figure 5 [1], [2], [3].

![Figure 5. The cylindrical-vertical core marks.](image)

Depending on the Lu/D to be determined dimensions of upper mark Ls and lower mark Li [1], [2], [3]. On the finished piece design were added as follows: shrinkage added, technological added, processing added and constructive inclinations. Therefore is obtained the technological design. On the technological design are determined the usable length of the central core, Lu, and the core diameter D:

\[
\frac{L_u}{D} = \frac{102}{60} = 1.7.
\]

According to [1,2,3], result following dimensions:

\[
\frac{L_s}{L_i} = \frac{25}{45} \text{ mm; } \alpha_{\text{sup}} = 10^\circ; \alpha_{\text{inf}} = 7^\circ.
\]

Thus, minimum diameter of the upper mark is 25 mm and minimum diameter of the lower mark is 45 mm. Lateral core is made separately, in box core and has the following dimensions: height 120 mm and width 35 mm. Making the lateral core, step by step, is presented in Figures 6, 7, 8.

![Figure 6. Making the lateral core – stage 1 – preparation of the plate moulding.](image)
Figure 7. Making the lateral core – stage 2 – mounting the outside of the core box.

Figure 8. Making the lateral core – stage 3 – core box assembly.

6. Conclusions
To obtain a casting, the design of set of pattern has an essential role. Also, the design the moulding-casting technology involves establishing types of cores used. Thus, for a drive wheel casting, the experiments of industrial practice show that the best technological solution is to place the separation plane, the additions and cores just as in Figure 9. Figure 10 presents the lateral cores, making according to the instructions.
Figure 9. To position the cores and the separation plane.

Figure 10. The core of the studied piece.

The castings (drive wheel) in accordance with this technology is presented in Figure 11.
According to this technology, which involves the use of two types of cores for establishing the internal and external of the casting, it reduces the quantity of material removed by machining, decreases the workmanship of the mechanical processing by cutting, which leads to decreased prices for fabrication of casting, with direct effects on enterprise costs.

References
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