RESEARCHES ABOUT THE INFLUENCE OF THE COLD ROLLING PARAMETERS ON MECHANICAL PROPERTIES OF THE STAINLESS STEEL ALLOYS

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Abstract. *One of the most common stainless steel grade for high tensile strength products is AISI series 301 and AISI 304 (hardened state recently requests). Each steel producer is knowing the behaiviour of the materials using diagrams for programming the products. To have a good results is strongly required to keep the specific processes under low level of variation. Time to time is recommended to make an up-date of the diagrams using hystorical data.*

Keywords: *austenitic steels, ferritic steels, hardened material,2H surface*

1. INTRODUCTION

The characteristics of stainless steel rolled strips are described by their mechanical properties (according with the standard EN 10088-2: 2009):

- tensile strength – RM [MPa];
- Yeld point – Rp0.2 [MPa];
- Elongation – A80 [%];
- Hardness – HV.

For the moment is not available an rigorous mathematical model which can indicate a relation beetween reduction of the material and his mechanical characteristics. Using hystorical data can be drawn a diagram for programing the reduction of the strips.

In this material is identified the cold rolling parameters which have influence on the behaviour of the material and the final values of the mechanical characteristics.

In this paper, we studied three stainless steels alloys in order to elaborate their hardening model (strength diagrams).

The device used for testing the materials was a Zwick tensile test machine (figure 1).

Figure 1. Tensile test machine Zwick [4].

Testing machine can provide tensile strength, yeld point and elongation. For hardness is used Vickers machine (*figure 2*).

Figure 2. Vickers testing machine [5]

For the diagrams we choosed a data base which contain the results of the mechanical properties for two years. An usual steel grade for 2H products (hardened) is AISI 301 HT4 wich can reach more than 2000 MPa in cold rolled conditions. Also AISI 304 is required in hardened conditions and tensile strength maximum values are arround 1900 MPa. AISI 430 steel grade demand is heat threated conditions but recently 2H orders was received. Ferritic stainless steels are less strength than others [M. Y. Huh, 2001].

Most of the time the requirements are outside the ranges described in the standards. The method of using strength diagrams is very useful for programming the required mechanical properties. The diagrams should be splited considering the influence factors:

- intermediate steps of process;
- raw material suppliers;
- ambiental temperature.

Delivery conditions for 2H strips are according with the standard SR EN 10151 (*table1*).

Table 1. Hardening grades [SR EN 10151]

Symbol	Tensile strength [MPa]
+C700	700 – 850
+C850	850 – 1000
+C1000	1000 – 1150
+C1150	1150 – 1300
+C1300	1300 – 1500
+C1500	1500 – 1700
+C1700	1700 – 1900
+C1900	1900 – 2200

2. ACKNOWLEDGMENTS

One of the most important cold rolling parameter (ambiental temperature) was statisticaly checked for AISI 304 steel grade (figure 3).

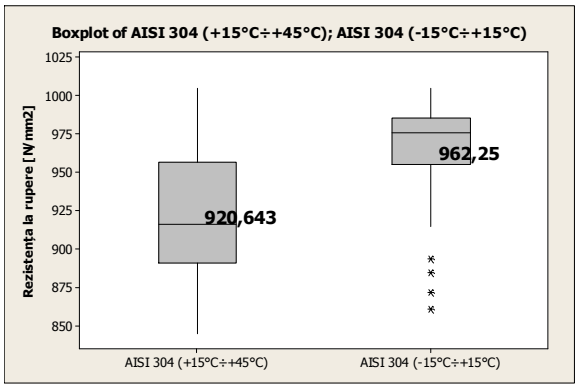

Figure 3. AISI 304 (ambiental temperature comparation).

Because of the founded differences (arround 40 MPa), a correction is required when using the diagrams (figure 4, 5, 6).

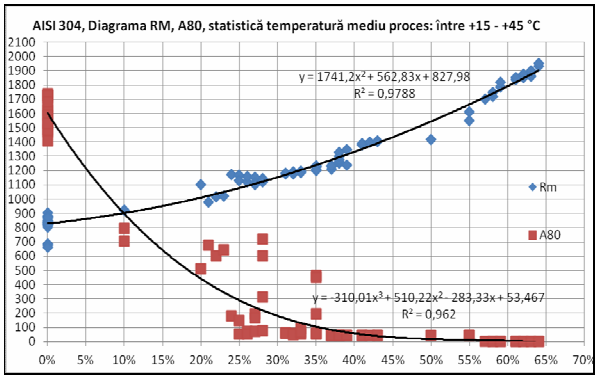

Figure 4. AISI 304 (ambiental temperature comparation).

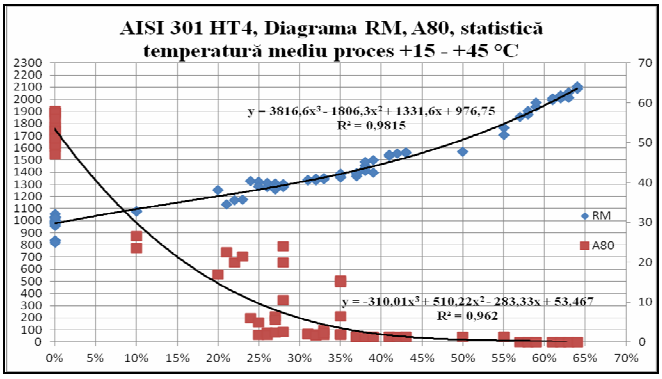

Figure 5. AISI 304 (ambiental temperature comparation).

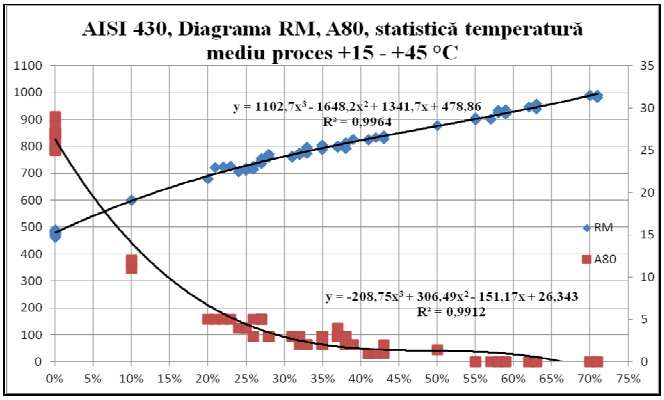

Figure 6. AISI 304 (ambiental temperature comparation).

Un-matching mechanical properties means a material which should be reprocesed or scraped deviating from his normal flow [Marin Trusculescu, 1983].

A future plan will be the influence of pass number on the mechanical properties of stainless steel strips.

3. REFERENCES

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