Improvement, using data mining techniques, of the heat treatment of a steel strip within a hop dip coating line (HDCL)

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ABSTRACT

The constant search to increase the quality of products and to reduce expenses in the manufacture process is a fundamental goal in any industrial plant. Today, companies are looking for more efficient tools and methodologies helping in these tasks.

Just un example is Data Mining (DM). DM and Multivariate Statistic tools are useful when people have a huge volume of historical data of the process. Its analysis with these new techniques helps in multiple aspects: control of quality, system identification, determination of causes in process' failures, detection of anomalies, prevention of failures, system modelling, by finding rules and patterns of behaviour, estimation of relations between variables, and so on.

In this thesis, an application of the CRISP-DM methodology is used for the improvement, within a Hot Dip Coating Line (HDCL) of steel coils, of the heat treatment of the steel strip before its passage by the immersion of the liquid zinc bath. The control and scheduling of coils in this process of annealing are the keys for the improvement of band and coating properties.

Throughout this thesis, there are several topics covered:

1. A methodology that, by using genetic algorithms and neuronal networks, allow us the optimization of furnace's transitional curves and band's speed between coils of different dimensions, reducing the temperature gap between the expected and the real one.

2. A sorting criteria for coils according to the composition of the steel. This tool has been an excellent issue for prediction of process's breakage or for detecting another kind of problems due to coils with anomalous steel.

3. A software based sensor projecting operating points of the furnace in a lower dimension space, much more easy for visual analysis and that helps operators to visualize its tendency and to take anticipated control actions over the furnace.