(225) Principles and utilization of a robotized Eddy current testing system on a continuous casting line

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INTRODUCTION

Since 1984, SOLMER has progressively equiped its 4 Continuous Casting lines with transversal crack detecting systems. This system's function is to direct only the defectuous slabs to the scarfing yard whereas the good slabs are sent directly to the Hot Strip Mill.

The advantages of this system, together with a good production quality level (less than 5 % of defectuous slabs) and in spite of a product mix including difficult steel grades (35 % of medium carbon Steel grades), have enabled us to send directly more than 90 % of our production as well as lessenning scarfing costs.

DETECTING METHOD

The chosen method is that of Eddy Current, the better adapted method in detecting surface defects and which also enables to evaluate the defects depth.

Before the head of the sensing system, the slab surface is cooled down to 500°C, in order to test the product in the ferromagnetic zone. For each constinuous casting strand, two robots keep eight Eddy Current sensors in contact with the slab. The sensor signals are generated and managed by a remote controlled channelling electronic equipment. A computer manages the robots movements and safety arrangements, constinuously optimizes the adjustment of probing parameters and ensures, throughout an adapted numerical filter, an optimal discrimination between the signals due to defects and those caused by oscillation marks.

RESULTS

The equipment described above ensures an all out automated detection of the defects ; all the defects with a depth more than 2 mm that pass under the sensors are located by the system. At the starting of the first installation, a campaign of tests covering 354 slabs, showed that 99 % of the defects were detected by the system and the rate of false alarm did not exceed 2 %. This result was confirmed in industrial production with the achieving of 10 000 T of X 70 grade without failure associated with a near 100 % machine availability.

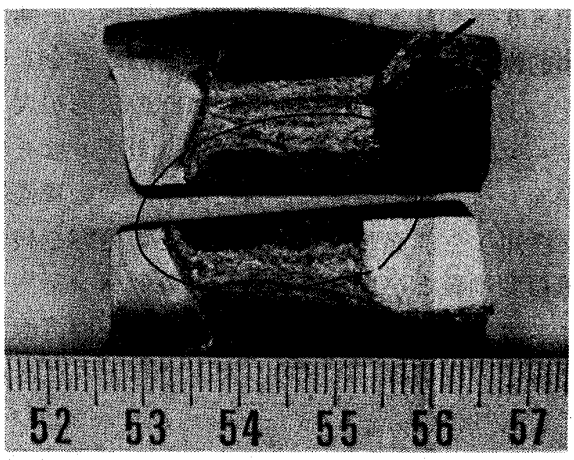

Fig.1 Example of defect

An example of detected defects is given on the above figure. The getting underway of this technique drove to a spectacular advance of direct charging, to-day attaining 92 % corresponding to a 17 % increase.

The diagram hereby, indicates the compared performances of two strands of a same Constinuous Caster, one being equiped, the other not.

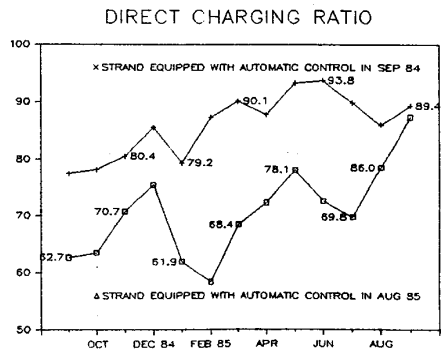

Fig.2 Direct charging ratio

CONCLUSION

The running of this device gives a higher quality guarentee for our products, as well as allowing a sensible increase of direct charging rate, and an important reduction of intermediate operations. In less than a year, the saving achieved have largely compensated the cost of equipping all the Constinuous Casting strands at SOLMER.