

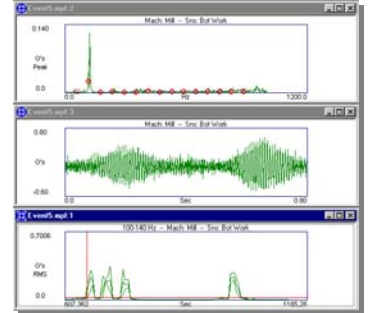
# MAARS Application Note

## Mill Stand Monitoring Application

Vibration analysis of Roll Process Mill Stands has proved to be very successful in solving Mill Stand crashes at an aluminum production facility. The concept of using vibration analysis was begun at the facility using a portable data collector, but the Mill Stand cannot be monitored on an ongoing basis due to personnel safety concerns.

### Problem Statement

The Mill Stand has been experiencing chatter which results in aluminum roll breakage. Suspected causes of the chatter include work roll resonance, which appears to be related to both the roll speed and cooling configuration. An experiment involving several combinations of cooling configuration and roll speed management was conducted with a temporarily attached monitoring system. Five junk aluminum rolls were run through the Mill Stand, taking each to failure (breakage) of the aluminum roll. Before roll breakage, a “standing wave” in the roll would be observed, with peak-to-peak amplitude of about 18-24 inches. Roll breakage causes about 45 minutes to 1 hour of unplanned downtime, in addition to quality control problems caused by the mill stand chatter condition. The goal of the testing was to see if vibration monitoring could predict in advance that the Mill Stand was about to enter a chatter condition and if the system could give the Mill Operator enough warning so the mill could be reconfigured to avoid chatter and roll breakage.



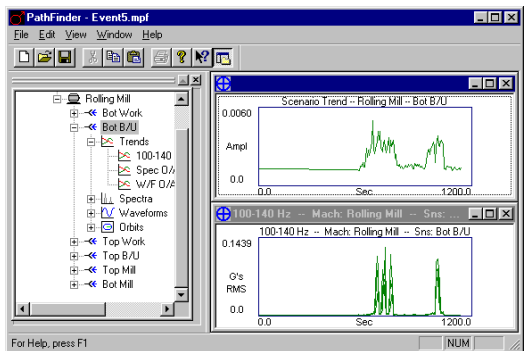
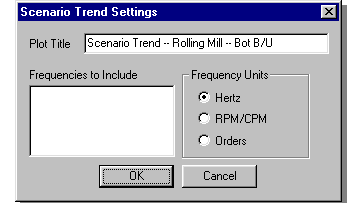
### Mill Stand Monitoring System Design Guidelines

- The data must be transmitted wirelessly to the Ethernet network connection of the PC server.
- The Master database, which stores configurations, alarms and statistics, is maintained on the server (optional).
- The Mill Stand monitoring unit should be capable of continued operation if disconnected from the network.
- All data from the Mill Stand (spectra, waveforms, and analysis parameters) to be saved in the Microsoft Access® database.
- Full compliment of vibration analysis capabilities including order tracking, waveform parameters, spectral bands, etc.
- The Monitoring system must be able to report the data and analysis results in “real time” to the Mill Operator to avoid roll breakage.

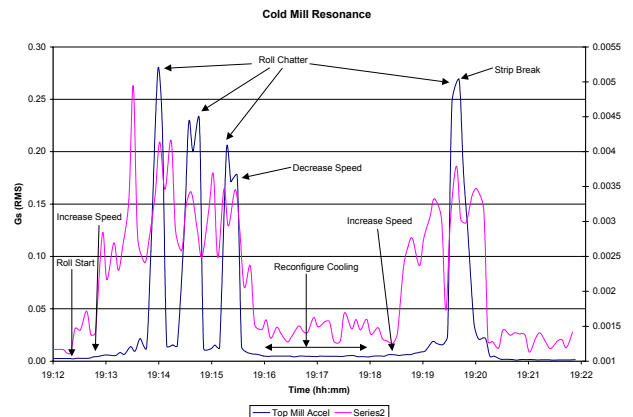
### Vibration Analysis

Due to Mill Stand access limitations, only six sensors were configured for this special test. In addition, only three analysis parameters were defined in the database, for the suspected vibration frequency at resonance and the spectral and waveform overalls. In order to determine if the vibration data could be used as a “predictor” of imminent roll chatter, the “Scenario Trend” function of the PathFinder™ Software was used. The three step process, outlined below, was used to find a vibration frequency range that trended up in amplitude level about 60 to 90 seconds before the Mill Stand entered a chatter condition.

1. Scenario Trend is found by right-clicking on the measurement point level in the database tree.
2. The analyst is then prompted to enter in a frequency range for the trend.
3. The trend data is presented for analysis. Analysis of the trend data shows the predictive capability of the vibration signal. The original trend data is shown below at right in blue, and the trend of the new predictive vibration band is shown in pink. Note that in all four cases the pink trend precedes the blue trend in vibration amplitude level, therefore predicting that a chatter condition is about to occur. By setting band frequency and amplitude limits, the operator can now observe only one gauge to determine if process changes are about to drive the Mill Stand into a chatter condition. Problem solved!



The results of the Scenario Trend are shown above. The original vibration data trend is shown in the lower plot, and the result of the Scenario Trend is shown in the upper plot.



Above is the data re-plotted in an overlaid fashion by using copy and paste into an Excel Spreadsheet and a line chart. This chart shows the dramatic predictive capability of the new frequency range.

### Contact Information

If you have a Roll Process Mill Stand in your manufacturing plant, please call MAARS, Inc. at (865) 927-6626 or email us at [sales@maars.com](mailto:sales@maars.com).