FINKL
A. FINKL & SONS CO.

ILLINOIS INSTITUTE OF TECHNOLOGY

IIT IPRO 304
Machine Tool Monitoring Control
For A. Finkl & Sons

IPRO Presentation

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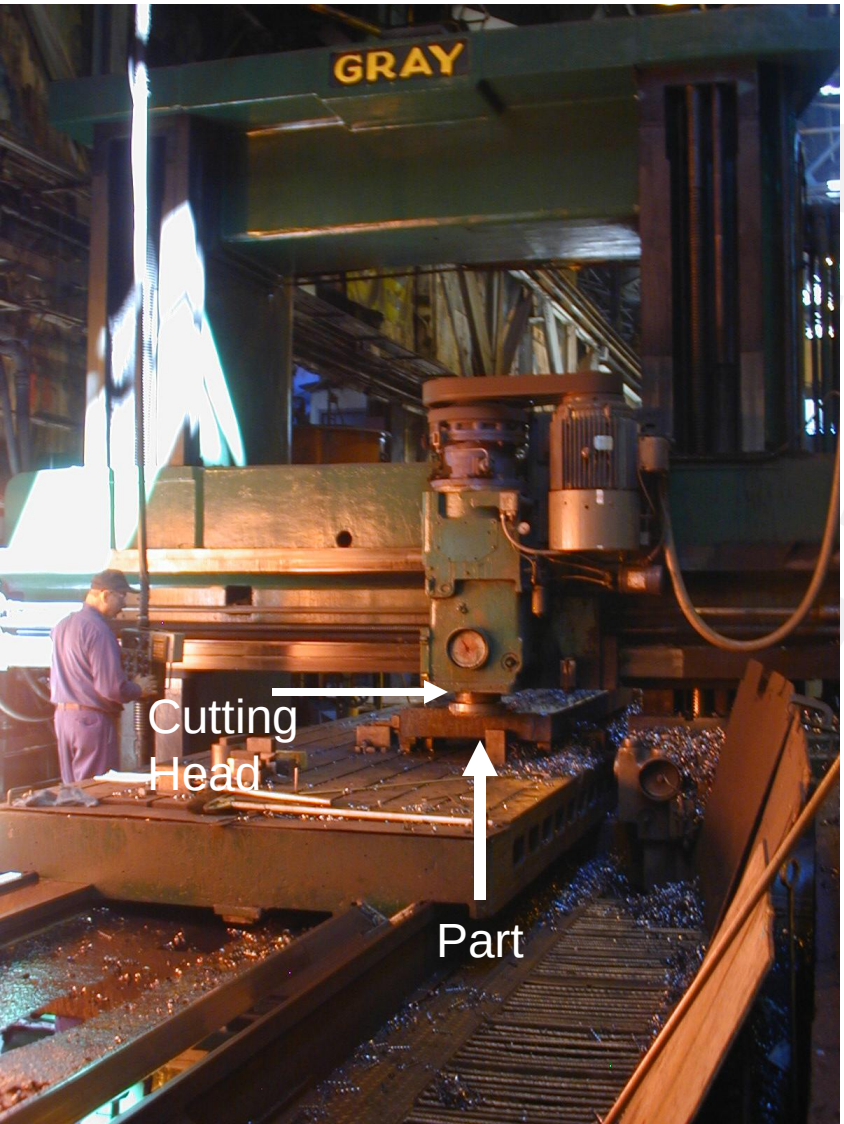
Background

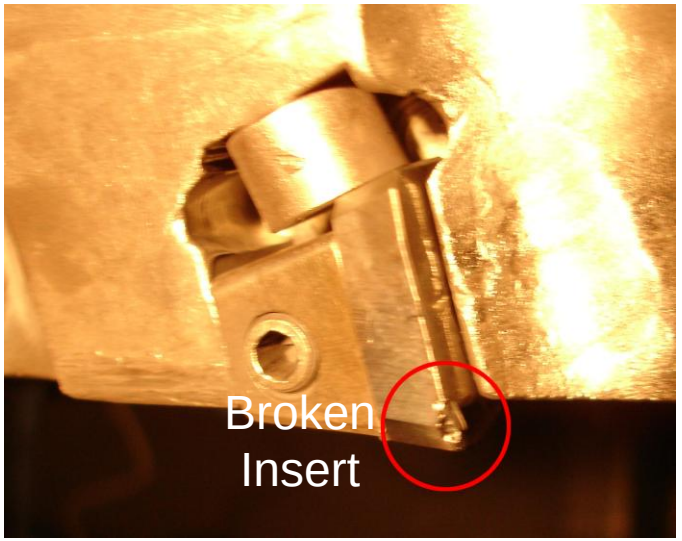
- A. Finkl & Sons is the world's leading supplier of forging die steels, plastic mold steels, die casting tool steels and custom open-die forgings,

- A. Finkl & Sons process over 100,000 tons of steel each year. These products are distributed domestically and to more than 18 countries worldwide.



The Problem

- Machinists must remain at machines at all time
- Broken inserts cause downtime and higher costs



Previous Work

- Visual method

  - A camera was used to take photographs of the milled piece and a Fast Fourier Transform analysis was preformed to discover patterns.

- Acoustic method

  - A directional microphone was used to try to detect the sound of an insert breaking.

- Accelerometer method

  - An accelerometer was attached to the milling machine housing directly over the cutting head.

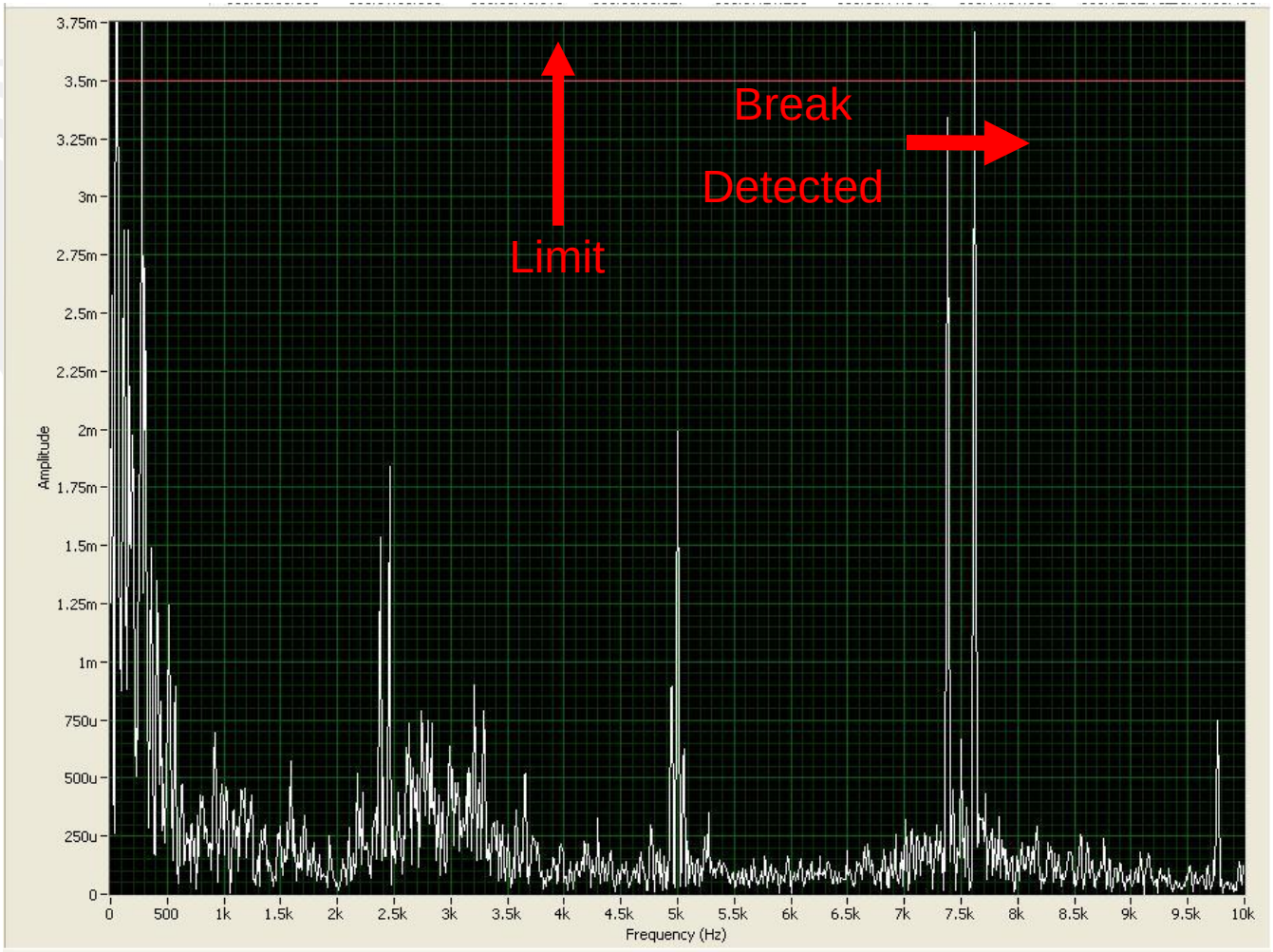
Current Work

- Accelerometer data :
  - 4 grades of steel
  - Five different machines of various size
  - Two different shapes (most milled material is rectangular)
  - Eight different size parts (from 1 to 17 tons)
- Lab View Signal Express was used to collect and analyze data

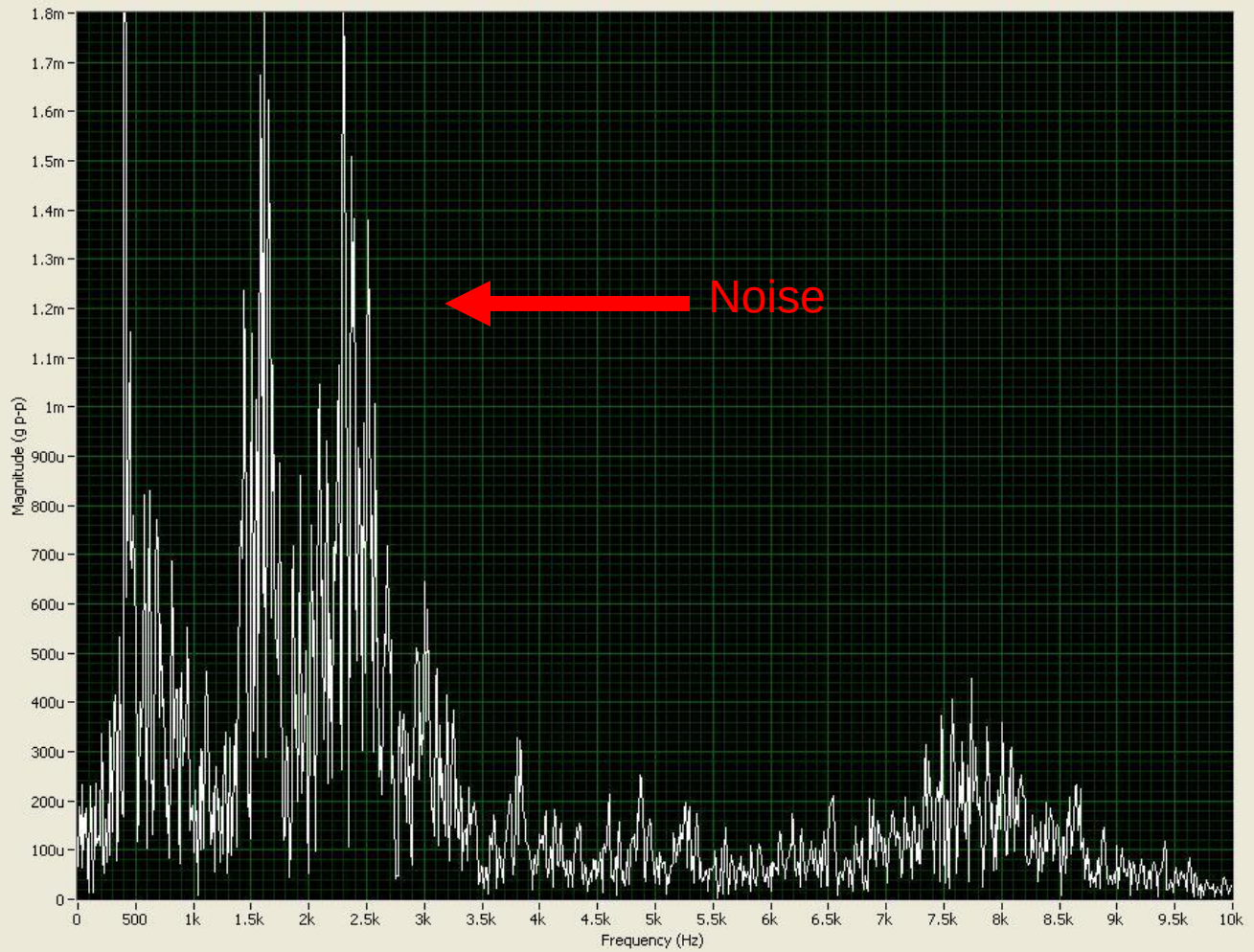
Research Time

- We went to A Finkl & Sons twice a week to collect data.
- We spent over 40 hours to get appropriate data from several machines.
- Two following signals were extracted from over 500 MB data.

Analysis (Proper signal)



Analysis (Improper signal)



Hypothesis

- In order to acquire accurate data the machine's running noise must be minimized
- Every machine is different and some may have worn bearings which could cause extra noise.

Recommendations

- Wireless accelerometers will be mounted to the milling machine shaft.
  - These computer chips are capable of wirelessly transmitting the vibration data to a central computer used for the analysis.
  - Mounting the accelerometers on the rotating shaft might minimize the noise found in the signals.

Future Work

- The accelerometers will need to be programmed to send the data to the central server.
- A program will be written to convert the streaming data into a format for LabView to analyze.
- If the noise is reduced the machine shop will be analyzed for optimal placement of the receiver.

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