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STUDIES AND RESEARCHES REGARDING THE INFLUENCE OF THE CASTING TECHNOLOGY OF THE MILL ROLLS MADE BY ADAMITE STEEL CASTED ON THE REGISTERED DEFECTS

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ABSTRACT
The paper presents a critical analysis of the fabrication technology of the mill rolls casted out of hypereutectoid steel, Adamit type, with the purpose of decreasing the percentage of the registered rejects in the industrial practice.
The most frequent met waster defects are presented, that are met in practice at the casting of the rolls meant to the Middle Profiles Rolling, as well as some technological measures applied with the purpose of reducing these deficiencies.
Key words: mill rolls, hypereutectoid steel, Adamite type, defects.

1. INTRODUCTION
The use of the rolls made of hypereutectoid steel, Adamit type, intended to the throttling of the middle profiles has lately sot, a bigger extension in the metallurgical entreprises.
The first step in obtaining some mill rolls corresponding from the point of seeing of the quality is strictly respecting their fabrication technology. Thus, taking into account the casting technology of the rolling cylinders, as well as the situations registered in the industrial practice, we can mention the fact the most frequent defects, which give the spoilage of the rolls, are [1]:

- *holes of gaseous nature (pores)* - represent gas bubbles incorporated in the casted alloy; according to the specialized literature, the share of this failure is of 25%;
- *holes* or *flaws*, due to the contraction or the use, in the formation, to the inadequate machines and equipment's, the share of this defect being of about 20% or the entire spoilage at cast;
- *the too great depth* or *insufficient of the face roll* - representing the spoilage due to the inadequate depth of the hardness face, thing that leads to the wear strength; the share of this defect is of about 10% from the entire refusal at cast (the hardness represented a basic parameter which permits the estimation of the wear strength;
- *inclusions* and *adherence* - represent the defects which appear on the rolls after a neglected carry out of the moulds, insufficient cleaning of the mixture remains during the form assembling, casting at a low temperature as well as in some insufficient speeds of filling of the mould;
- *shrinkage holes* and *porosity* - represent the defects that appear at solidification;
- *inadequate chemical composition* - represents a defect that, due to the non-respecting standard chemical composition, leads to the rolls refusal;
- *structure defects* - represent the defects that appear, most of the times, because of the inadequate charging of the furnace, casting, cooling and thermal treatments etc.

2. THE INFLUENCE OF THE MANUFACTURING TECHNOLOGY ON THE REGISTERED DEFECTS
Subsequent studies made on the casted rolls of hypereutectoide steel, Adamit type, at [2], S.C. Siderurgica S.A. Hunedoara, a series of defects have been registered.

Thus, in fig. 1, roll no. 0950 is presented, casted from the charge no. 03736, which represents spoilage due to the fact that on the table's surface, this has a longitudinal crack. The cause of the appearance of this defect is the usage of on inadequate metal mould (which resents a fissure).

Figure 1. The mill rolls no. 0950/03736, which presents longitudinal crack (the rejected roll registered at casting).

A longitudinal crack on the table's surface (fig. 2) is also registered in the case roll no. 0963/03745.

Figure 2. The mill rolls no. 0963/03745, which presents longitudinal crack.

In fig. 3, 4 are presented types of adherence, which appeared in the zone between the inferior neck and table in the zone of the superior neck. The adherence appears, mostly, because of: the use of inadequate forming mixtures; insufficient deoxidized alloy; use of some inadequate refractory paints; too high casting temperatures; inadequate casting network etc [3].

Figure 3. Casted roll presenting adherence (in the zone between inferior neck and table).

Beside cracks and adherences, another frequent defect met in the producing practice is the defect called "tough" spots. This defect is catalogued at the category of structure defects no it occurs because of the reduced casting temperature (the "tough" spots are zones with a bigger proportion of cementite

and ledeburite, appeared because of some agglomeration of nonmetallic inclusions, which promote the carbides stability [4]). This defect, registered at many rolls (0453/02846, 0470/02900, 0477/02963) is presented in fig. 5.

Figure 4. Casted roll presenting adherence (in the zone of the superior neck).

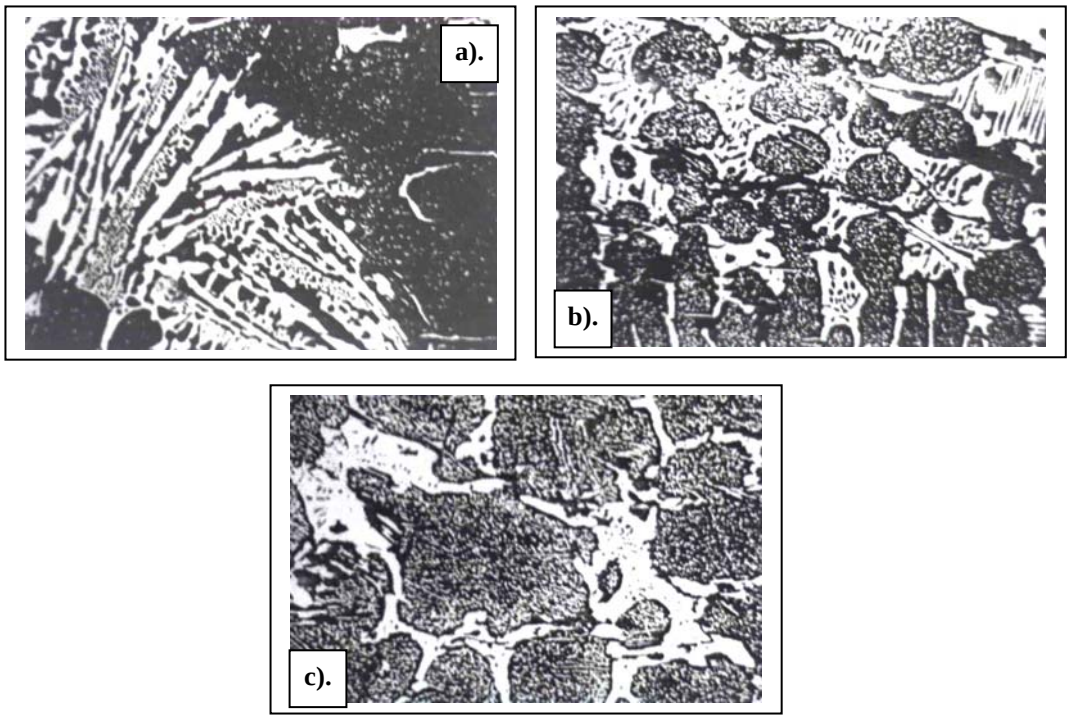

Figure 5. The microstructure of the roll 0470/02900 rejected because of the "tough" spots (growth: 100:1 - attack: nital 2%): a, b - zone with tough spots (425 HB); c - normal zone, without defects (360HB).

After a critical analyze of a 92 rolls lot casted out of 23 elaborated charges, 12 pieces presented defects which led to their rejected, in a percentage of 13,046%. The situation of the rejected rolls in the studied period at metallurgical enterprises is presented in table 1.

From the analyses of the rejected rolls situation (tab. 1), it follows that the reject percentage, registered at the rolls cast of Adamit type steel taken into study, is of 13,04%. The share of defects registered during the period in which experiments have been done is presented in fig. 6.

Table 1. Situation of the rolling cylinders cast by Adamit steel rejected in the studied period, at the metallurgical enterprises.

No. roll	Dimensions [mm]	Weight [t]	Cause of rejection
1	ϕ450 x 900	1,6	Pores on the table's surface
2	ϕ450 x 900	1,6	Pores on the table's surface
3	ϕ460 x 900	1,70	Broken at knocking out
4	ϕ450 x 1130	1,94	Cracks in the shaft-table connecting area
5	ϕ540 x 900	2,15	Cracks on the table's surface
6	ϕ550 x 900	2,25	Cracks on the table's surface
7	ϕ570 x 900	2,35	Tough "spots"
8	ϕ540 x 900	2,15	Tough "spots"
9	ϕ540 x 900	2,15	Tough "spots"
10	ϕ450 x 1130	1,94	Cracks in the shaft-table connecting area
11	ϕ450 x 900	1,60	Cracks on the table's surface
12	ϕ450 x 900	1,60	Longitudinal cracks
TOTAL 12 pcs. =		**23,03 t**	

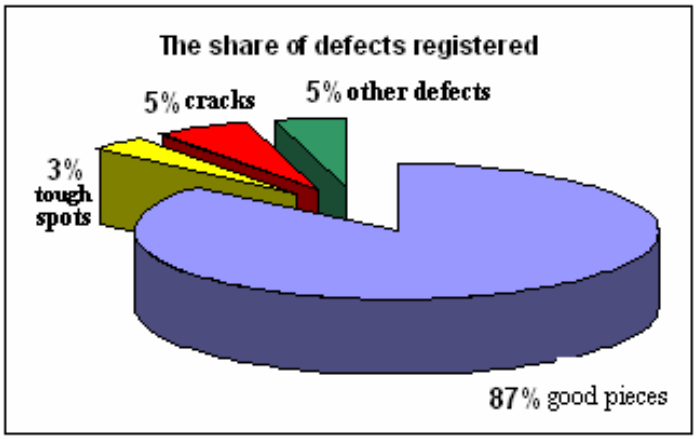

Figure 6. The share of defects registered.

3. CONCLUSIONS

The prevention of the deficiency's occurring at the rolling cylinders cast can be done only by respecting the elaboration-formation-casting technology, as well as by a good disciplined technology.
In view of reducing or even eliminating these deficiencies registered during the production practice the next measures are proposed:

- interdiction of gas stirring at temperatures t < 1450^{o}C;
- the casting temperature has to be between 1430…1440^{o}C interval because the casting temperature of 1420…1430^{O}C which is presently practiced at metallurgical enterprises is too low, resulting the structure defects;
- to eliminate the pores it is compulsory corresponding drying the moulds;
- to avoid the appearance the cracks at cold a debate of moulds at lower temperatures then 150^{o}C is indicated.

4. REFERENCES

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