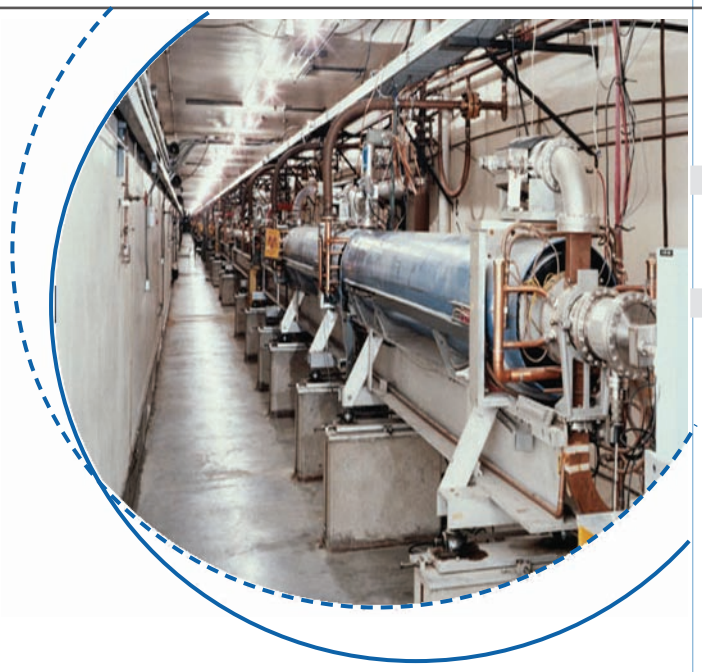
Rolling Mill



Applications

Steel
Aluminum
Plastic
Fiberglass
Wood

Departments

Research & development
Production
Quality

Overview

Steel, aluminum, fiberglass, particle board, and plastics are formed into sheets in a rolling mill. The material is heated to a specific temperature and run through a series of presses and rollers at a specific speed to attain the correct thickness.

Problem

Rolling machines are large and complex, requiring measurements at many points to completely characterize their operation. Variations in rolling process variables such as temperature, speed, pressure, and tension can result in output that varies in consistency and thickness. Because these variables interact with each other, it is important that a process characterization system detect small changes in correct time sequence so that cause can be distinguished from effect.

Solution

A VXIbus data acquisition and control system from VXI Technology is well-suited to characterizing a rolling mill process. Thousands of transducer readings can be performed each second and extensive triggering capability ensures correct time sequencing. Resolutions of better than one part per million mean that accuracy is usually limited by the transducer, not the data acquisition system. And extensive control output capability allows a process characterization system to grow into a complete control system as needed.

Significant amounts of material must be loaded into a rolling machine at process start-up. Good process control will minimize the amount of this material that is lost to scrap. Characterizing roller bearing vibrations can help predict bearing failure so that preventive maintenance can be scheduled and unexpected down-time minimized.

Application Note

Implementation

Material temperature

The steel, aluminum, plastic, fiberglass, or wood pulp is heated to make it malleable. Characterizing the temperature can ensure that it will be rolled out properly. Thermocouples can be used to measure temperature, but in very high temperature cases, infrared sensors or radiation pyrometers must be used.

Roller pressure

Readings are made on the rollers to sense the amount of pressure used when rolling out the material. Pressure is inversely proportional to the thickness of the material. Pressure can be controlled with voltage outputs. It is monitored by transducers that output a voltage or current proportional to pressure.

Roller speed

The speed of the material passing over the rollers greatly affects the way that material is pressed into sheets. Variances in speed can cause variances in tension and consequently variances in thickness. Speed is measured by a frequency counter that senses the pulse train frequency of a shaft encoder.

Material tension

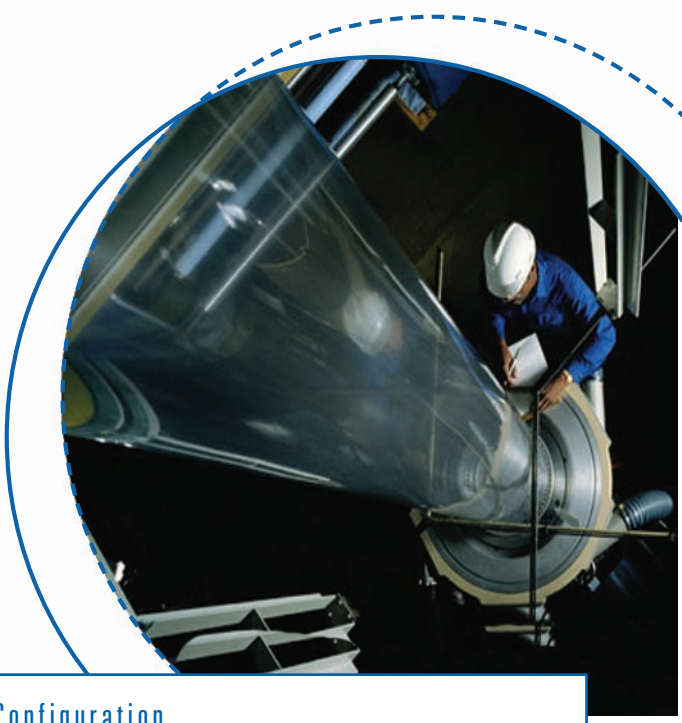
The tension of the material as it passes over the rollers is monitored to ensure that the correct roller speed is being maintained throughout the rolling process. Load cells mounted on special rollers are used to measure tension.

Material thickness

X-ray and beta-ray sensors are used to monitor the thickness of material passing through the rolling mill. The voltage output from these sensors is scaled and stored as material thickness.

Roller vibration

Roller vibration is an indication that the roller is due for preventive maintenance or replacement. Early discovery of irregular vibration can prevent unexpected downtime. High-speed analysis is used to measure vibration.



Key System Features

- **VXIbus open architecture**
- **Data Acquisition and Control on a single programmable VXIbus card (VT1419A)**
- **Graphical programming language(Agilent VEE or NI Labview)**
- **Flexibility with deterministic control**
- **Wide choice of inputs/outputs**
- **Built-in control algorithms**
- **Up to 32 user-written "C" codealgorithms**
- **65,000 reading FIFO buffer**
- **500 reading Current Value Table(CVT)**
- **All algorithms can write toFIFO/CVT**
- **Data can be time-stamped**

Typical Configuration

Data Acquisition System	Qty
CT-100C VXI 6-Slot Card Cag	1
VT1432A 16-Channel Digitizer	1
Firewire VXI Slot 0 Command Module	1
VT1419A Multifunction Measurement & Control Card	1-4
Analog input channels	30-150
Strain gage completion channels	10-40
Counters channels	5-15