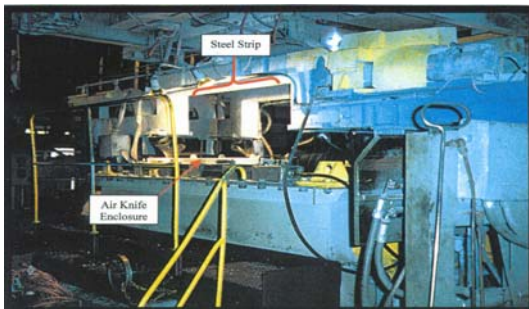


Hot Dip Galvanizing Steel Industry

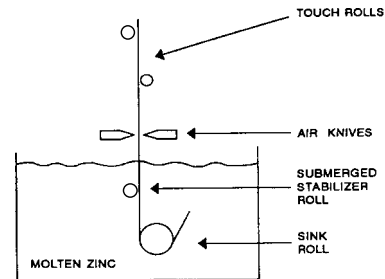
Problem: Vibration of steel sheets during the hot dip coating process causes non-uniformity of galvanized coating thickness. This non-uniformity forces the steel producer to place a thicker coating of zinc on the steel than is required in order to guarantee that minimum specifications are met.

The hot dip galvanizing process is used to place a rust-proof zinc coating on steel sheets. In this process the steel sheet is submerged in a vat of molten zinc. The sheet then passes between a set of air knives where the excess zinc is blown off. One of the major variables that controls the coating thickness in this process is the distance between the air knives and the steel sheet. Control of steel sheet shape and vibration at the air knives can increase the quality and throughput of the process and reduce costs. Steel industry experts indicate that substantial savings can be achieved through sheet shape and vibration control.



Steel sheet just above air knives

A laboratory demonstration is conducted to evaluate the feasibility of using an active control system to control the steel sheet at the air knives. This is not an easy task. While the vibration response of the tensioned steel sheet is dominated by two or three modes of vibration, the sheet dynamics are complex and constantly changing as sheet crossbow, buckle and tension and thickness vary. Such phenomena make this a difficult control problem. A scale model of this process has been constructed at SDL laboratory facilities to mimic the anticipated dynamic characteristics of



Schematic of Hot Dip Process

the steel sheet in the hot dip galvanizing process. A control system has been developed that controls both the sheet shape and vibration.

AK Steel, Inc., has provided both financial resources and access to their facilities to support this work. Efforts are currently underway to apply this technology to AK Steel's galvanizing line located in Ashland, Ky.



Tensioned Sheet Test Stand

Solution: An active control system is being developed that will stabilize the steel sheet at the air knives. This will produce a more uniform zinc coating and reduce zinc material costs.

SDL

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