Industry
Small & Medium-Sized Manufacturer

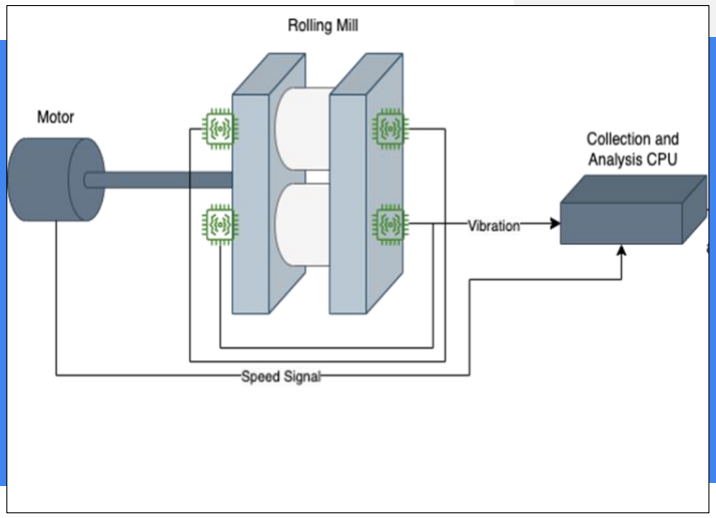
Applications
Process Modeling
Predictive Maintenance

Solutions
Energy Savings

CESMII
THE SMART MANUFACTURING INSTITUTE

PROJECT CASE STUDY

Predictive diagnostics of roll-forming equipment



PROJECT LEAD

Case Western Reserve University

PROJECT TEAM

Rafter Enterprises

PROJECT OBJECTIVE

A wireless sensor network will monitor bearing vibration signatures on key mill equipment. The monitoring algorithms provide prognostic indicators that enable predictive maintenance and prevent catastrophic failures that cause unplanned machine downtime.

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Smart Monitoring of Rolling Mill Bearings Prevents Catastrophic Equipment Failure

BENEFITS TO OUR NATION

Motor-driven devices such as pumps, fans, gearboxes, and forming equipment are ubiquitous in American manufacturing and production facilities. The tools and techniques developed in this project can be implemented across a wide range of American manufacturing plants that run rotary equipment. Implementing these equipment health monitoring tools will improve manufacturing productivity and make American manufacturers more competitive and efficient.

BENEFITS TO INDUSTRY

The mill monitoring system will provide manufacturers with the ability to pinpoint maintenance problems and address them prior to a catastrophic failure. The monitoring system can track the life expectancy of bearings and other consumable parts and reduce part replacements. The data from the monitor can be used to develop predictive maintenance programs and increase operational efficiency. Manufacturers will benefit from the efficiency increases from minimized downtime and reduced costs for replacement parts. The industry can benefit from mill run time analytics by improving equipment utilization and increasing manufacturing productivity.

PROJECT DESCRIPTION

TECHNICAL APPROACH

Data-driven algorithms will be implemented to enable incipient detection, fault tracking and prognostics of rotary equipment. The monitoring system developed will provide reports showing potential areas of failure and recommended predictive maintenance responses. Implementation and utilization of the fault detection system will make mill personnel aware of maintenance requirements to ensure that the necessary parts are available and maintenance can be scheduled before catastrophic failures occur, reducing unplanned downtime and minimizing unnecessary part replacement.

ACCOMPLISHMENTS

- Demonstrated bearing health tracking with normal and faulted bearings
- Implemented equipment health monitoring application that transfers data to the Smart Manufacturing Innovation Platform for:
  - Rotary equipment health tracking and analysis
  - Notification of impending equipment failure (predictive diagnostics) to maintenance personnel

DELIVERABLES

- Complete vibration dataset collected from Rafter (industrial partner) production equipment for model development and validation
- Developed predictive model for vibration monitoring and fault detection
- Implemented fault detection algorithm on the Smart Manufacturing Innovation Platform

REUSABLE OUTCOMES

Smart Mill Monitoring App for rotary equipment

RESULTS

↑Productivity

Potential to greatly increase manufacturing productivity by reducing equipment downtime.

↓15% Downtime

Potential to reduce unplanned equipment downtime by 15% when implementing mill monitoring App.

↓ Costs

Reduced maintenance and spare parts costs when implementing predictive maintenance protocols.

PROJECT DETAIL
Budget Period: BP4 – BP5
Submission Date: 12/12/2022
Sub-Award (contract) Number:
4550 G YA132
SOPO: 2323

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