IPRO 331
Machine Vibration Monitoring & Control Solutions for A. Finkl & Sons

Objective:
The purpose of IPRO 331 is to develop a system to automatically detect an irregularity with a mill at A. Finkl & Sons Co. The system will either turn the mill off or warn the operator when a tooth breaks, or some other irregularity occurs. This system will involve measuring vibration, sound, power consumption, or some combination of these variables. This will replace the current setup, which involves an operator remaining in close proximity to the mill at all times in order to turn it off when an irregularity occurs.

Accomplishments:
Initial vibration data was obtained on a mill at Illinois Institute of Technology (IIT). There was already a vibration monitoring system in place at A. Finkl & Sons, however it was discovered that the sampling rate of 1 Hz was far to low to be useful. Therefore, the vibration system from IIT, which has a sampling rate up to 10 kHz, was used to collect data at A. Finkl & Sons. In addition, a web camera was installed so that the mill can be monitored remotely by students at IIT. A microphone and a power meter were also purchased and are currently at A. Finkl & Sons.

Obstacles:
Cooperating with an outside company presented several challenges and impeded the progress of IPRO 331. For the first month of the semester, the mill was not operational. There were also times when our inquiries went unanswered for several weeks. In addition, it took several weeks to obtain approval to buy the new equipment, such as the web camera, microphone and power meter. To date, the power meter and microphone have still not been installed at A. Finkl & Sons.

Results:
The vibration data reveals a significant increase in vibration when a broken tooth is present. Therefore, vibration data shows great promise as a monitoring system. Noise and power consumption data has not yet been obtained.

Future Work:
The ideal sampling frequency for vibration monitoring must be determined. If the frequency is too low the signal will not be detected, and if it's too high the system will require a large amount of memory. In addition, a large amount of data and further data analysis is required to determine a threshold. Once the microphone and power meter are installed, data must be collected and analyzed. After data analysis is complete, it will determine which method or methods to implement. Once the monitoring system is in place, it will need to be validated. This will be accomplished by creating a system to sound an alarm when the mill is out of normal operating parameters for validation. Once validated, another system will be implemented to automatically turn off the mill.

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