

## **Innovating Process Improvements in Manufacturing**

*Spring 2009  
Phase 3*



**IPRO** 304

INTERPROFESSIONAL  
PROJECTS PROGRAM

# Advisors and Members

Members

Introduction

Research  
Accelerometer

Experimental  
Design

Data

Results

Questions

**Advisors:** William Maurer  
Sheldon Mostovoy

**Sponsor:** A. Finkl & Sons Co.

**Team:** Anandha Abhay  
Anthony Bergeron  
Christopher Catalina  
Jason Entler  
Maximillian Estrada  
Alexander Kolbasov  
Vishal Patel  
Vien Quach  
Jay Taggart  
Sunghwan Yeo



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**Preamble:** IPRO 304 believes that a code of ethics is fundamental to maintaining an honorable and respectable presence inside and outside of the classroom. Members of IPRO 304 shall conduct their themselves in accordance with the ethics standards stated below.

- Conduct research and classroom discussion in a manner that is consistent with accepted honor and decency.
- We will strive to maintain the highest standards of honesty and integrity in all endeavors associated with the IPRO.
- Be civil and respectful in professional and academic interactions, avoiding discrimination, based on race, religion, or age.
- Treat other students, professors and host fairly.
- Be constructive without malice in evaluating the work of students.
- Encourage the free and open exchange of ideas and information without fear of retaliation.



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# A. Finkl & Sons Co.

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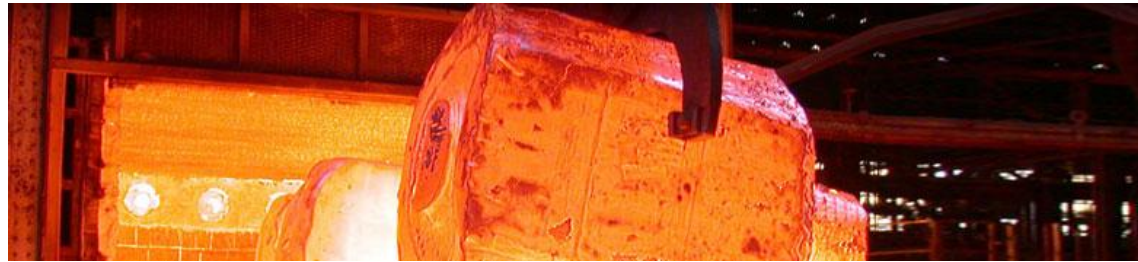
Questions



Melting



Forging



Heat  
Treating



Milling Process



Finished Product



# Advancement Opportunity

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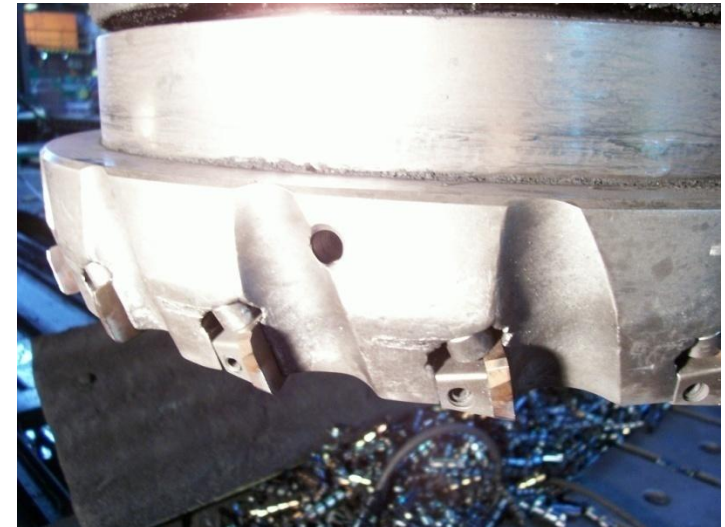
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- Milling machine (below) contains inserts that get broken during the milling process
- To develop a working prototype
- Automatically monitor & detect broken inserts
- Provide A. Finkl & Sons with the proper data & statistics of which solution to invest in



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## Finish Cut with Broken Insert



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## Finish Cut with Broken Insert



{ **No Insert Failure** } { **Failure** }

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## Finish Cut with Broken Insert



{ **No Insert Failure** }



{ **Failure** }



# Objectives of Current IPRO

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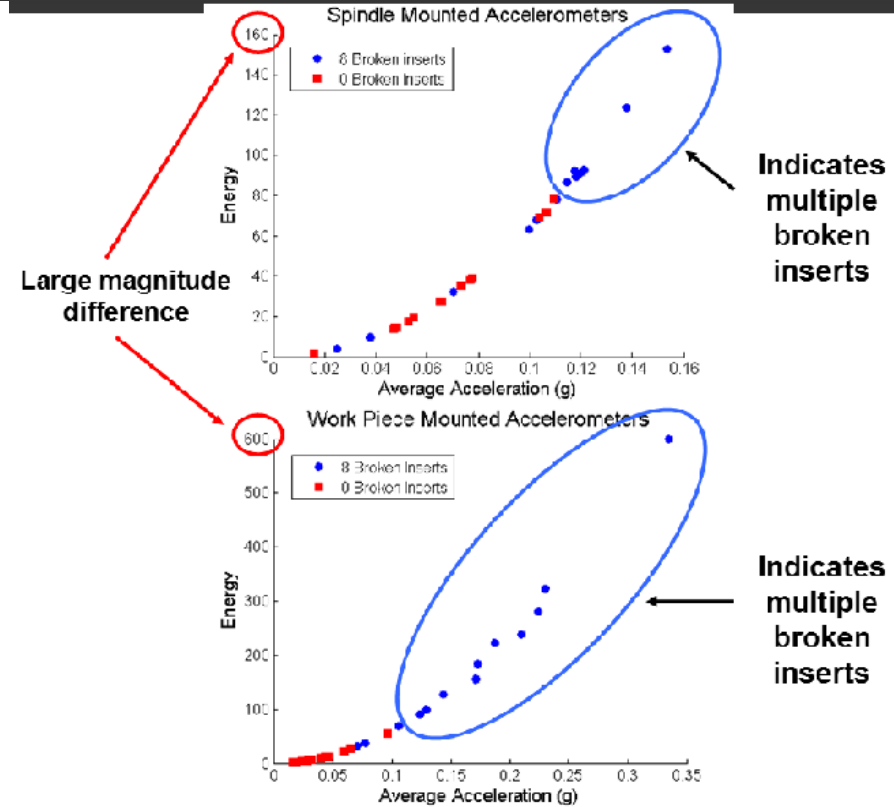
Results

Questions

Develop a system to detect broken inserts by use of accelerometers.

Alert the machinist monitoring machine in order to replace inserts.

Research, test and inform A. Finkl & Sons of a possible alternative to pursue an automated insert breakage detection system.



# Objectives of Current IPRO

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**Developing a method of analysis.**

**Intensive observational on site data collection.**

**Accounting for a wide range of variables:**

**Depth of cut**

**Speed of processing**

**Hardness of material**

**Operator inconstancies**

**Part geometry**

**Age of machines**

**Location of accelerometer**

**Identifying characteristic signature of a broken tooth.**

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## Data Collection

### Information Technology

- Anandha Abhay
- Anthony Bergeron
- Jay Taggart

### Data Processing

- Vishal Patel
- Vien Quach

### Data Analysis

- Christopher Catalina
- Jason Entler
- Maximillian Estrada
- Alexander Kolbasov
- Sunghwan Yeo

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## Wireless Accelerometer

### Pros

Wireless

Easier Mounting

### Cons

Intermittent Data Collection

Fragile



## Wired Accelerometer

### Pros

Constant Data Feed

Robust

LabView

### Cons

Wired Limitations

Connection Concerns



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## Wireless Accelerometer Placements



# Data Lifecycle

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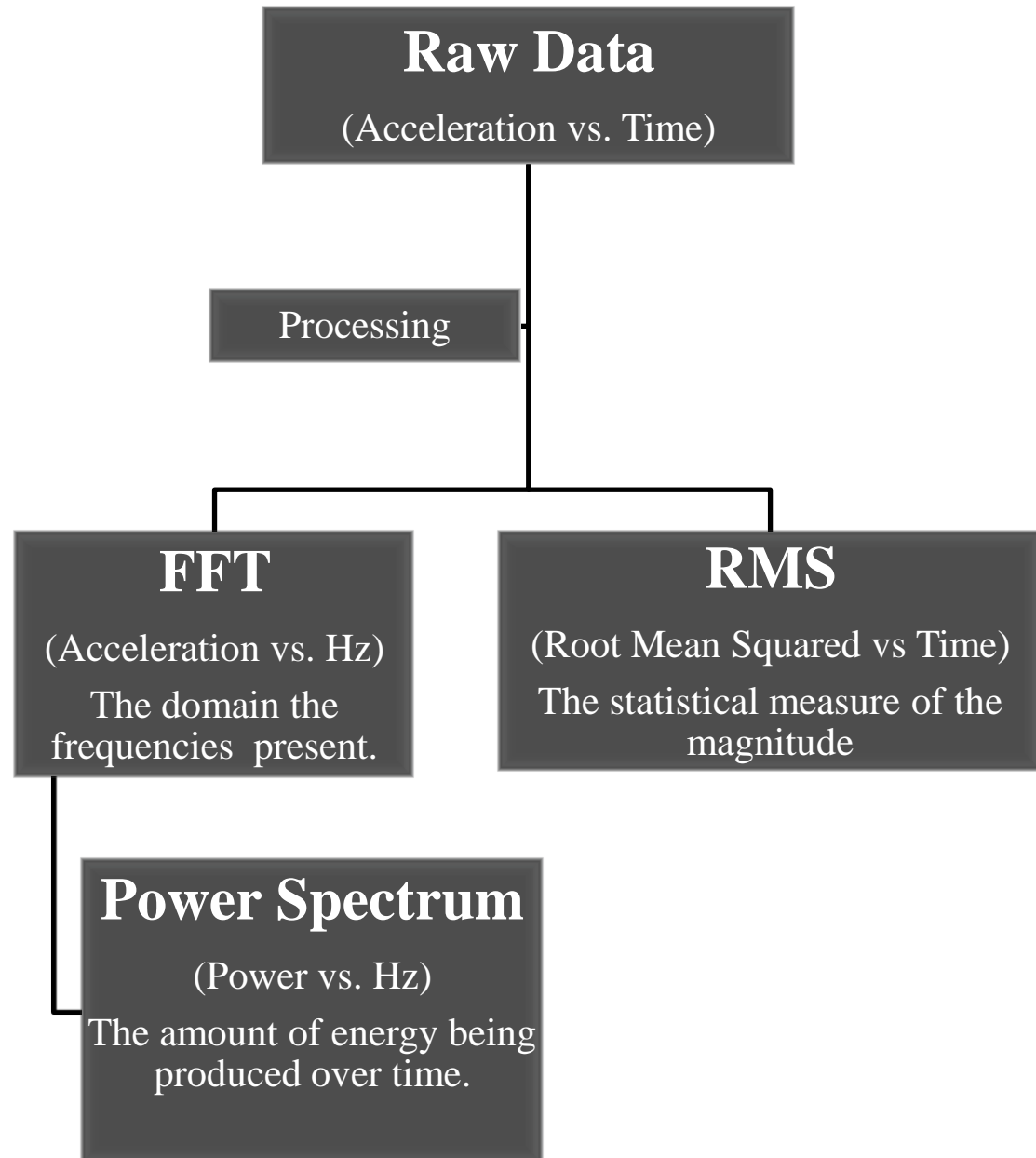
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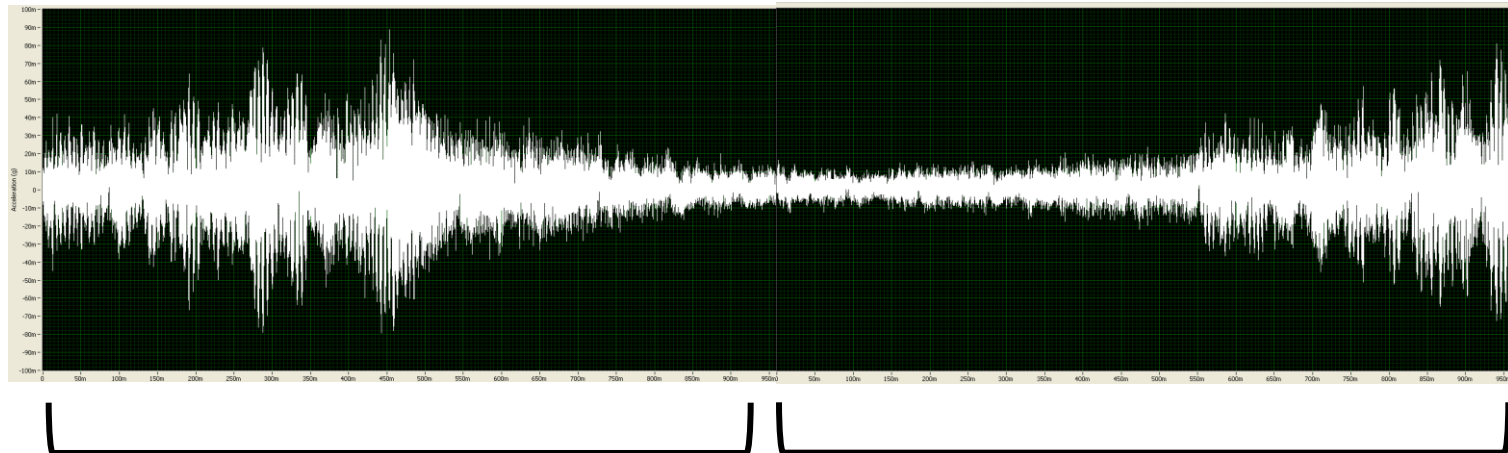
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## Signal Pulse



**Time = 1**

**Time = 2**

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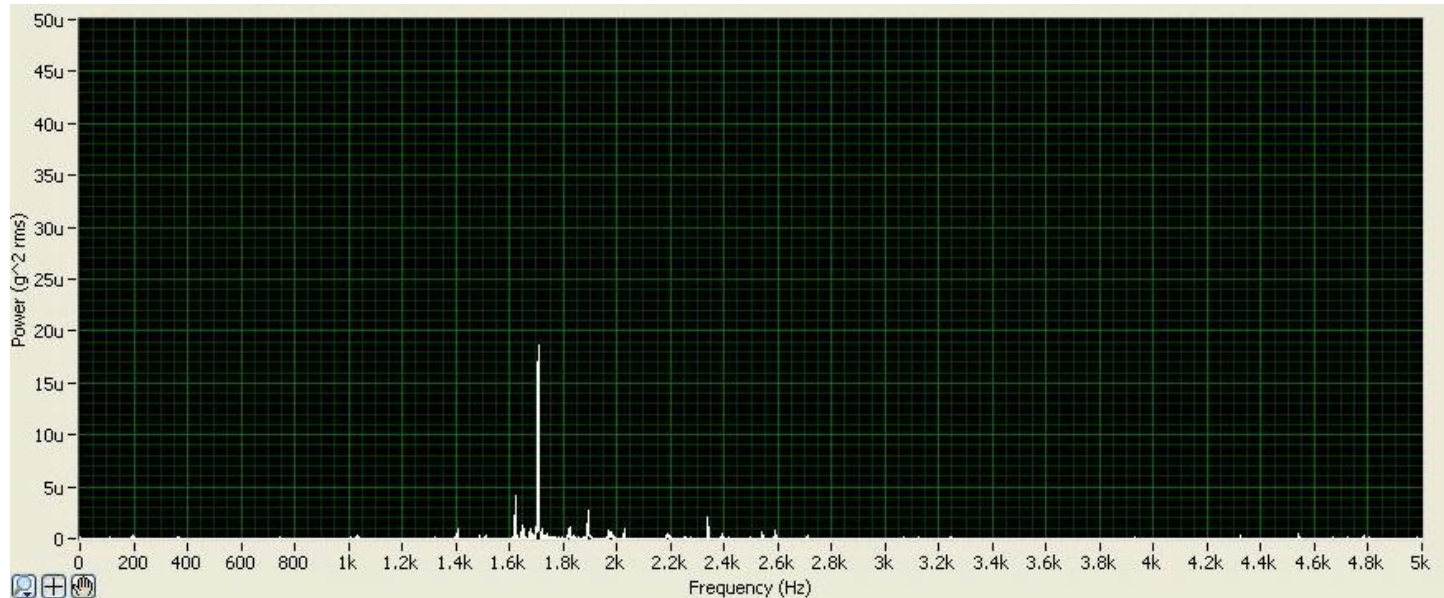
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## Power Spectrum

No Broken Inserts





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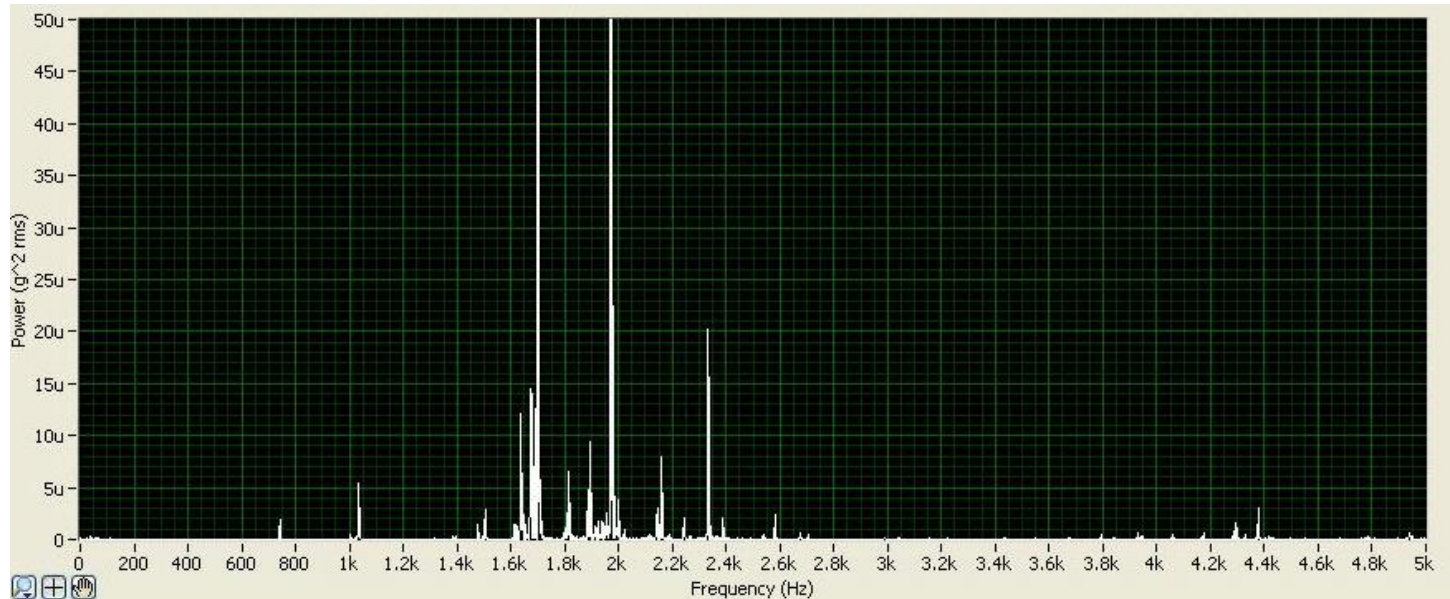
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## Power Spectrum

### Broken Inserts



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- **Wired over wireless**
- **Collect data on work piece not spindle**
- **Data contingent on many variables**
- **Accelerometer signal requires a lot of processing**
- **Making incremental progress to fulfill the IPRO's purpose**



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## Suggestions for Next IPRO

- **Further implementation of wired accelerometer**
- **Use of LabView software**
- **Continue data collection**
- **Seek trends with processing considering all variables**
- **Signal processing assistance**



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# Questions?

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**We would like to thank A. Finkl & Sons,  
Professors Maurer and Mostovoy,  
Liz Bilitz, Paritosh Mokhasi,  
Vladmir Frankfurt, Gary Gregga  
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and support.**

**Thank You!**

**IPRO Team 304**



# Questions?