

## THE DETERMINATION OF SECTION HARDNESS VARIATION ON HYPEREUTECTIC STEEL ROLLS

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### ABSTRACT

The paper presents Adamit-type alloys meant for casting rolls to be use in the rolling trains, as well as their mechanical characteristics and microstructure, that lead to their use in making roling train rolls at S.C."Siderurgica" S.A Hunedoara.

### KEYWORDS

Adamit, casting rolls, hardness, corelations, sample rings

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### 1. INTRODUCTION

The Adamit-type steels have a carbon content in the range 1,7 – 2,1% and are Cr, Ni and Mo alloyed and are used on those rolling mills where high wear resistance is required (usually in the pre-finishing stands of the bar mills) [1], [2], [3], [5].

The technical literature shows that the best results in what concerns the physical-mechanical and operation features have been achieved with the following chemical composition [2]:

- 1,7 – 2,2 %C; 0,6 – 1,5 %Si; 0,7 – 0,9 %Mn;
- 1,0 – 2,0 %Ni; 0,7 – 1,5 %Cr; 0,3 – 0,5 % Mo;
- max.0,04 %P; max.0,02 %S.

### 2. EXPERIMENTS

In order to point out to their section hardness variation, we carried out an analysis on 13 casting rolls used on rolling mill for medium – sizes products to S.C. Siderurgica S.A. Hunedoara [5].



Figure 1. Sample rings for determining of mechanical characteristics

In account on this, were cut 13 sample rings (fig.1) one for each cast roll, and the hardness variation were determined from 15mm to 15mm. The sample rings were cut on superior level - support roll neck.

Figure 2 presents the sample rings cut from the support roll neck, used for determining of mechanical characteristics.

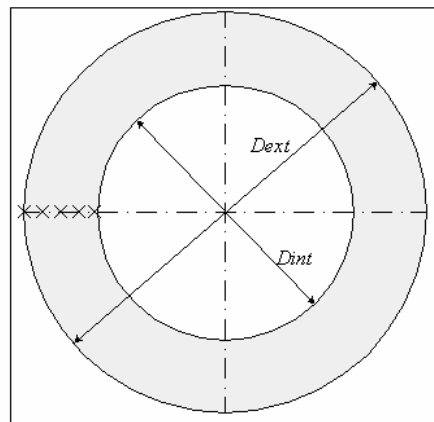


Figure 2. Sample ring from support roll neck:  $D_{ext}$  – the external diameter, mm;  $D_{int}$  – the interior diameter, mm; x – the mark for the hardness determination.

The cast rolls on Adamit type alloy, heat treated are half-hard rolls, the hardness being included in 320-420 HB interval [2],[3].

The section hardness on 13 cast rolls are presented in tab.1. For the hardness testing were used a digital hardness testing machine (EQUOTIP-type), that may be connect to a computer.

Table 1. Hardness variation

No. roll	Ring diameter, mm		Hardness, [HB]							
	Ext.	Int.	surface	15mm	30mm	45mm	60mm	75mm	90mm	105mm
0947	453	333	299	322	325	301	280	-	-	-
0950	470	323	394	397	419	419	443	411	343	-
0951	462	333	296	311	257	309	296	295	-	-
0954	475	338	296	313	317	320	340	340	339	-
0955	463	335	309	327	333	335	311	309	-	-
0958	465	328	313	342	343	336	320	310	-	-
0959	460	323	342	423	454	456	422	402	-	-
0965	531	335	355	360	349	379	367	362	348	329
0968	471	322	334	330	338	324	310	-	-	-
0961	532	323	350	378	373	362	374	382	359	-
0949	479	344	334	334	377	344	374	332	-	-
0957	522	327	347	348	351	352	356	340	346	330
0953	522	332	326	360	367	364	364	378	381	355

Into account to these testing values, we pointed out to a series of correlation between hardness values and the distance from surface, presented in fig.3,4,5.

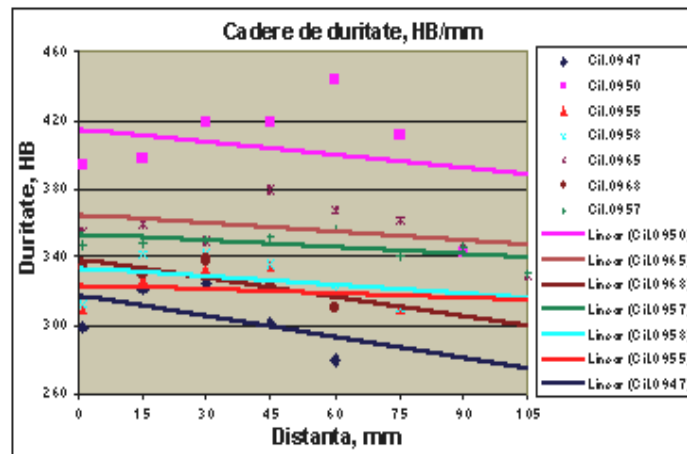


Figure 3. Hardness variation (0947, 0950, 0955, 0958, 0965, 0968, 0957)

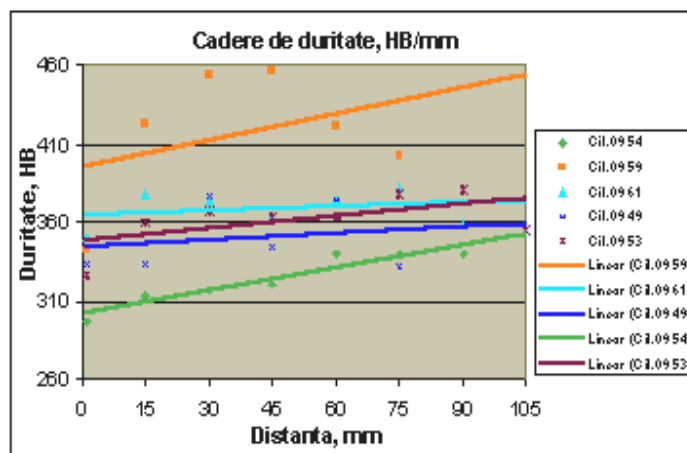


Figure 4. Hardness variation (0954, 0959, 0961, 0953)

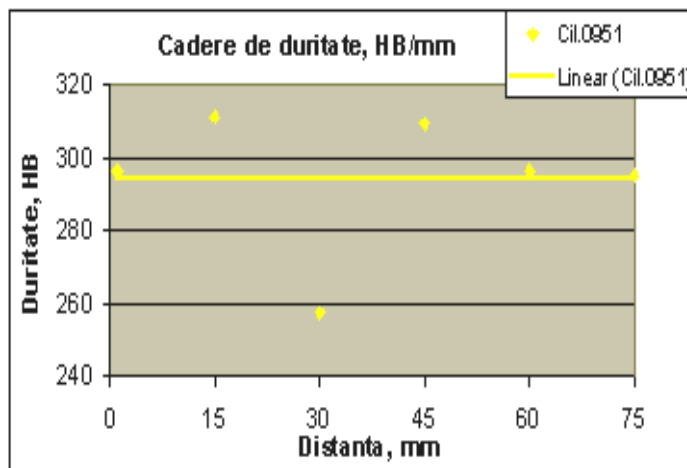


Figure 5. Hardness variation (0951)

### 3. CONCLUSIONS

The analysis of the hardness variation curves leads to the following conclusions:

- the hardness variation on 0947, 0950, 0955, 0958, 0965, 0968, 0957 cast rolls presents a linear trend, being in accordance with ITE 770-89;
- the hardness variation on 0954, 0959, 0961, 0953 presents an increasing trend from surface to the central part of the roll;

- the hardness variation on 0951 cast roll presents a constant trend.

The differences between hardness variation upon cast rolls are determined by microstructural appearance, that is the distribution of pearlite, eutectic carbide and carbides

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