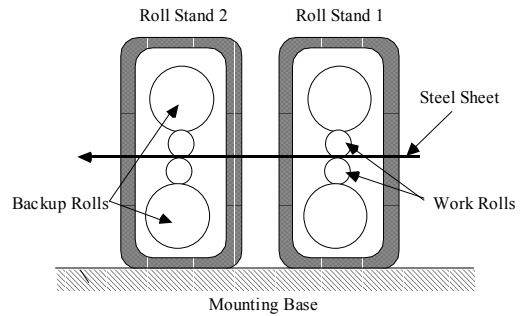


Steel Production – Rolling Mill Chatter

Problem: Rolling mill chatter, a form of self excited vibration, is a chronic problem in steel and aluminum mills which limits production, reduces product quality and increases maintenance cost.

Over 15 million tons of cold rolled steel are produced annually in the U.S. on multi-stand rolling mills. These mills consist of a sequence of roll stacks through which steel sheet is rolled, successively reducing its thickness to the desired gauge and imparting the desired surface finish. While this is an old and seemingly simple process it is actually very complex and not well understood. An issue of particular concern is chatter. Rolling mill chatter is a vibration problem limiting the throughput of nearly all metal rolling operations. In addition, associated sensitivity of the system to



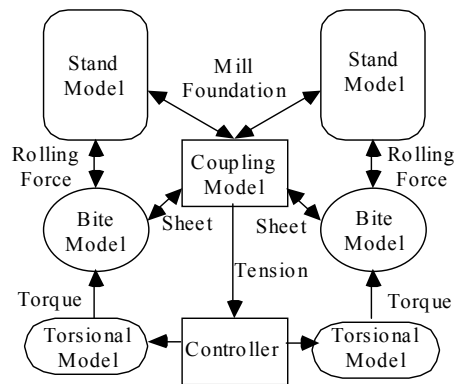
Schematic of Roll Stacks



Multi-Stand Cold Roll Steel Mill

of to modify the feedback path such that the feedback is a stabilizing rather than destabilizing effect. This research has the potential to significantly impact the production rate, product quality and maintenance costs for many cold roll mills. SDL is currently developing control technology with the capability to stabilize the chatter mechanism and is evaluating paths on which to proceed with this research. This research has been supported by the National Science Foundation.

forced vibration necessitates costly maintenance programs to minimize these forces. The root cause of the problem is a destabilizing feedback mechanism which renders the system extremely sensitive to any excitation. In the limit, the rolling process is unstable and self excited. The extension/tension relationship of the inter-stand steel sheet is a critical component of the feedback path. Preliminary research conducted by SDL has identified aspects of the sheet behavior which have not previously been considered yet may have a paramount influence on the chatter process. This behavior may be taken advantage



Block Diagram of Chatter Feedback Model

Solution: Preliminary research conducted by SDL indicates aspects of the feedback path may be modified to stabilize the rolling operation making it insensitive to vibration forces and preventing self-excited chatter.

SDL

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