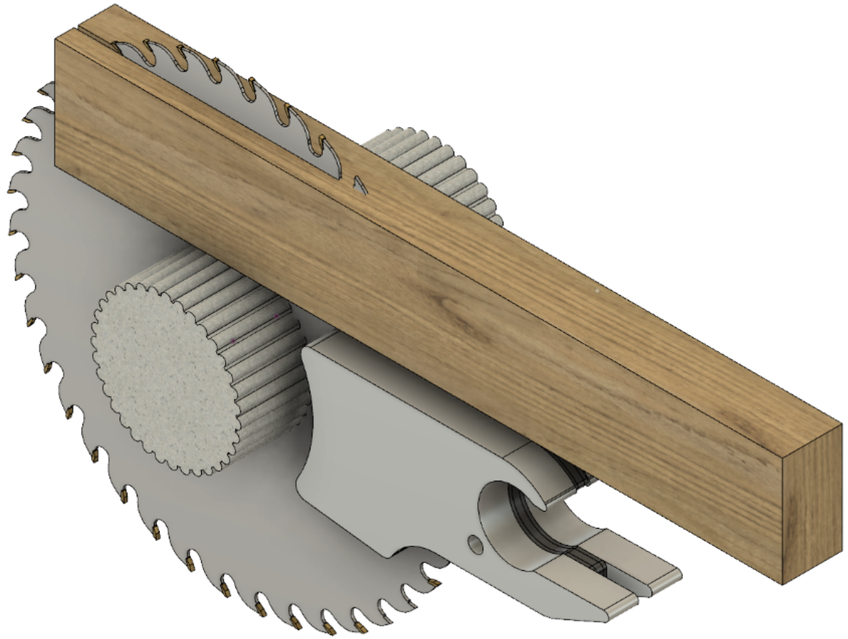

CIRCULAR SAW MONITORING SYSTEM

PRIMARY WOOD PRODUCTS MANUFACTURING

Ahmad Mohammadpanah

FPInnovations

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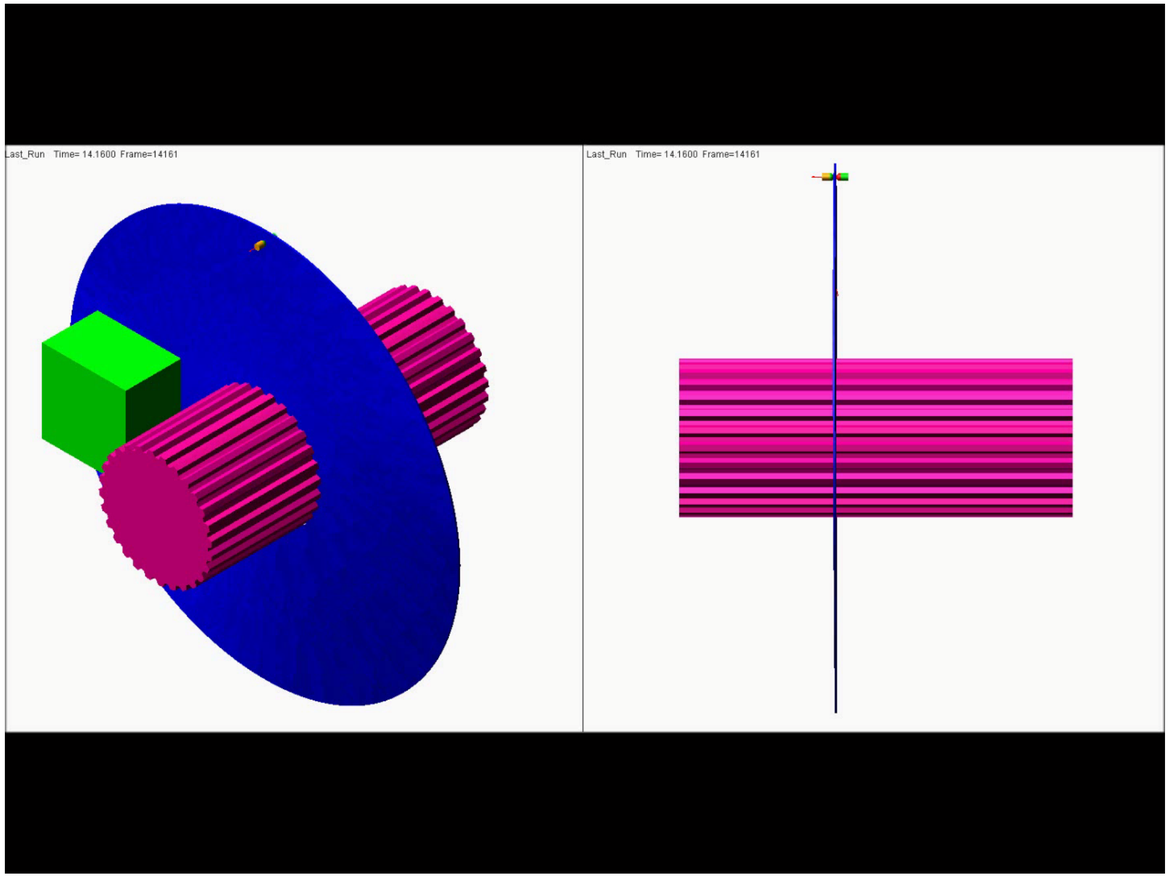
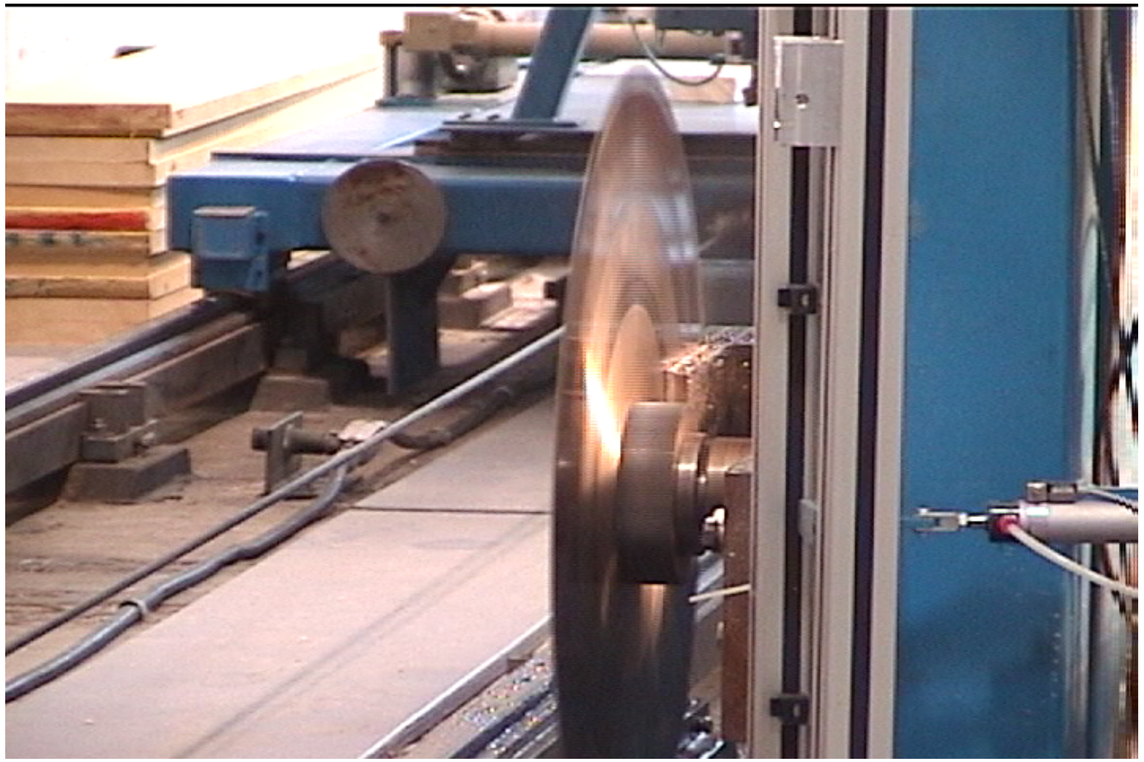
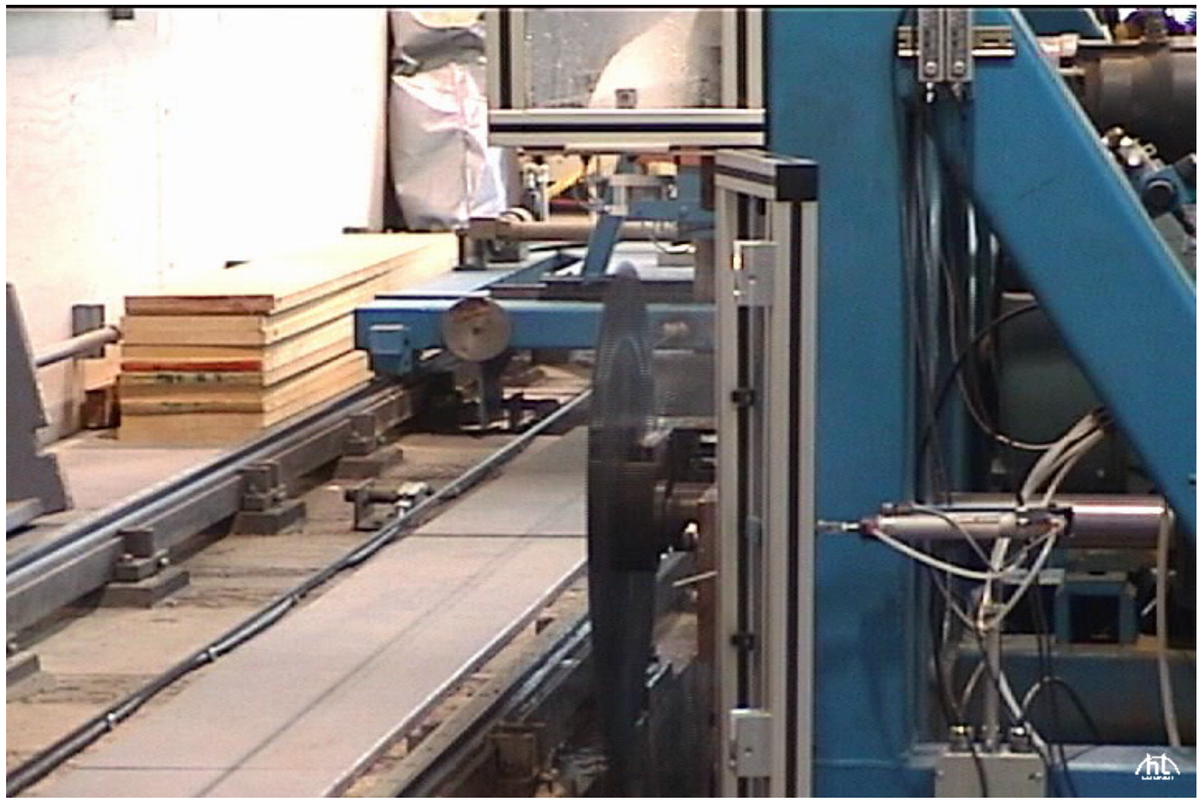
SIMULATION OF A GUIDED SAW, SPEED RAMPING



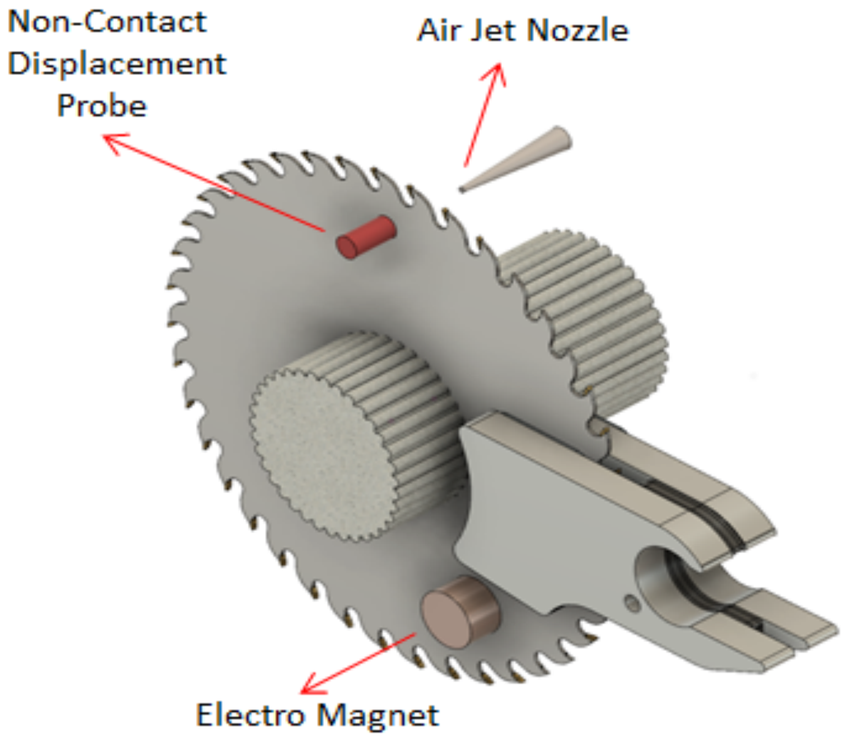
SAW RUNNING AT CRITICAL SPEED

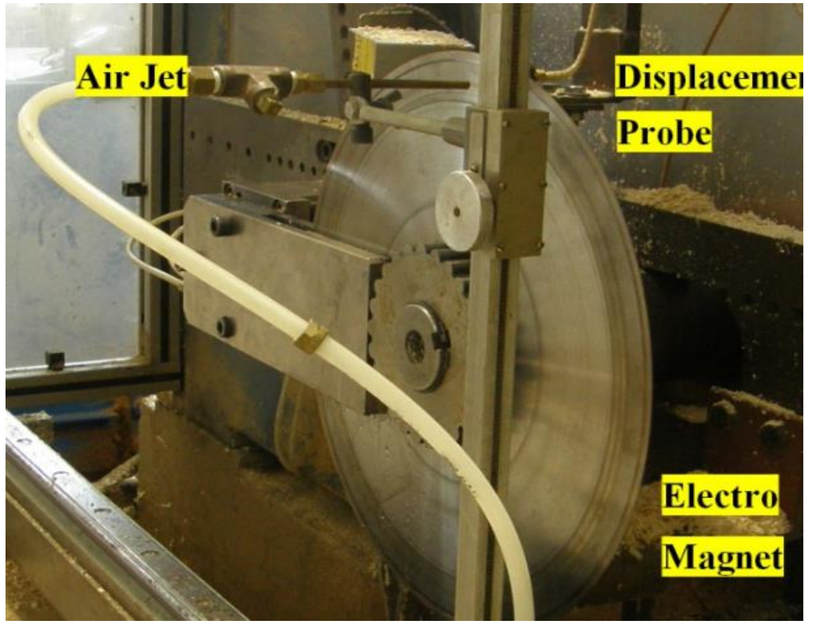


SAW CUTTING AT CRITICAL AND SUPERCRITICAL SPEEDS

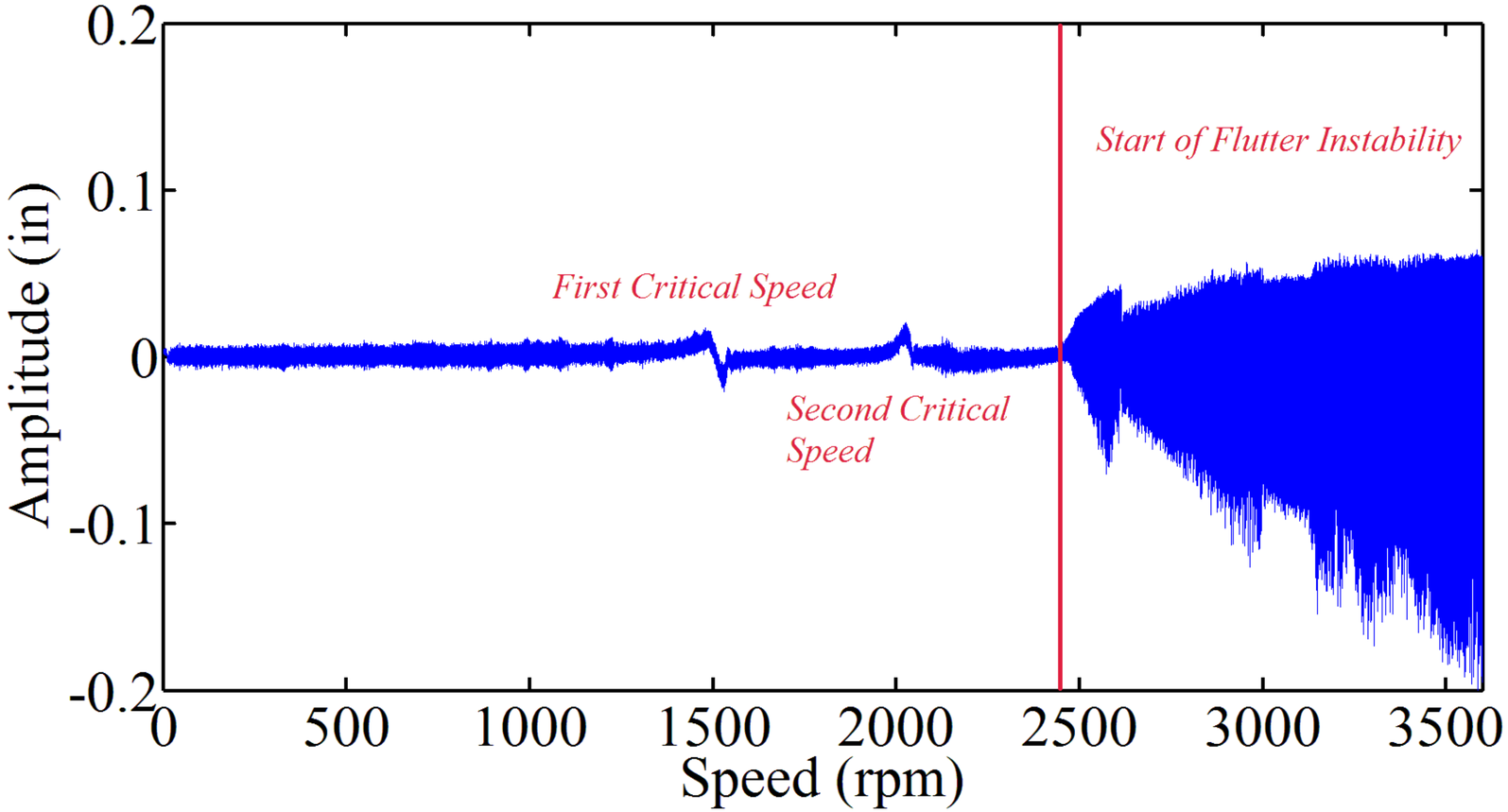


MEASURING VIBRATIONS OF SAW AS SPEED RAMPS UP

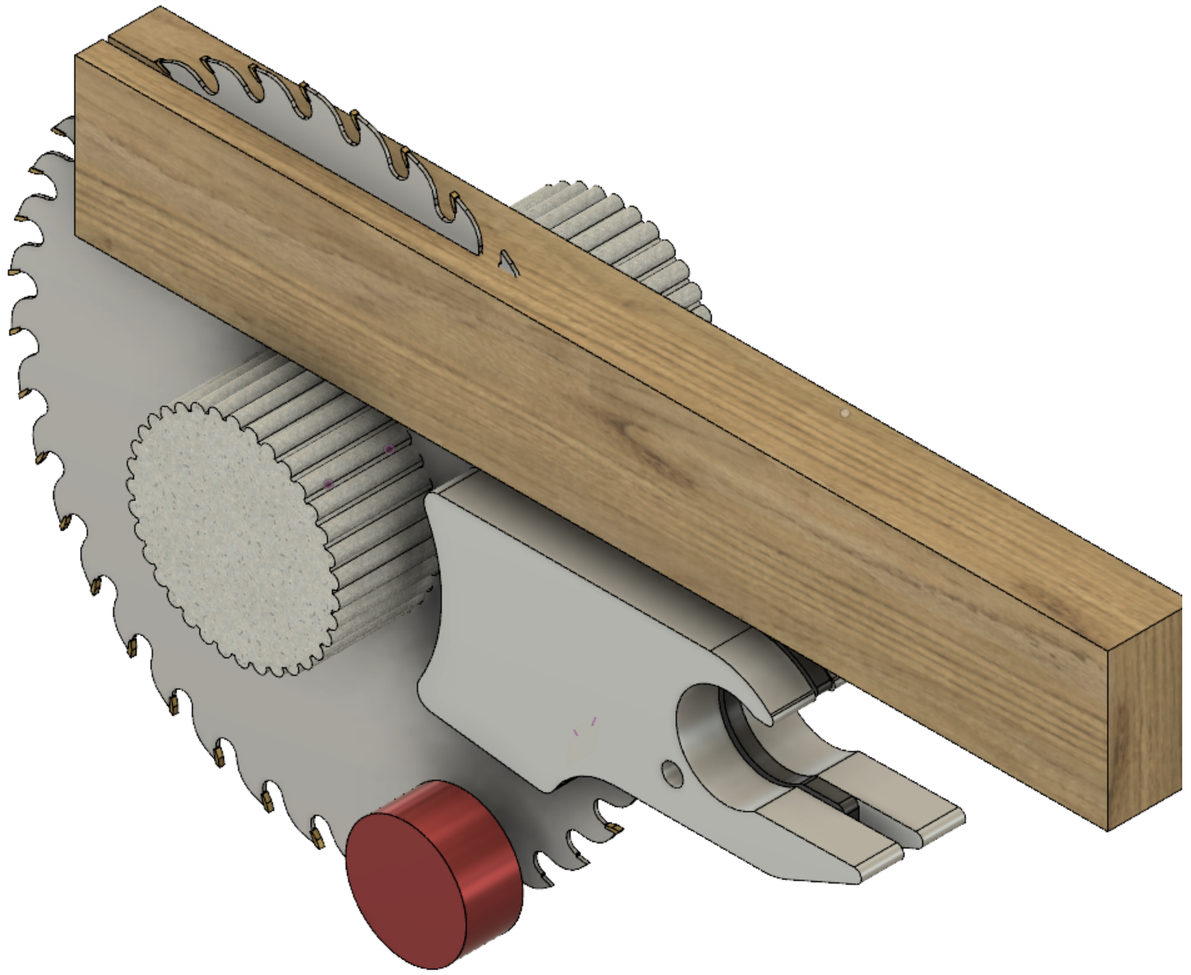




DEFLECTION OF THE BLADE DURING SPEED RAMP UP



EFFECT OF HEAT ON DYNAMIC BEHAVIOUR OF SAW



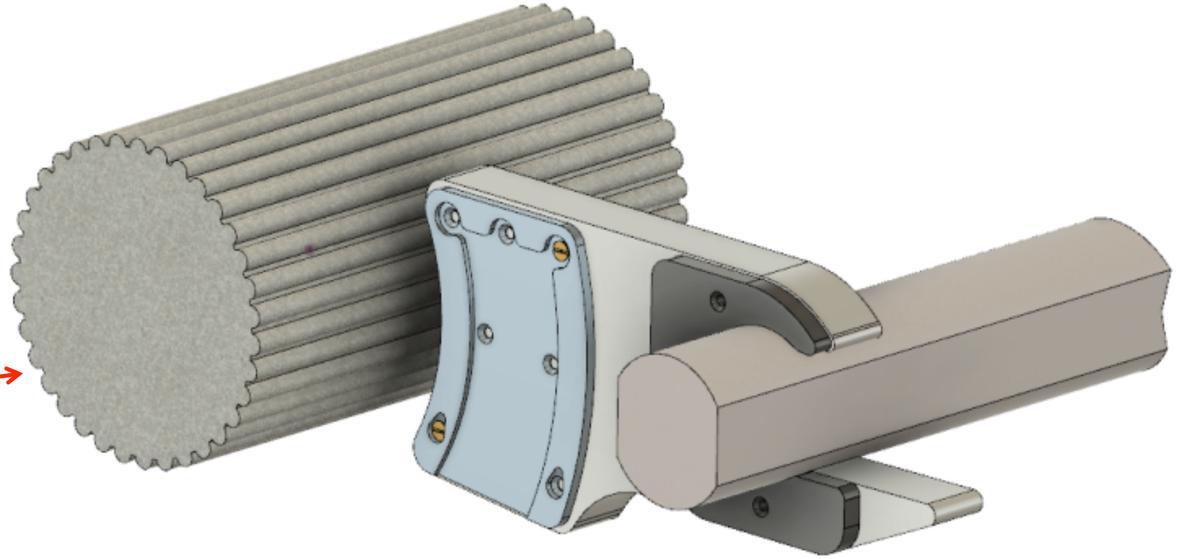
EFFECT OF HEAT ON SAWING PERFORMANCE

HEAT RESULTS IN HIGH SAWING DEVIATION.

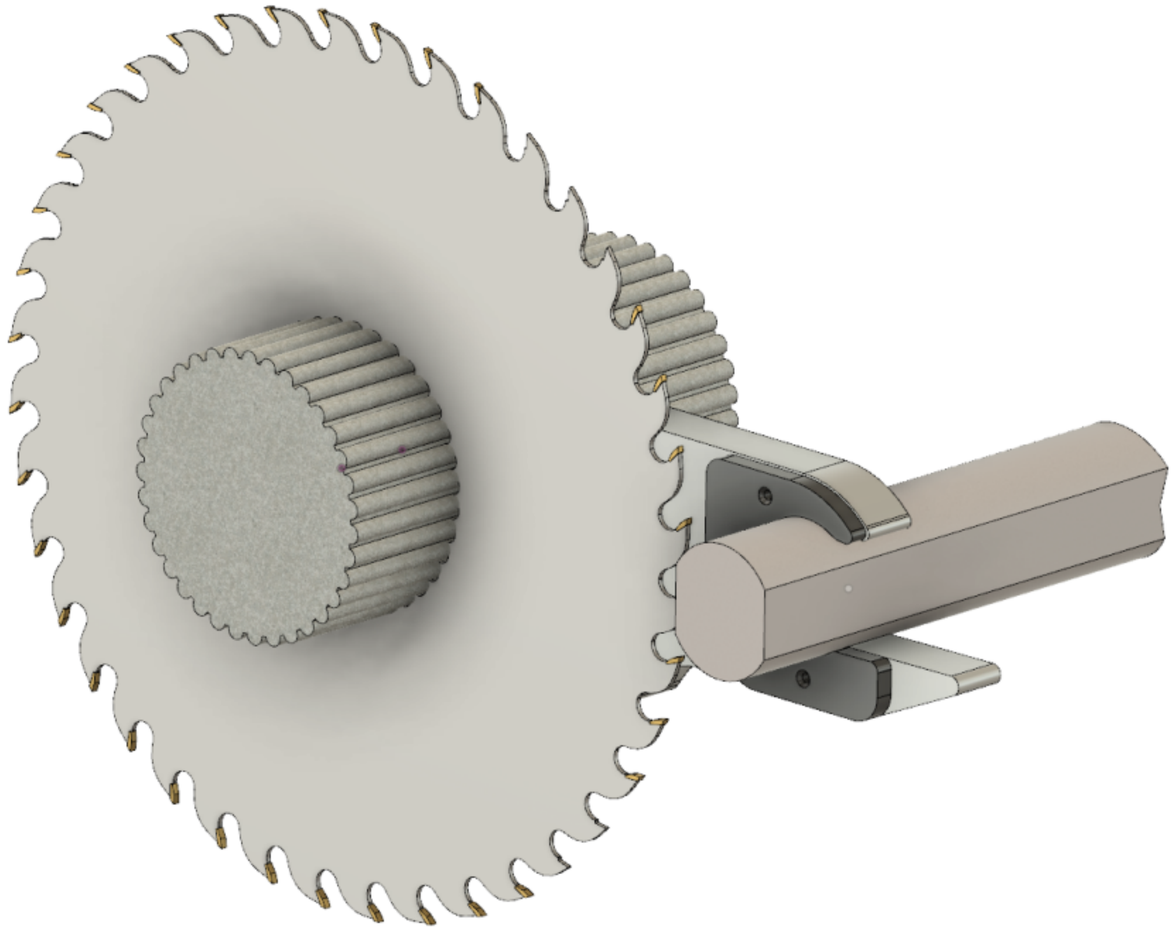
THE FEASIBILITY OF DEVELOPING A MONITORING SYSTEM FOR GUIDED CIRCULAR SAW

PRACTICAL LIMITATIONS FOR CIRCULAR SAW MONITORS

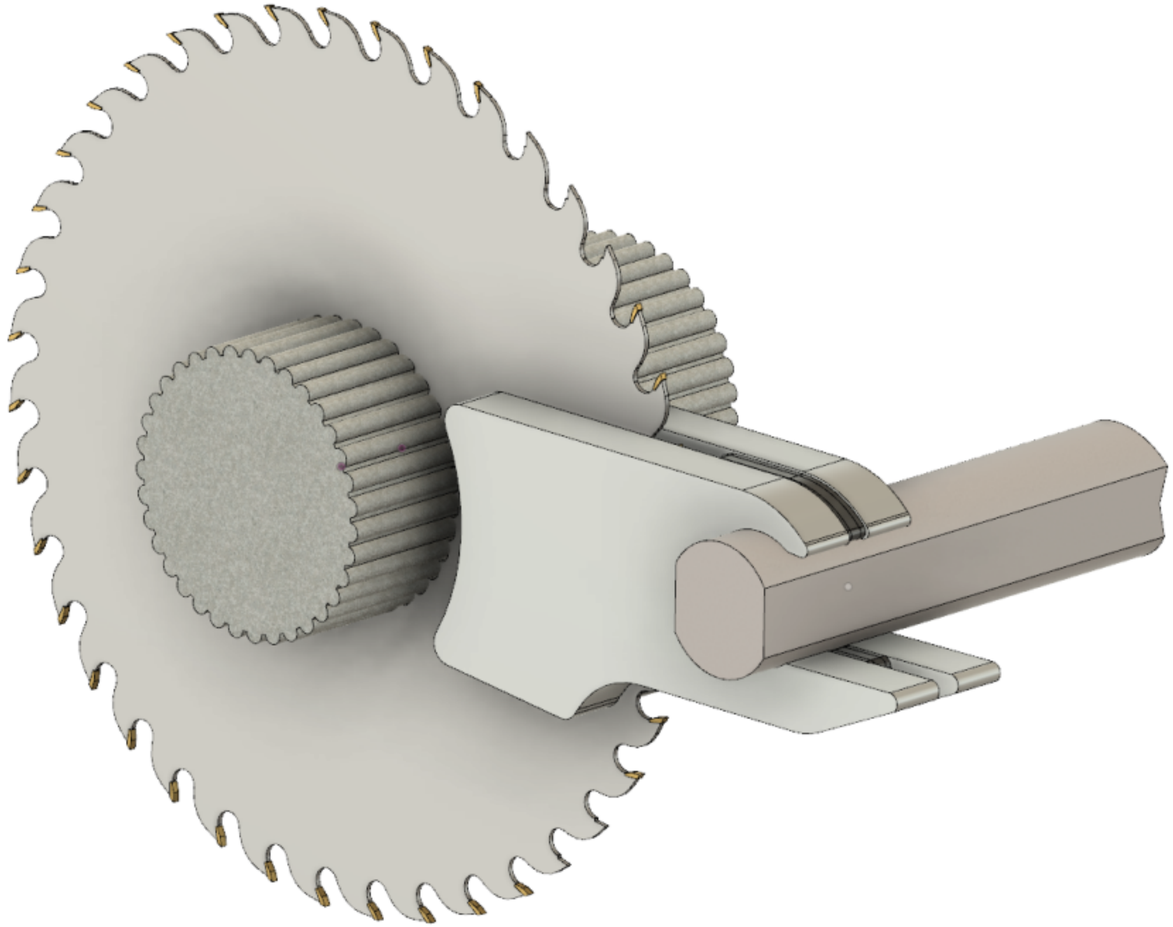
PRACTICAL LIMITATIONS FOR CIRCULAR SAW MONITORS



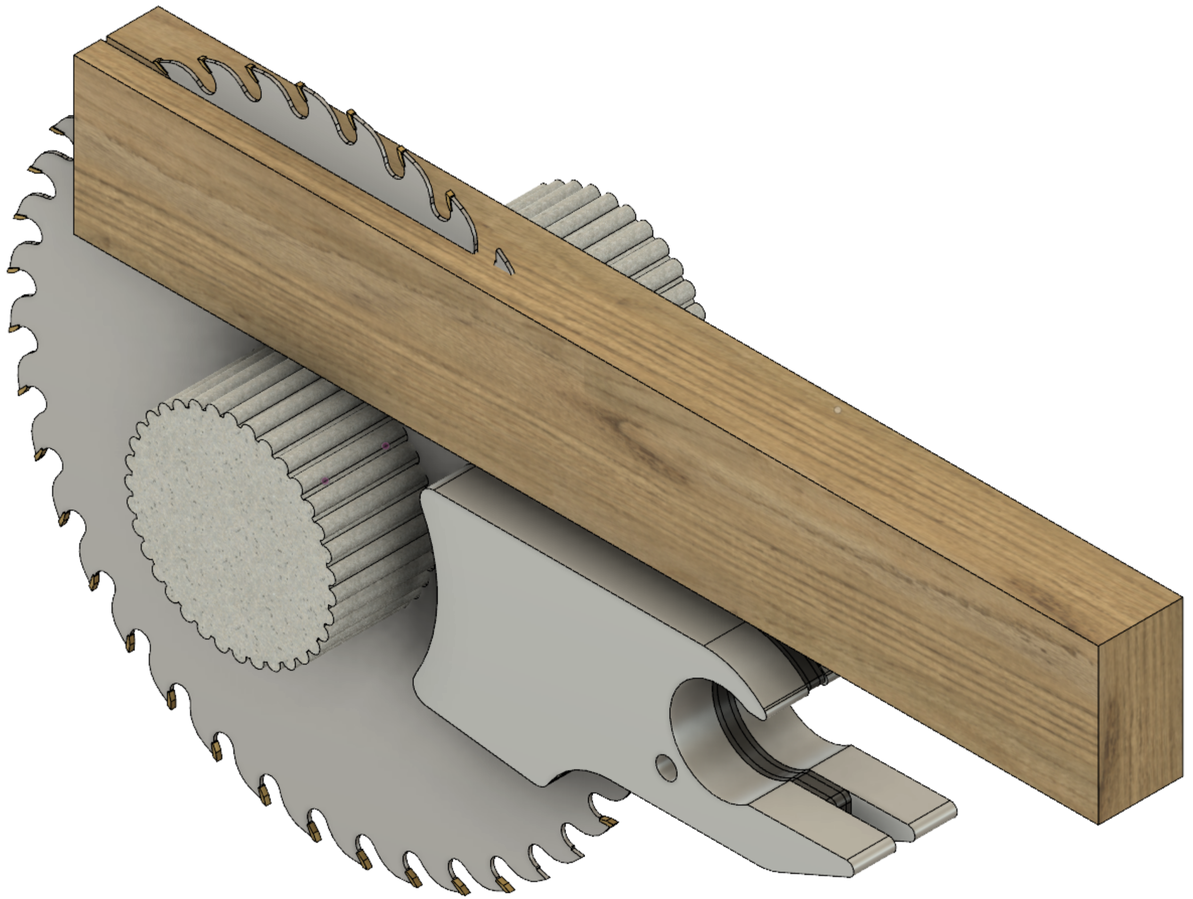
PRACTICAL LIMITATIONS FOR CIRCULAR SAW MONITORS



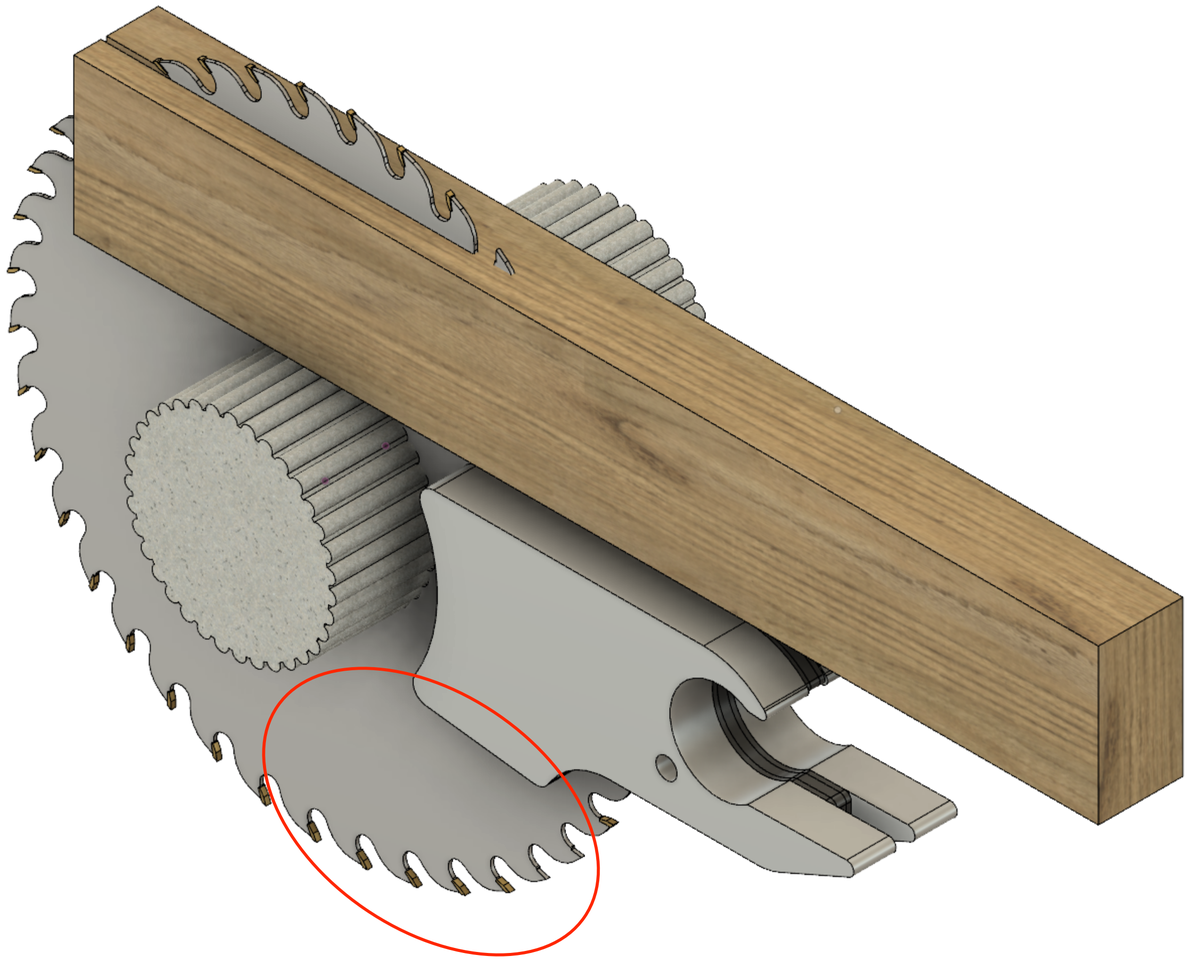
PRACTICAL LIMITATIONS FOR CIRCULAR SAW MONITORS



PRACTICAL LIMITATIONS FOR CIRCULAR SAW MONITORS

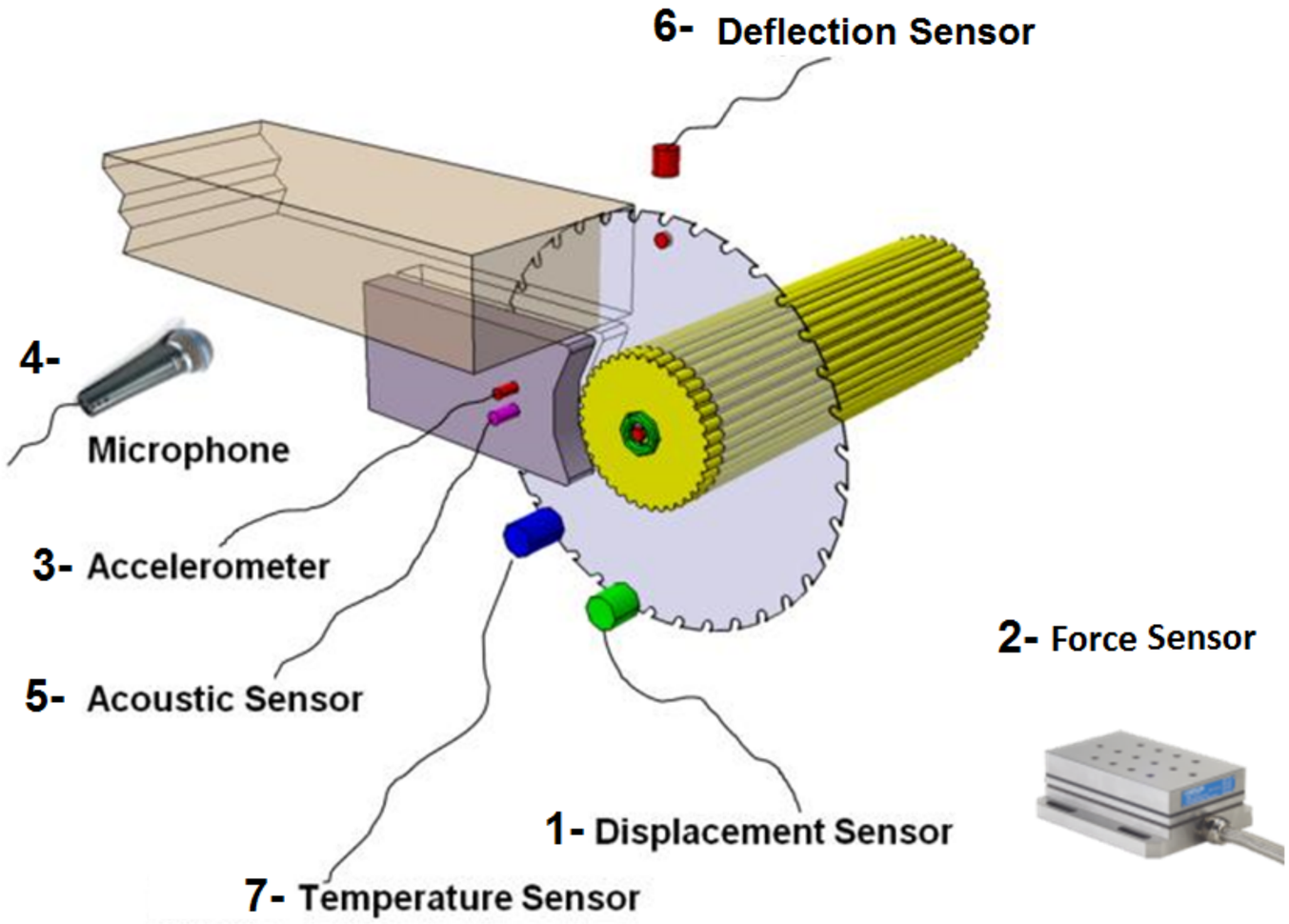


PRACTICAL LIMITATIONS FOR CIRCULAR SAW MONITORS

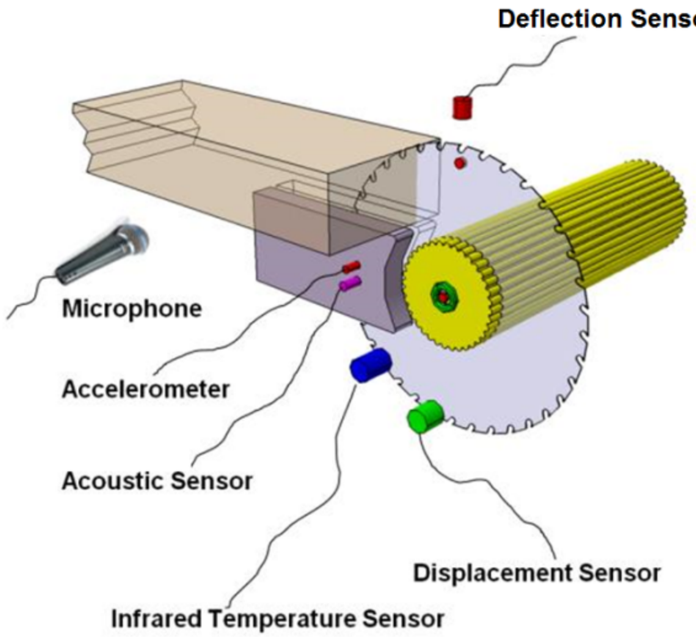


Safe area for placing a sensor

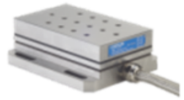
CHOICE OF SENSORS

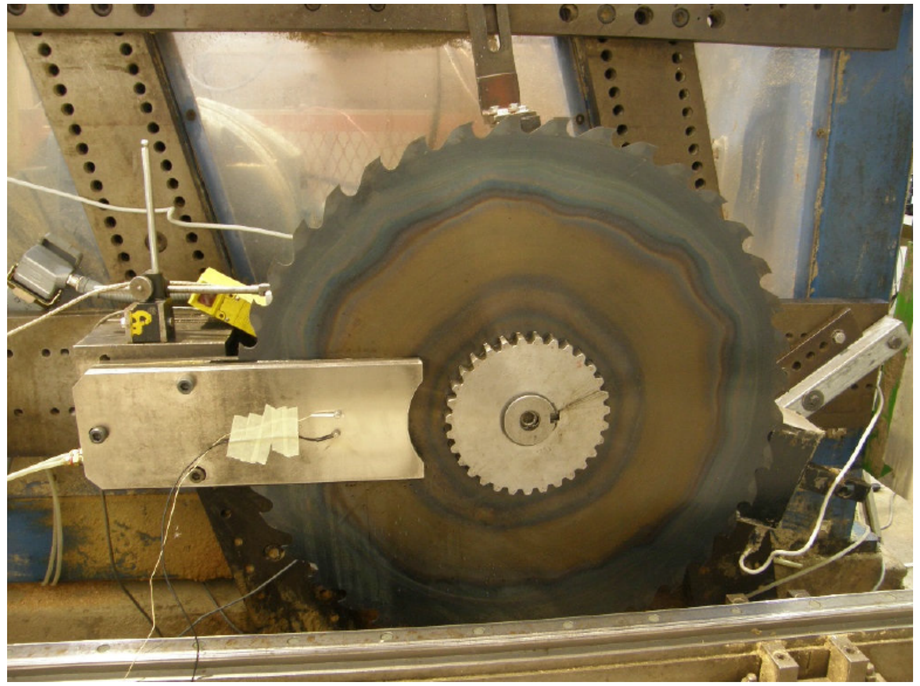


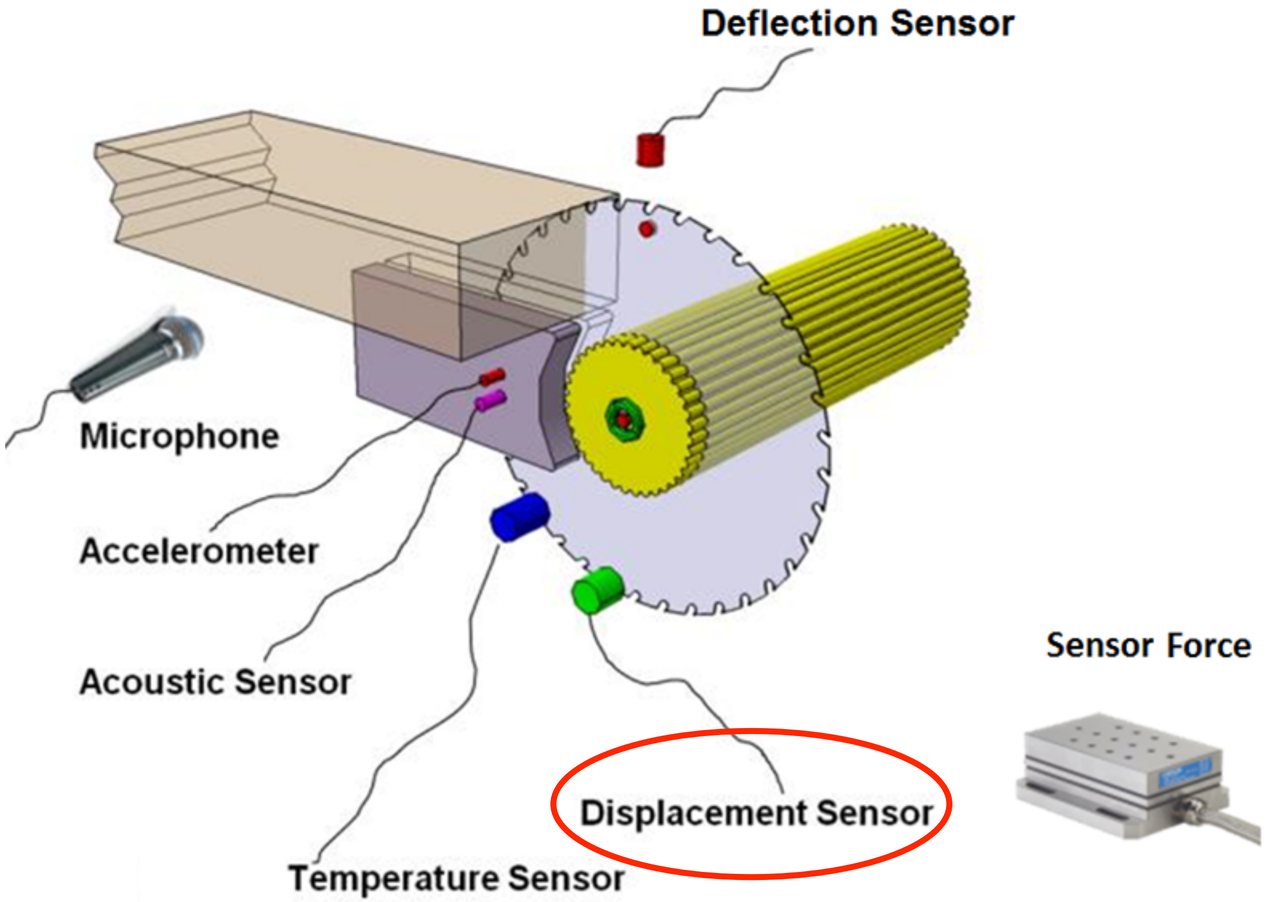
EXPERIMENTAL SETUP



Dynamometer (Force Sensor) Placed between the guide arm and machine frame.

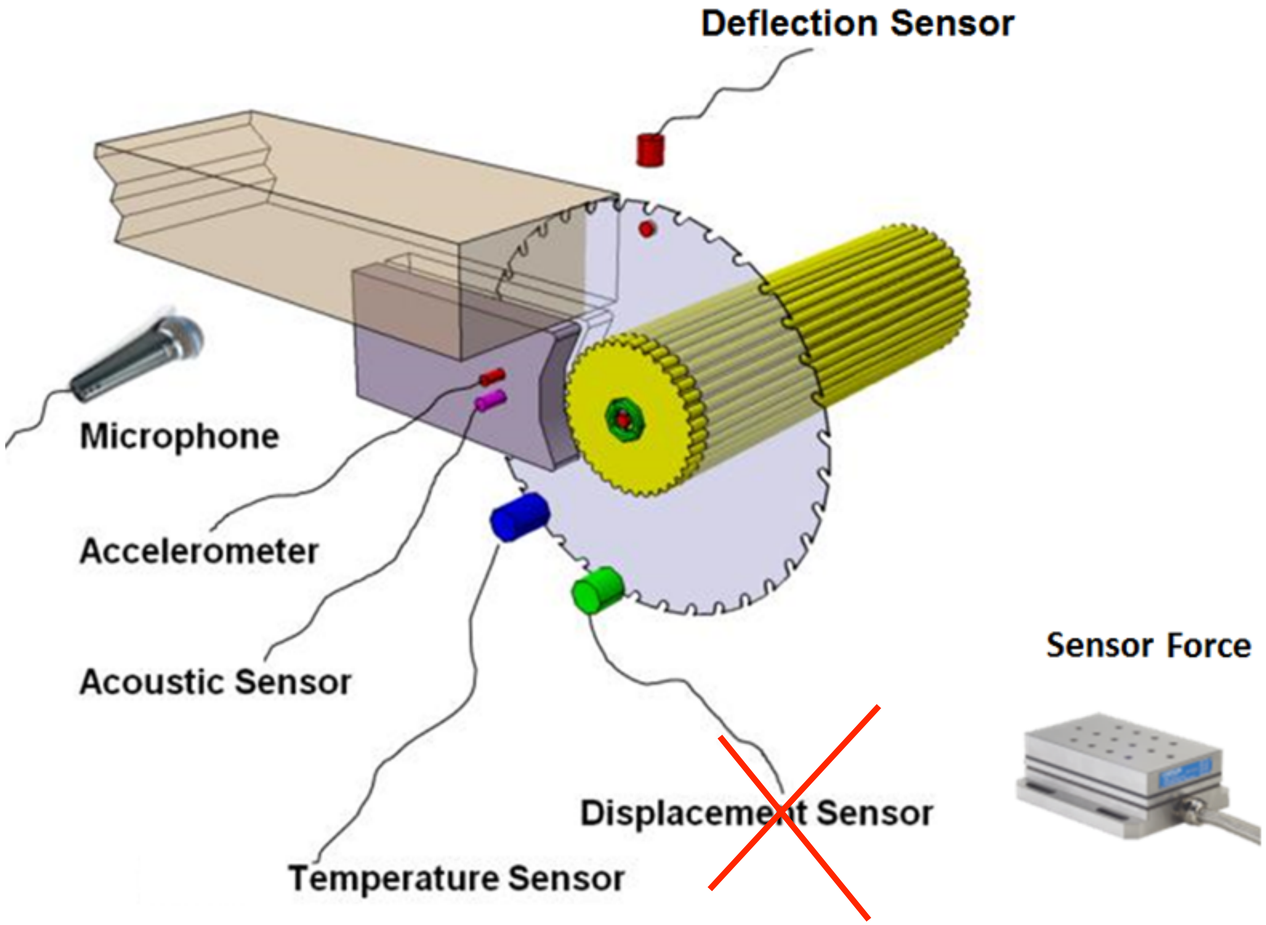


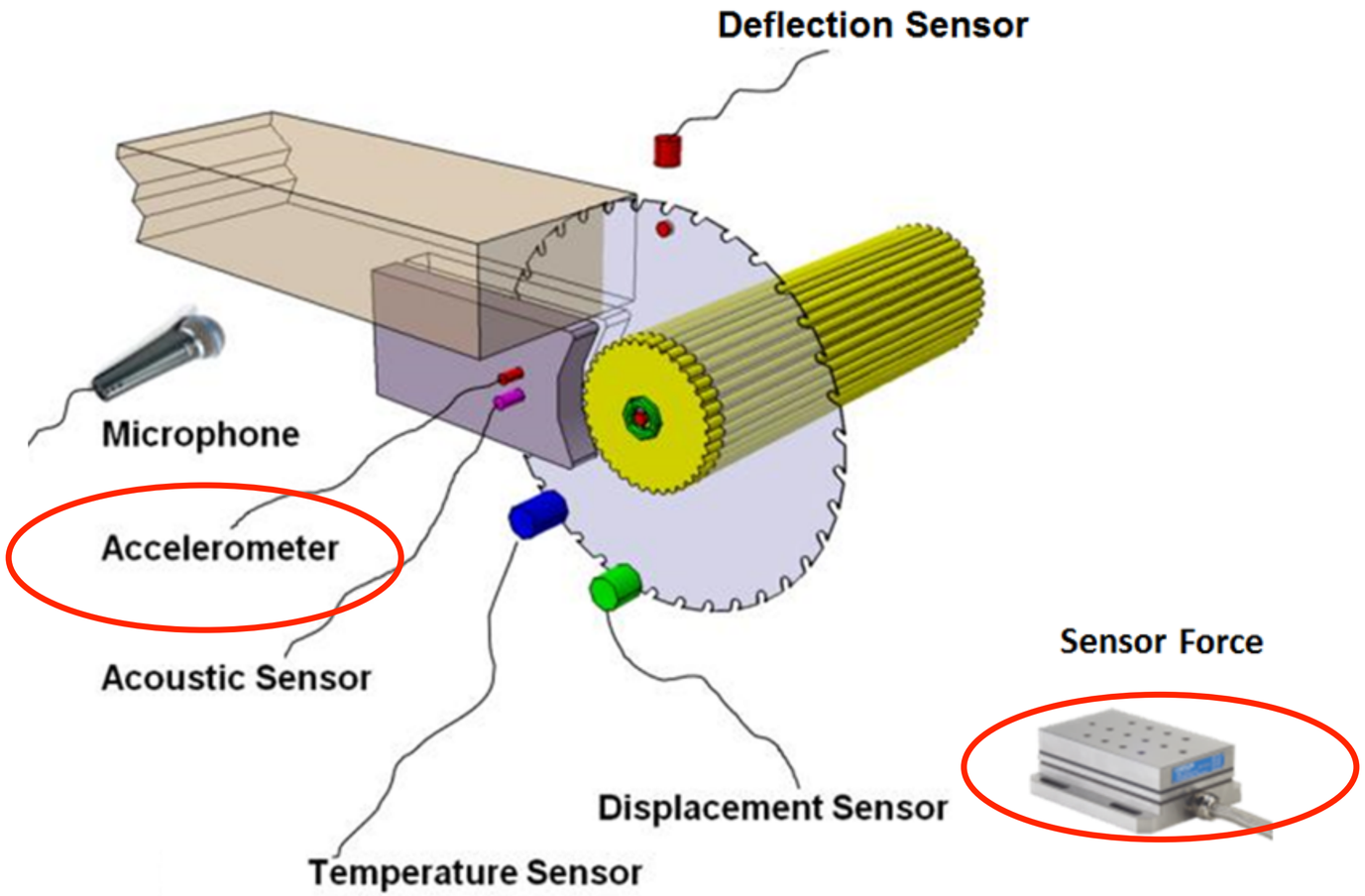




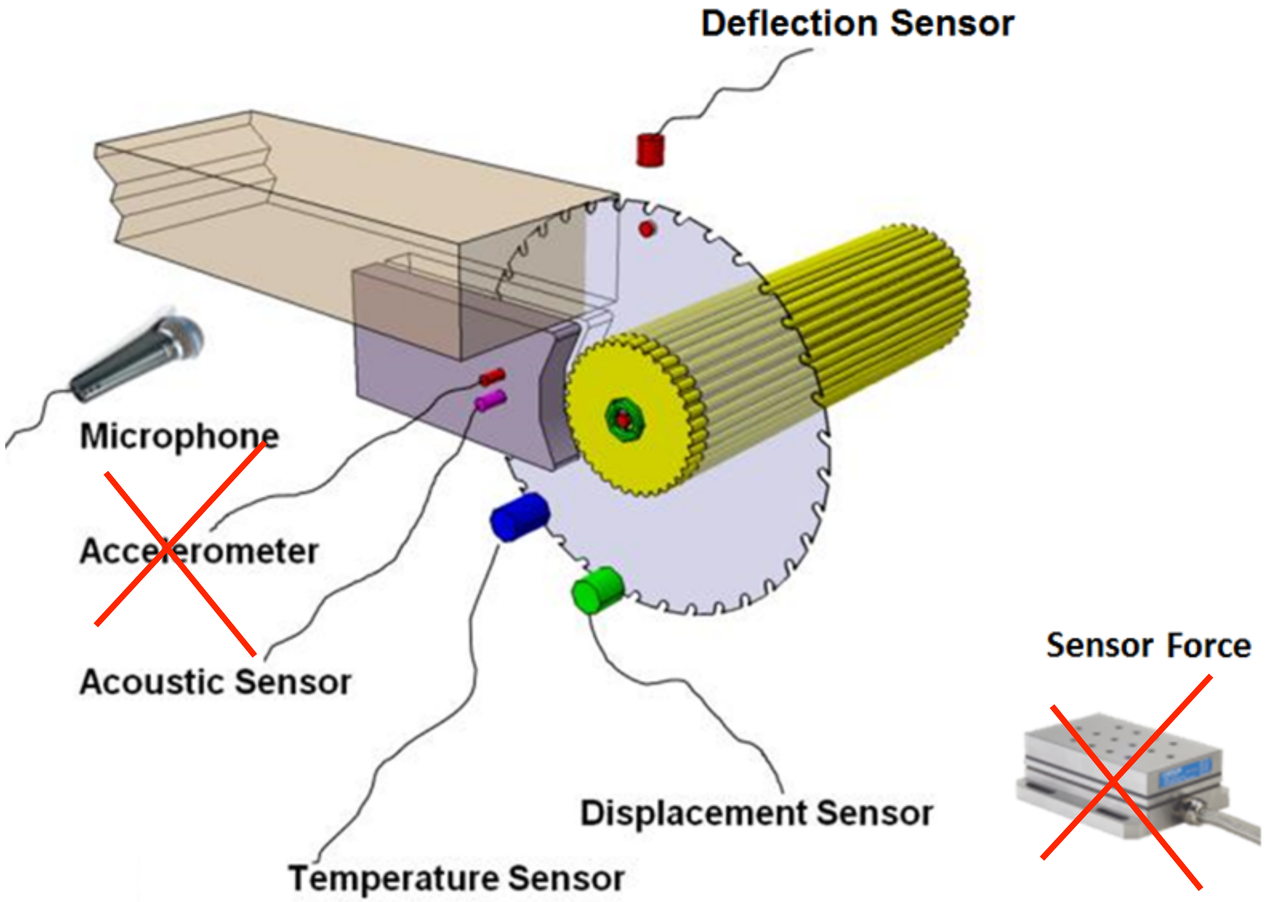
Sensor Force

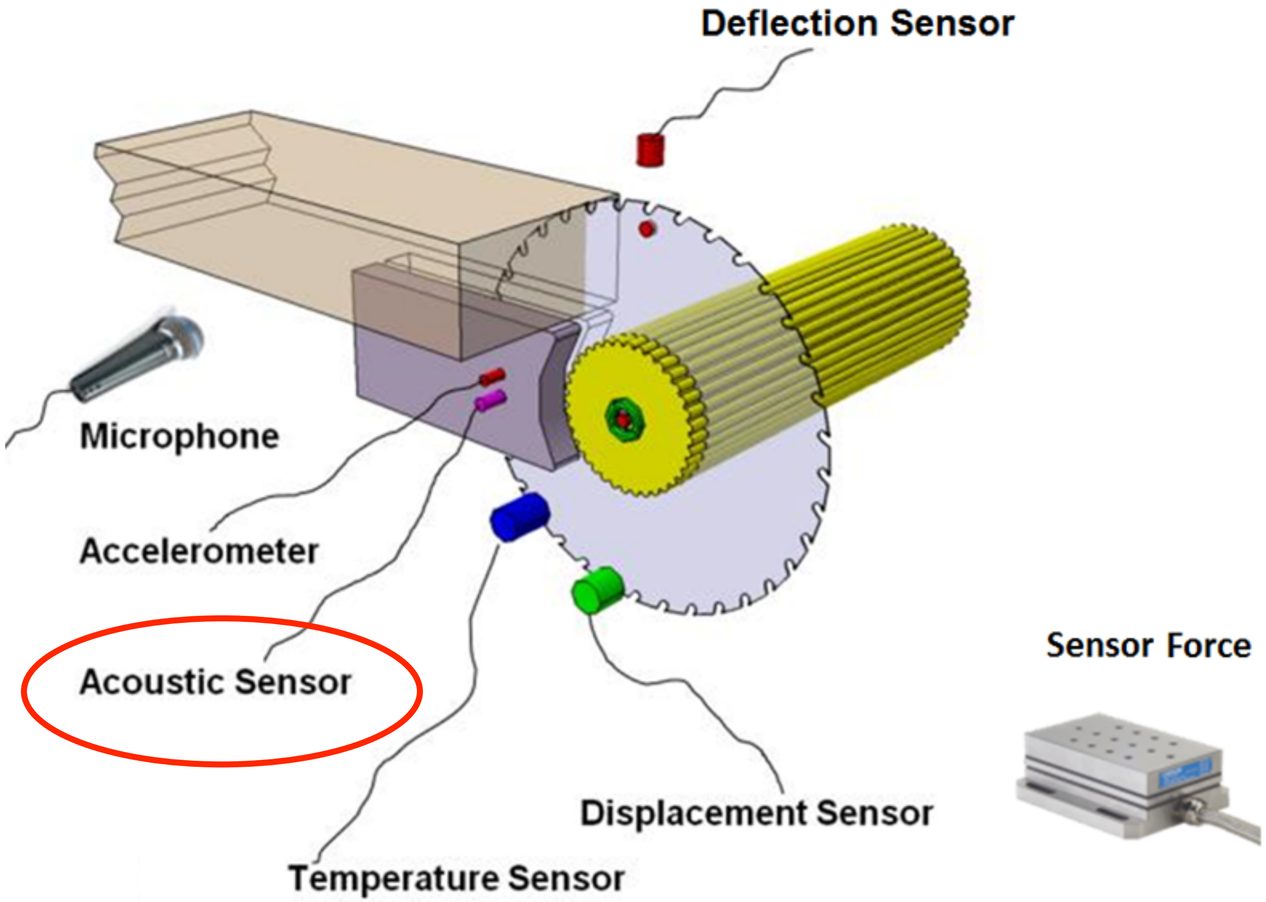
SAW DEFLECTION BELOW THE GUIDE DOES NOT CORRELATE TO WHAT IS HAPPENING IN THE CUT ZONE.




Deflection Sensor
Microphone
Accelerometer
Acoustic Sensor
Temperature Sensor
Displacement Sensor
Sensor Force

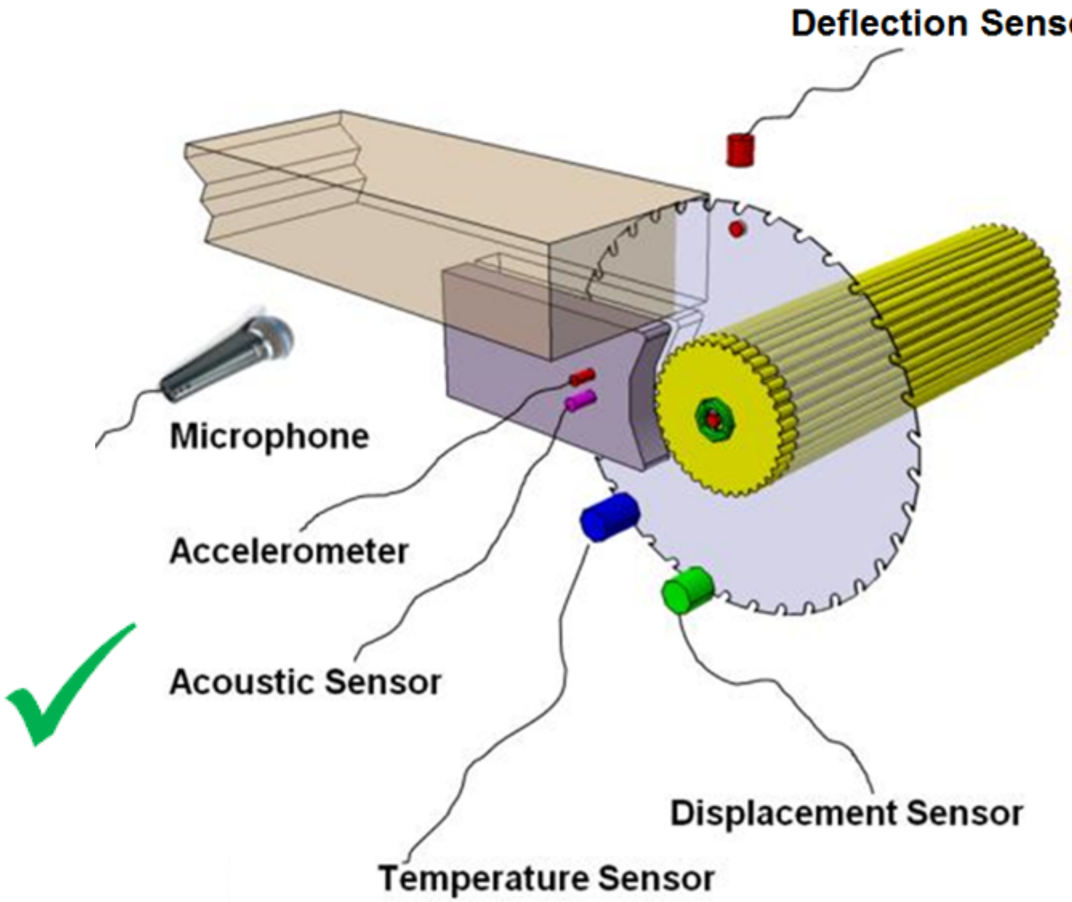
FORCE AND VIBRATION SIGNALS ARE TOO NOISY TO INDICATE SAW DEFLECTION.



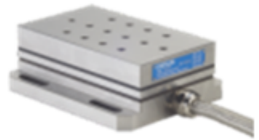


Sensor Force

LAB TESTS INDICATED THAT THERE IS A CORRELATION BETWEEN CUT DEVIATION AND AE SIGNAL.



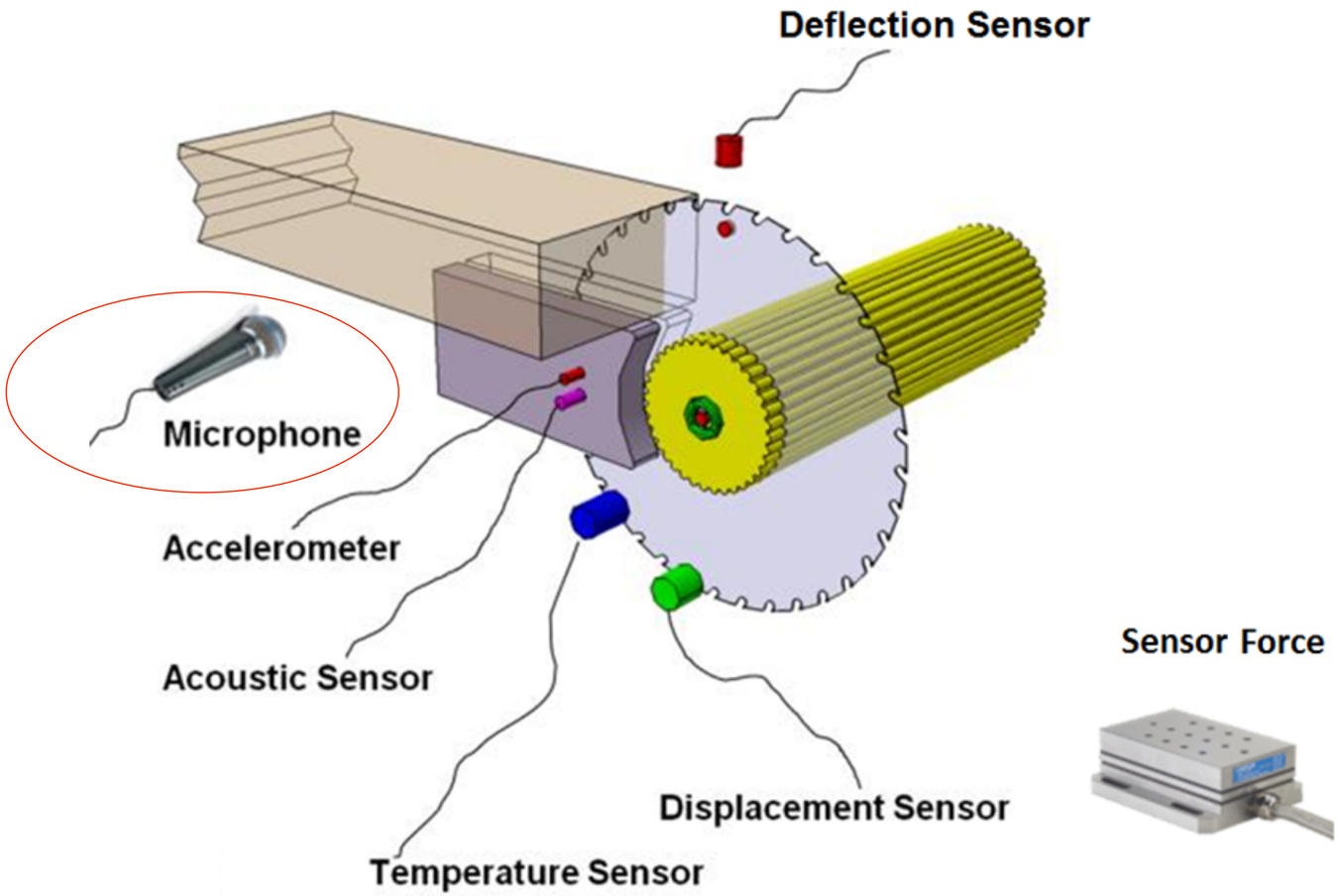
Sensor Force



SAWMILL TEST CONFIRMED AE IS NOT SUITABLE FOR THIS APPLICATION.

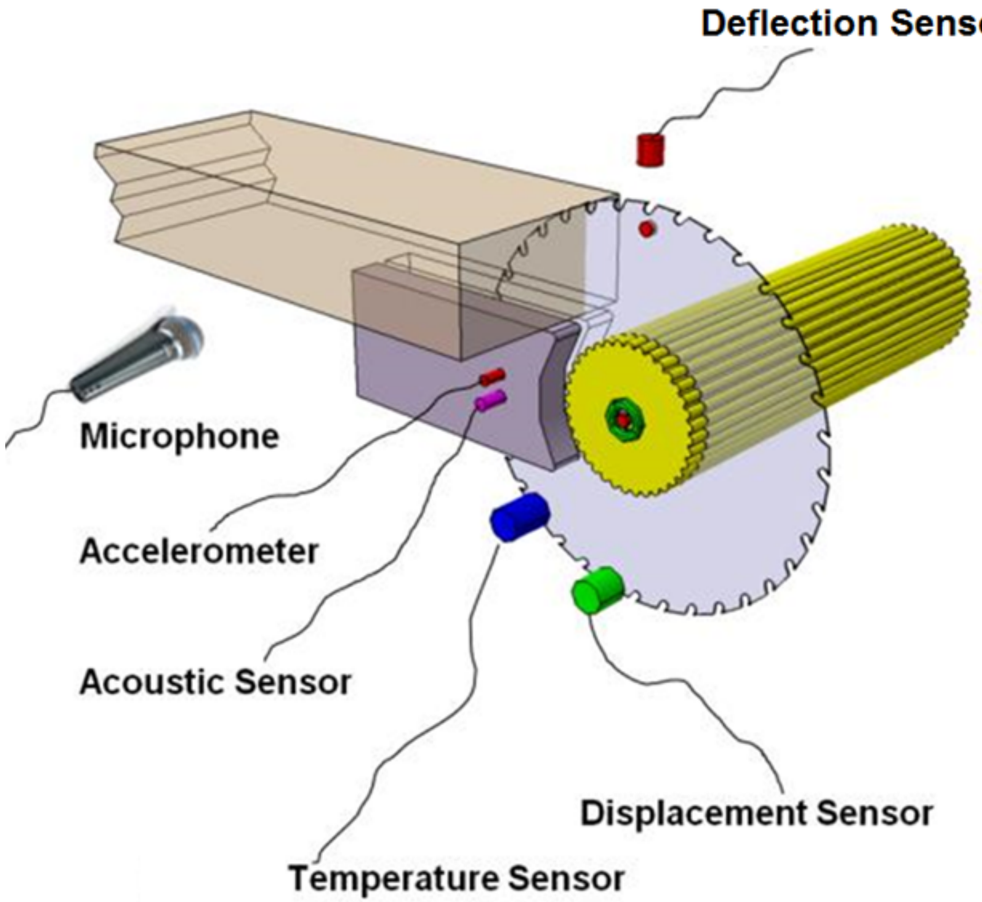
Signal by AE can be affected by:

- Multiple saws work together
- Other mechanisms working simultaneously

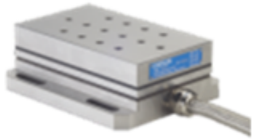

Deflection Sensor
Microphone
Accelerometer
Acoustic Sensor
Temperature Sensor
Displacement Sensor
Sensor Force

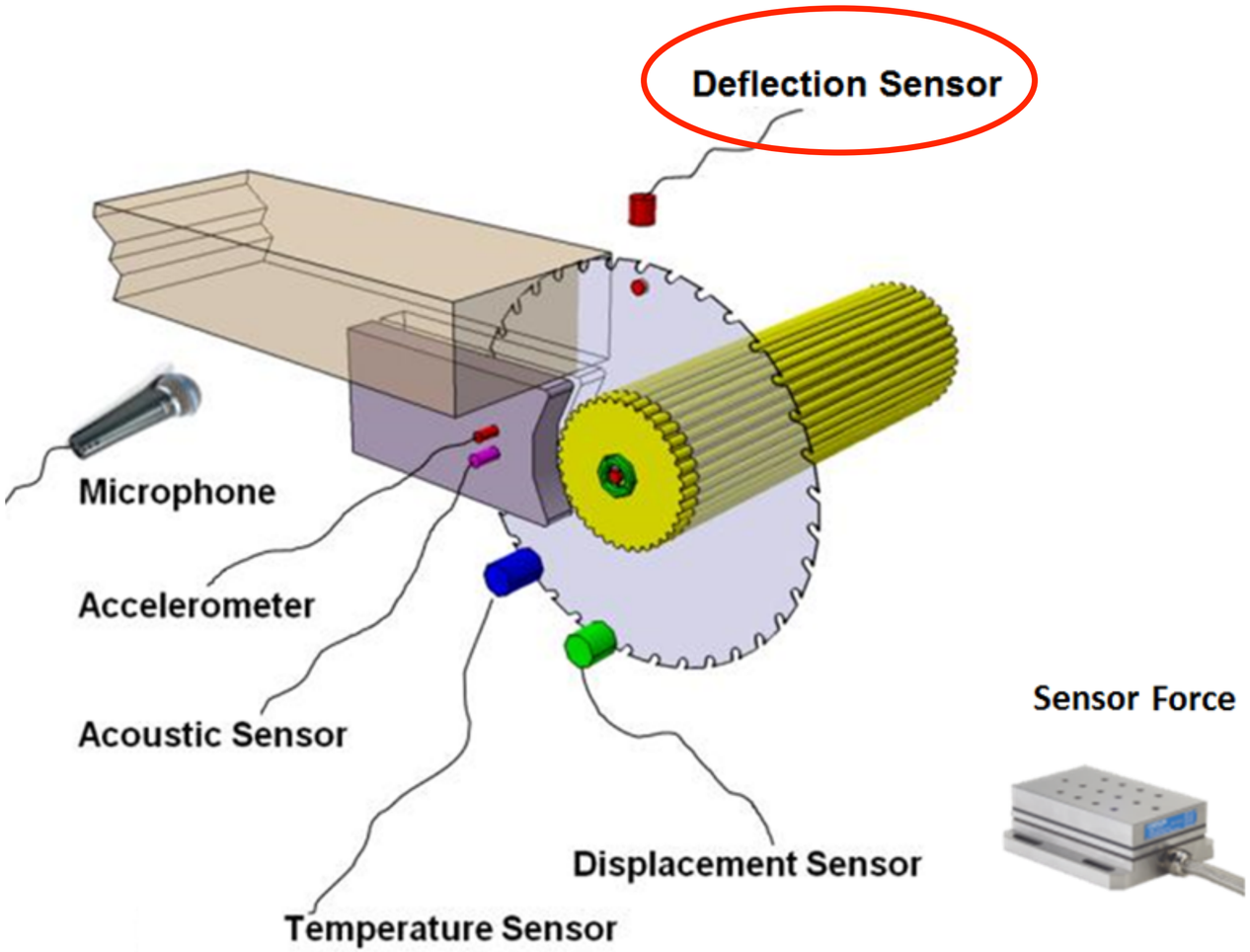
NO DIRECT CORRELATION WITH CUT DEVIATION, BUT MACHINE LEARNING TECHNIQUE CAN BE USED TO FIND PATTERNS BETWEEN GOOD AND BAD SAWING PERFORMANCE.

?



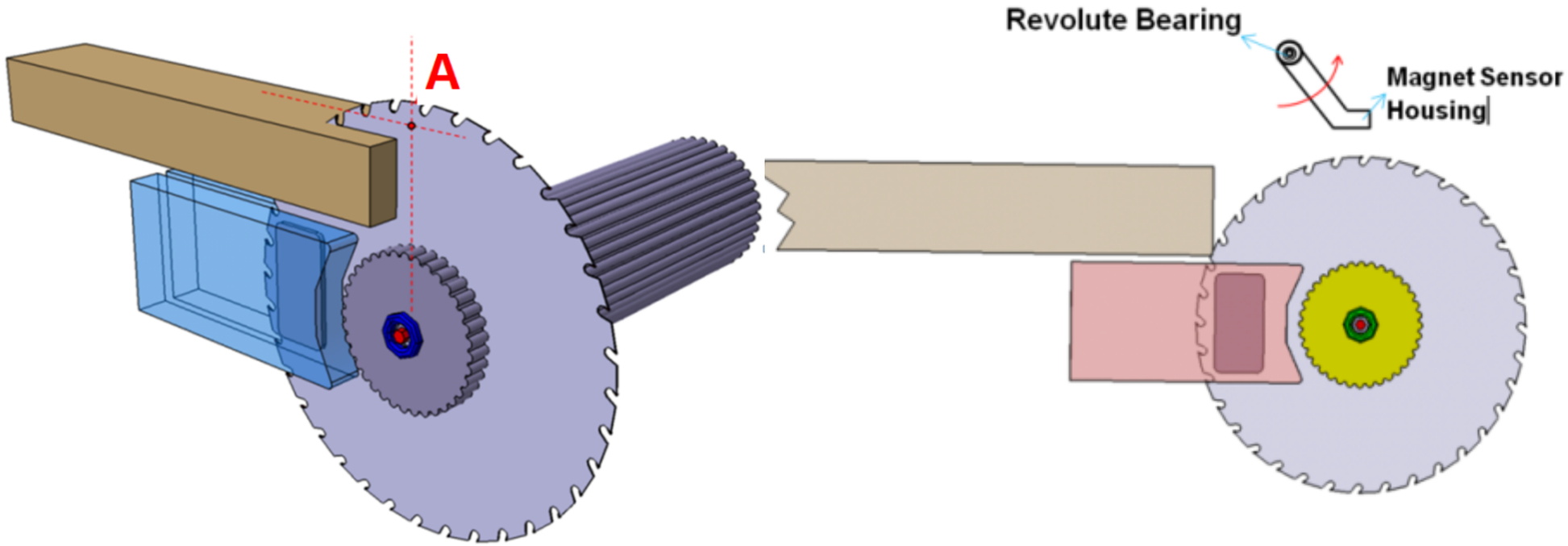
Sensor Force



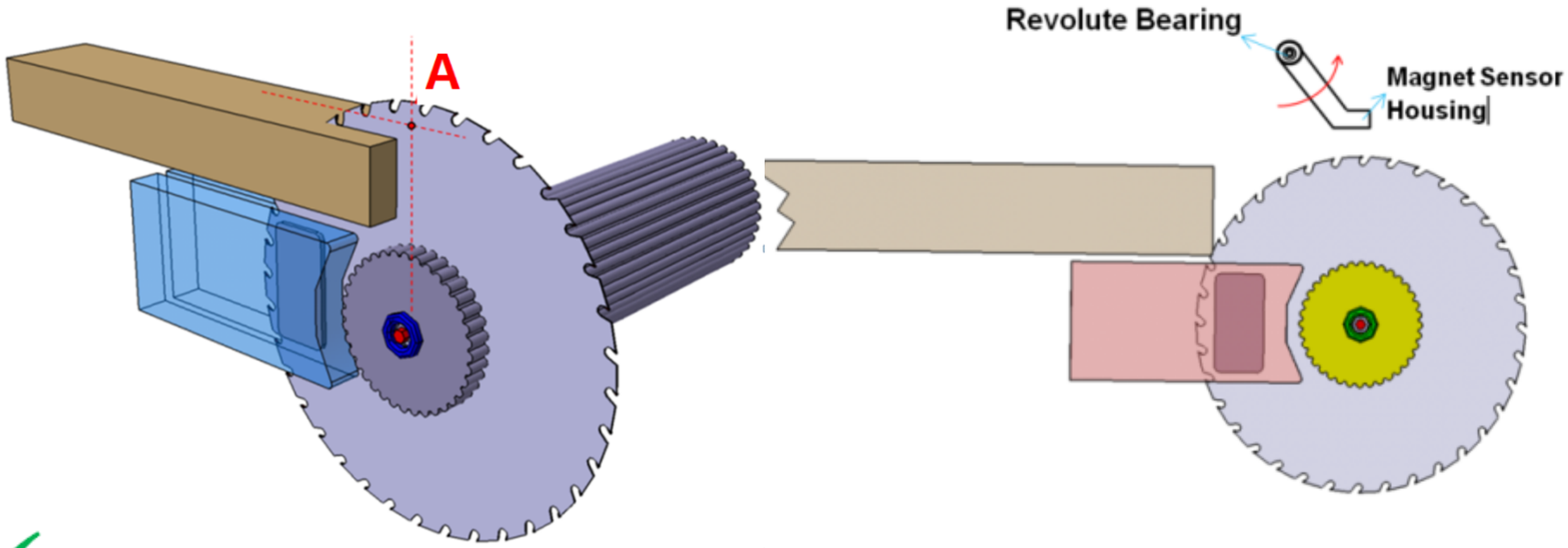


Sensor Force

DIRECT MEASUREMENT OF SAW DEFLECTION ABOVE THE CUT



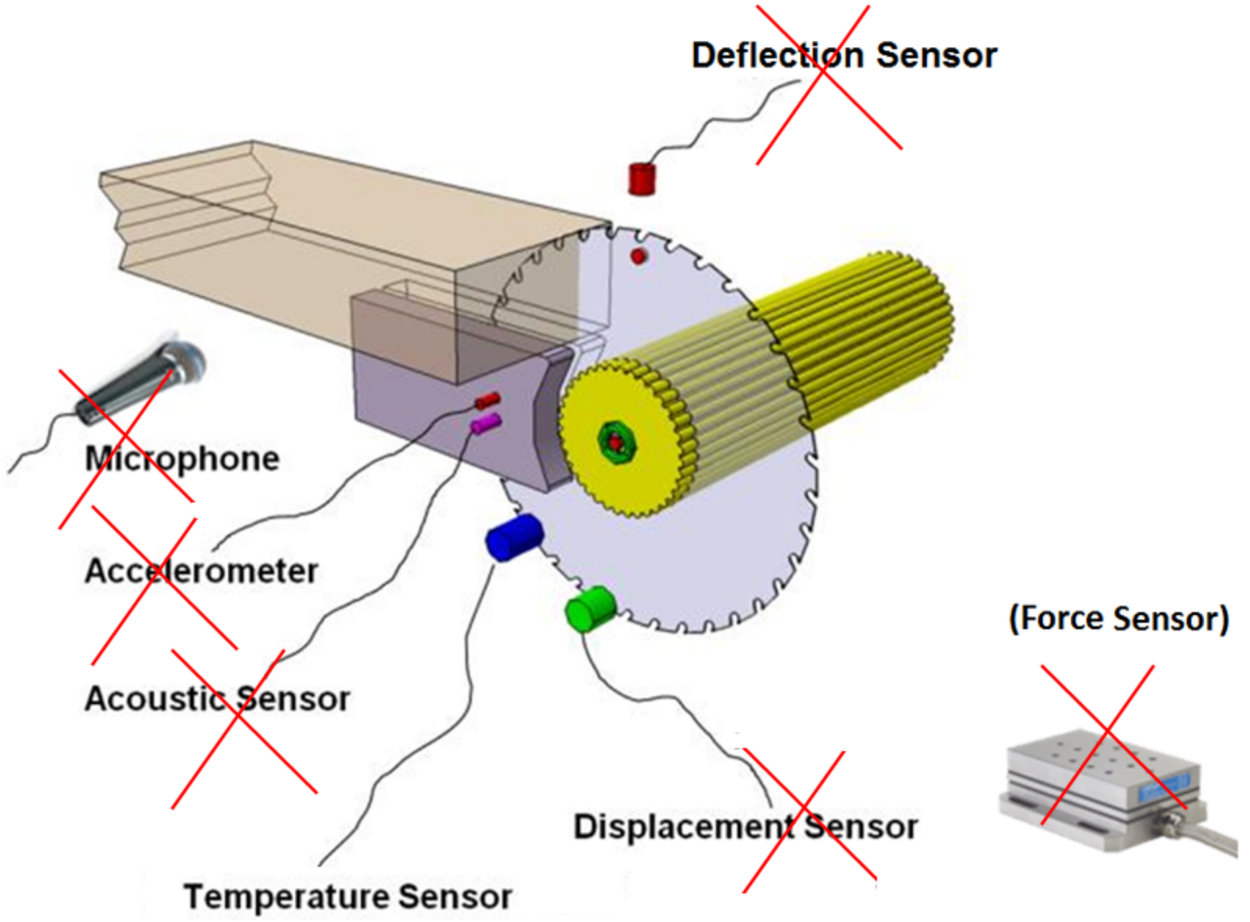
DIRECT MEASUREMENT OF SAW DEFLECTION ABOVE THE CUT



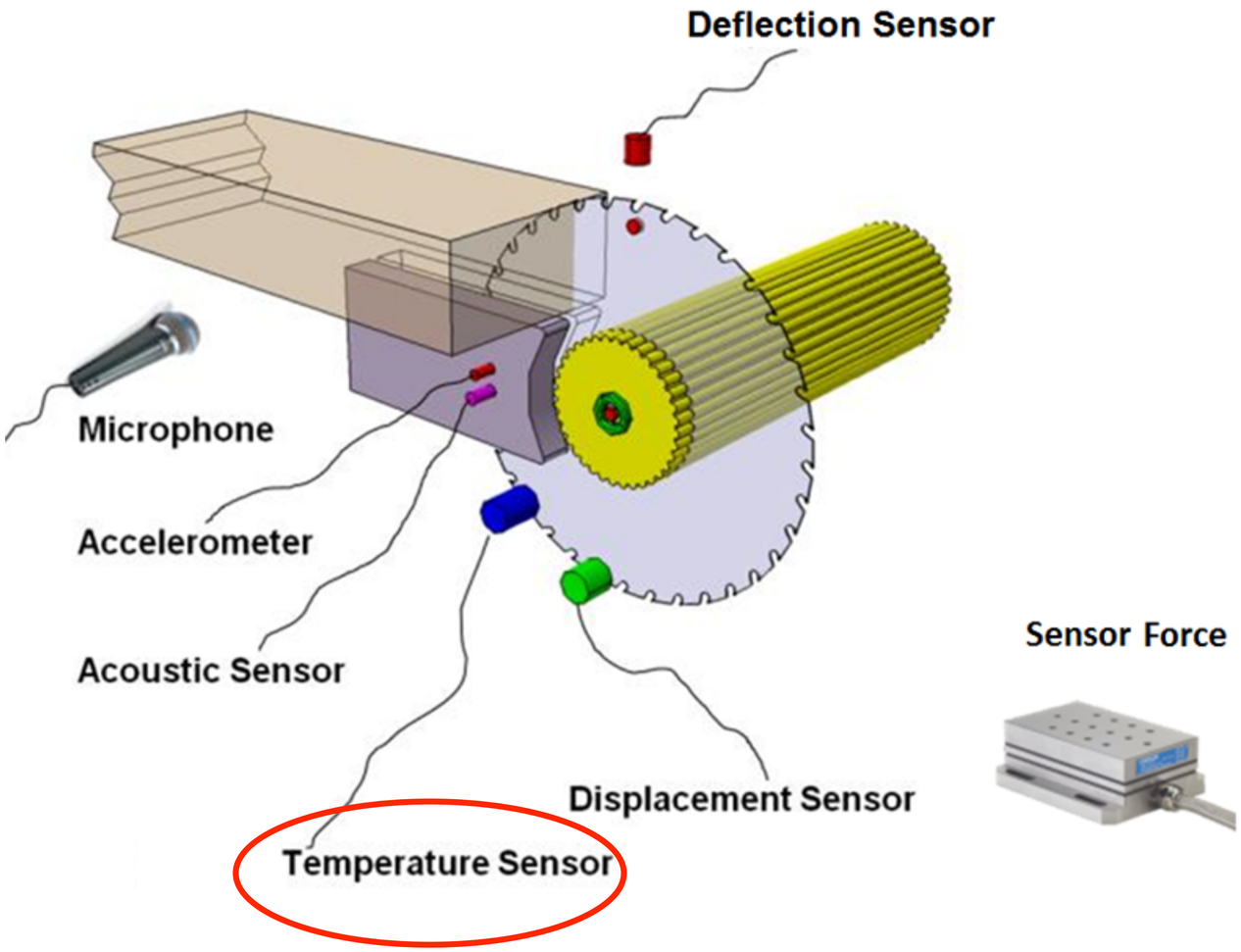
- Accurately measures saw deflection in lab tests

- Limitations: Needs to be very close to the saw

IN SUMMARY:

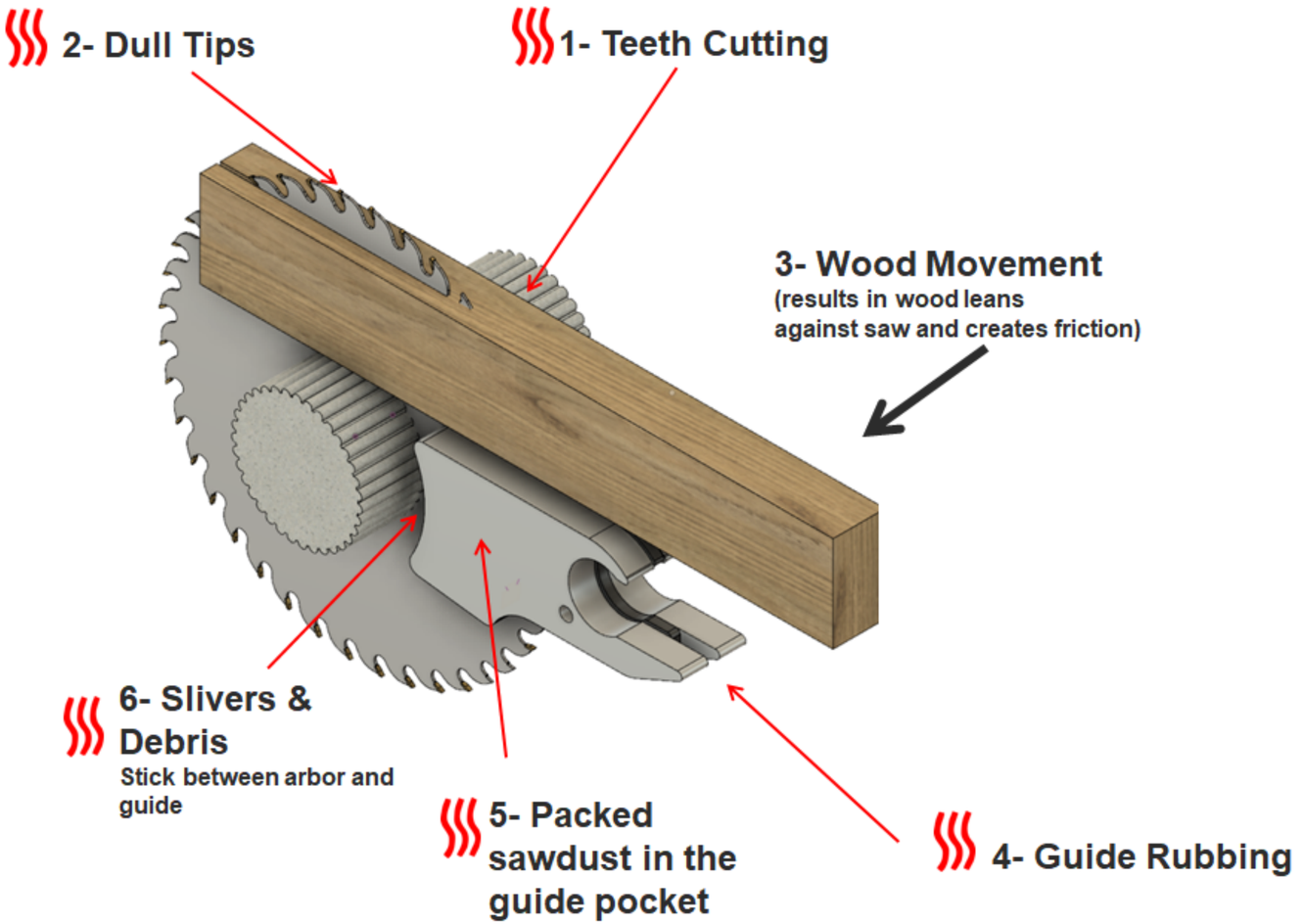

Deflection Sensor
Microphone
Accelerometer
Acoustic Sensor
Temperature Sensor
Displacement Sensor
(Force Sensor)

IN SUMMARY:

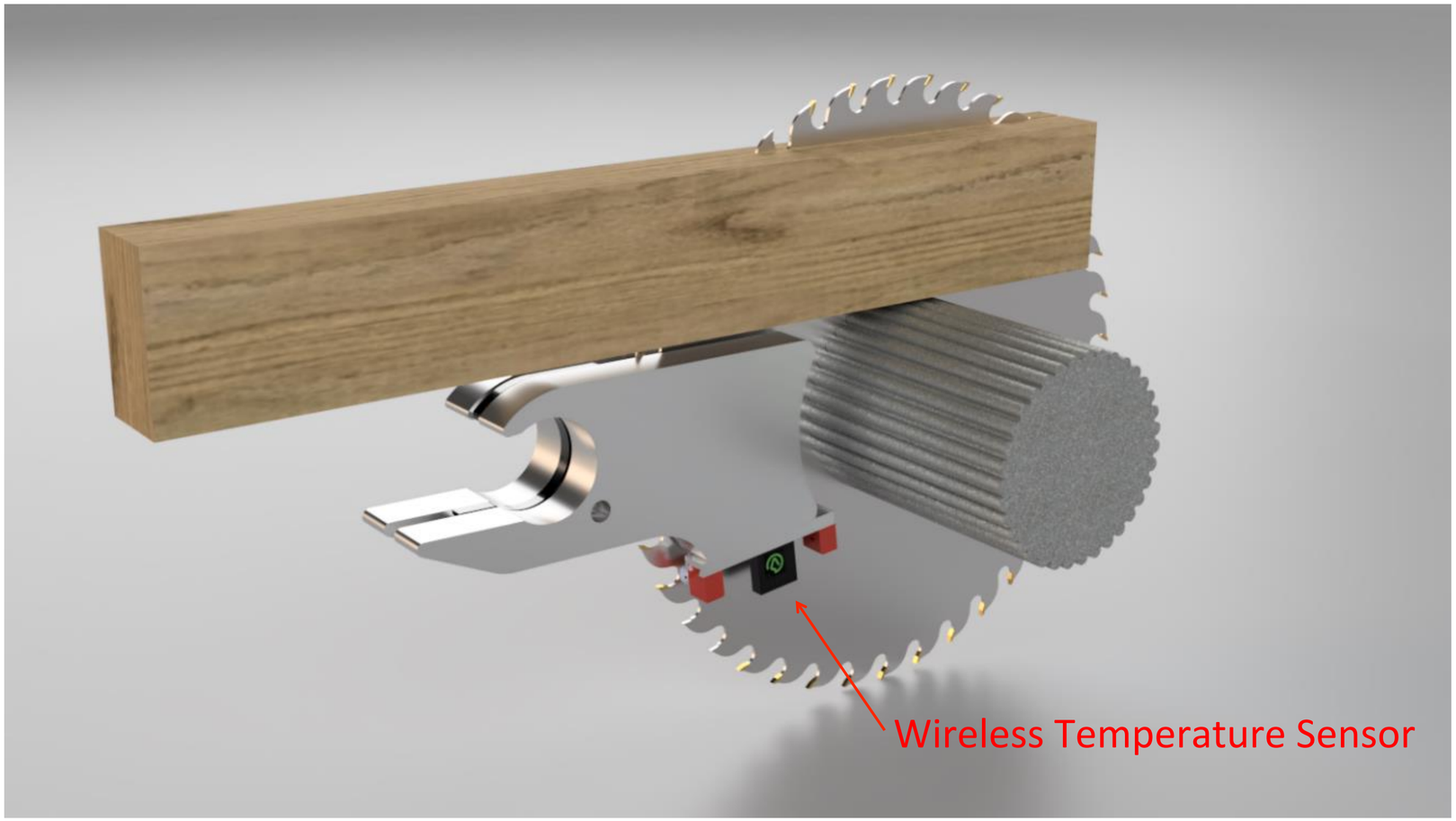


Sensor Force

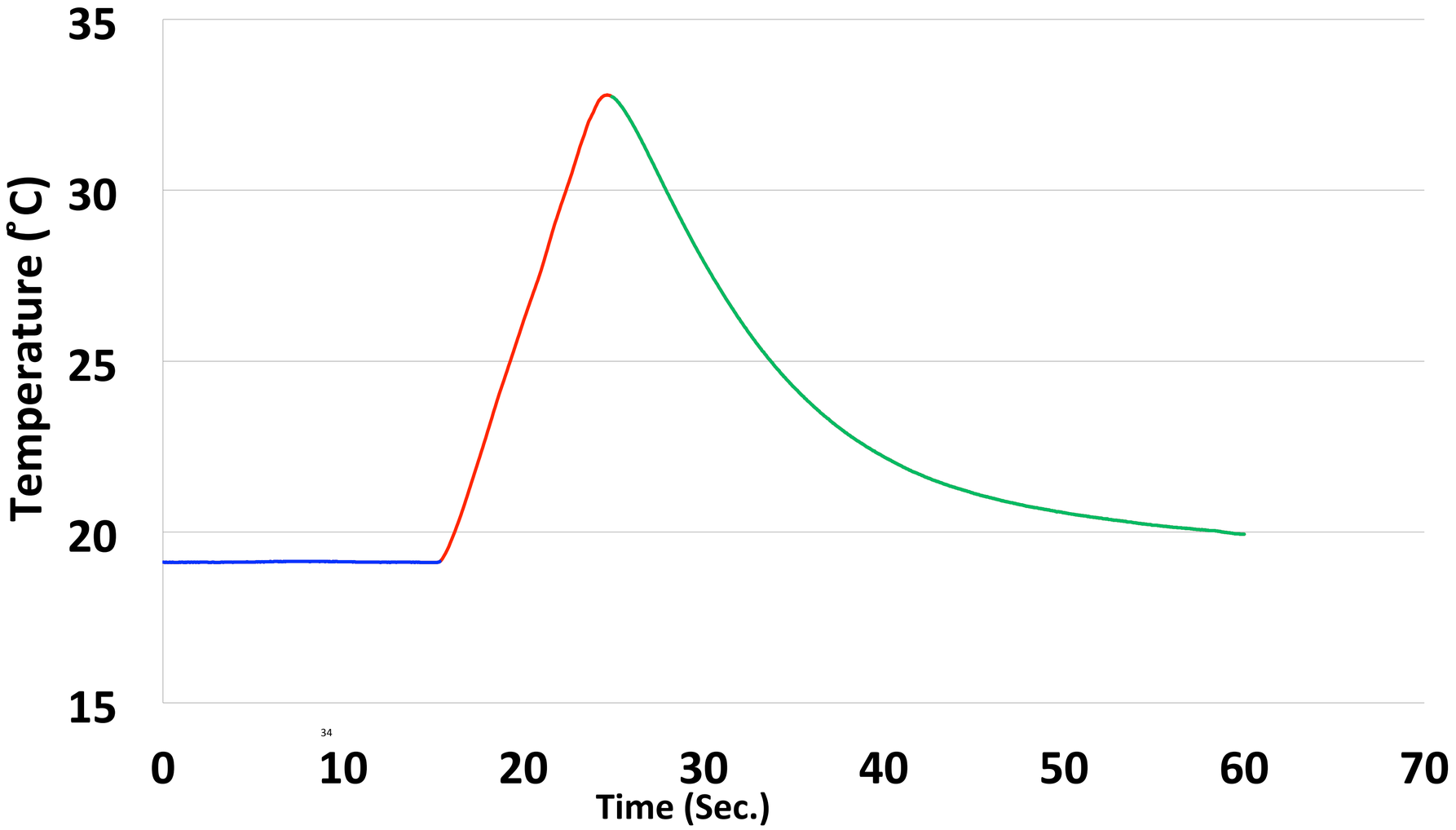
BLADE TEMPERATURE IS CRITICAL TO SAW STIFFNESS



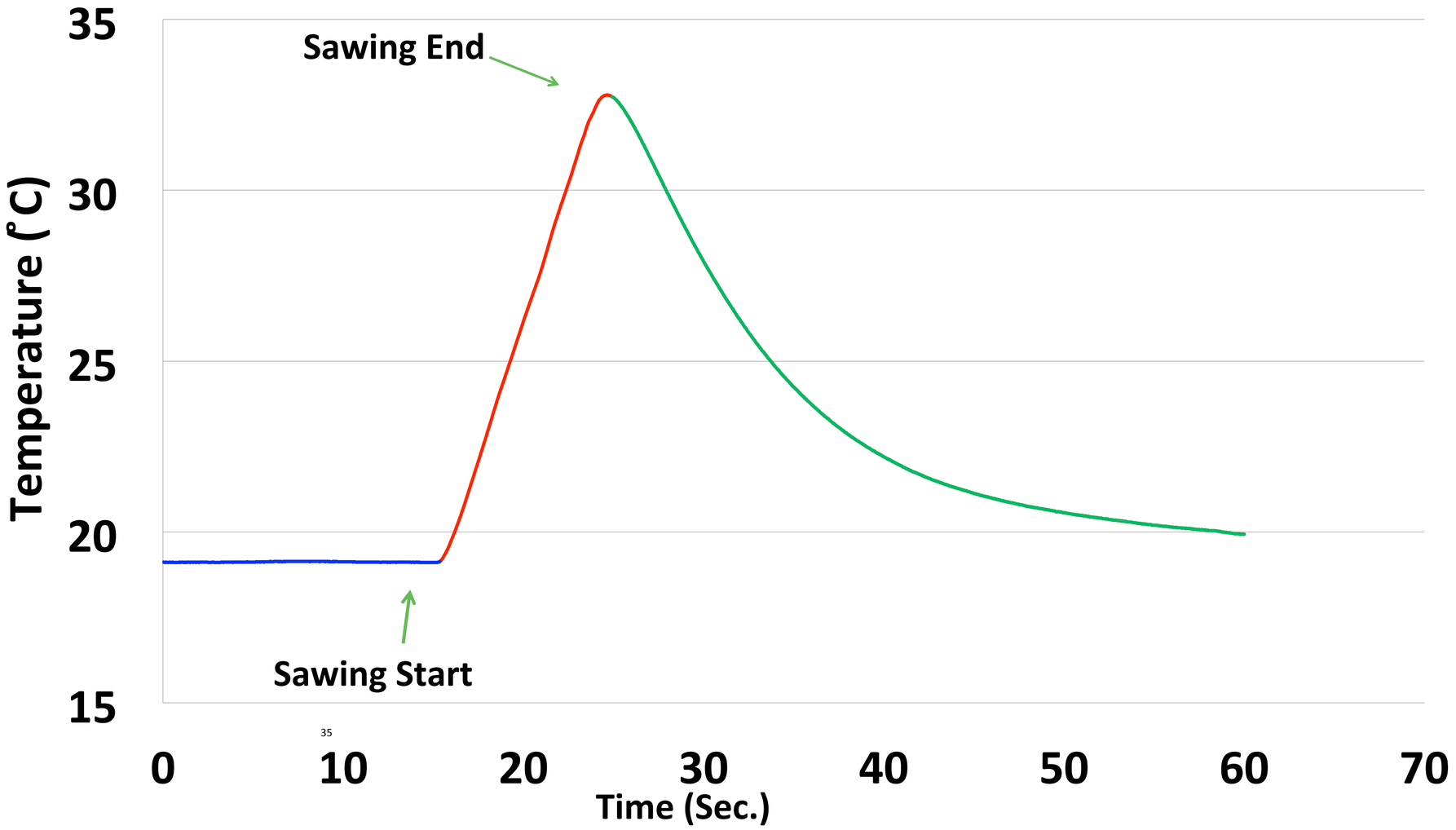
MEASURING SAW TEMPERATURE



BLADE TEMPERATURE IN A CUT



BLADE TEMPERATURE IN A CUT



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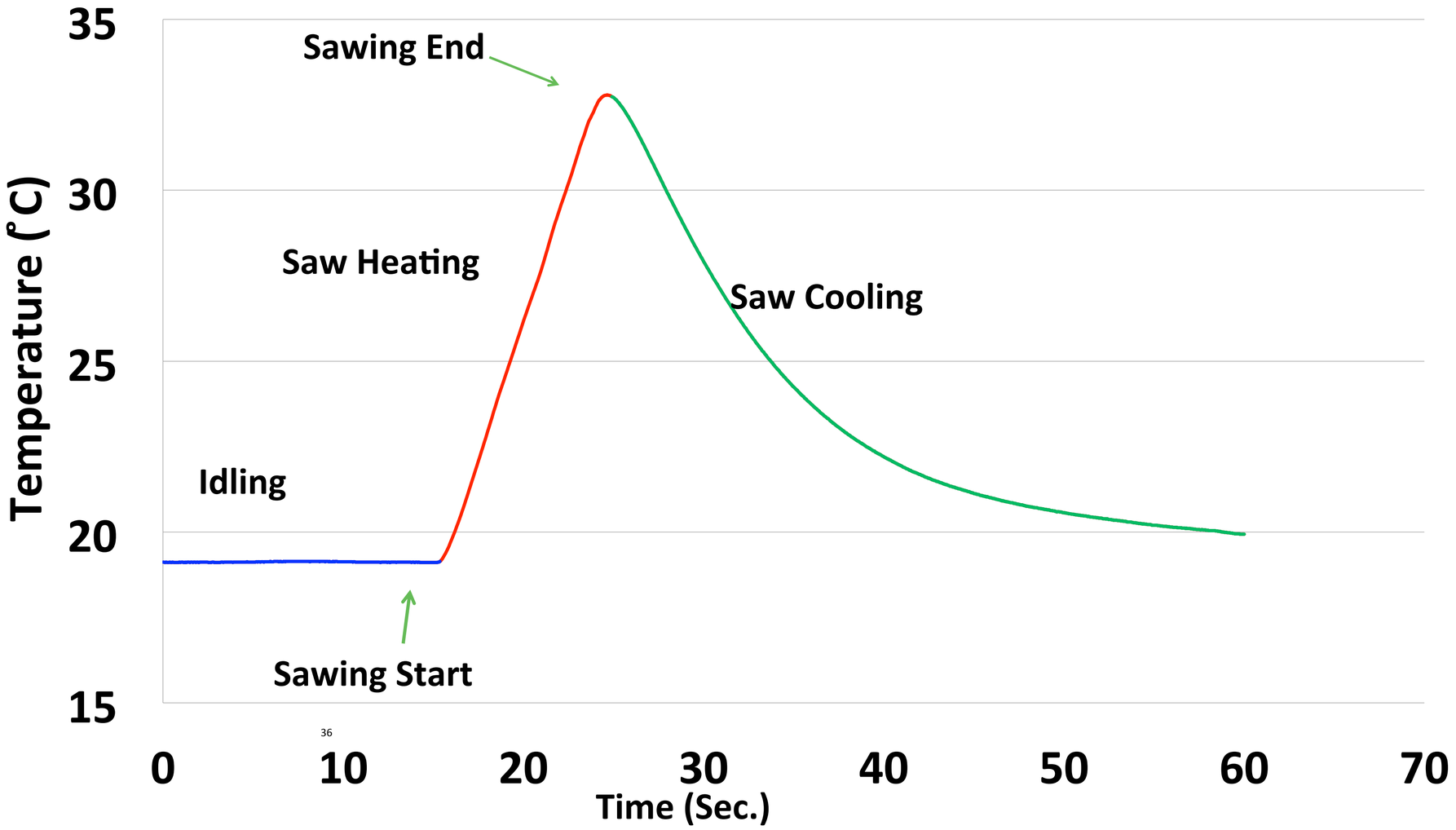
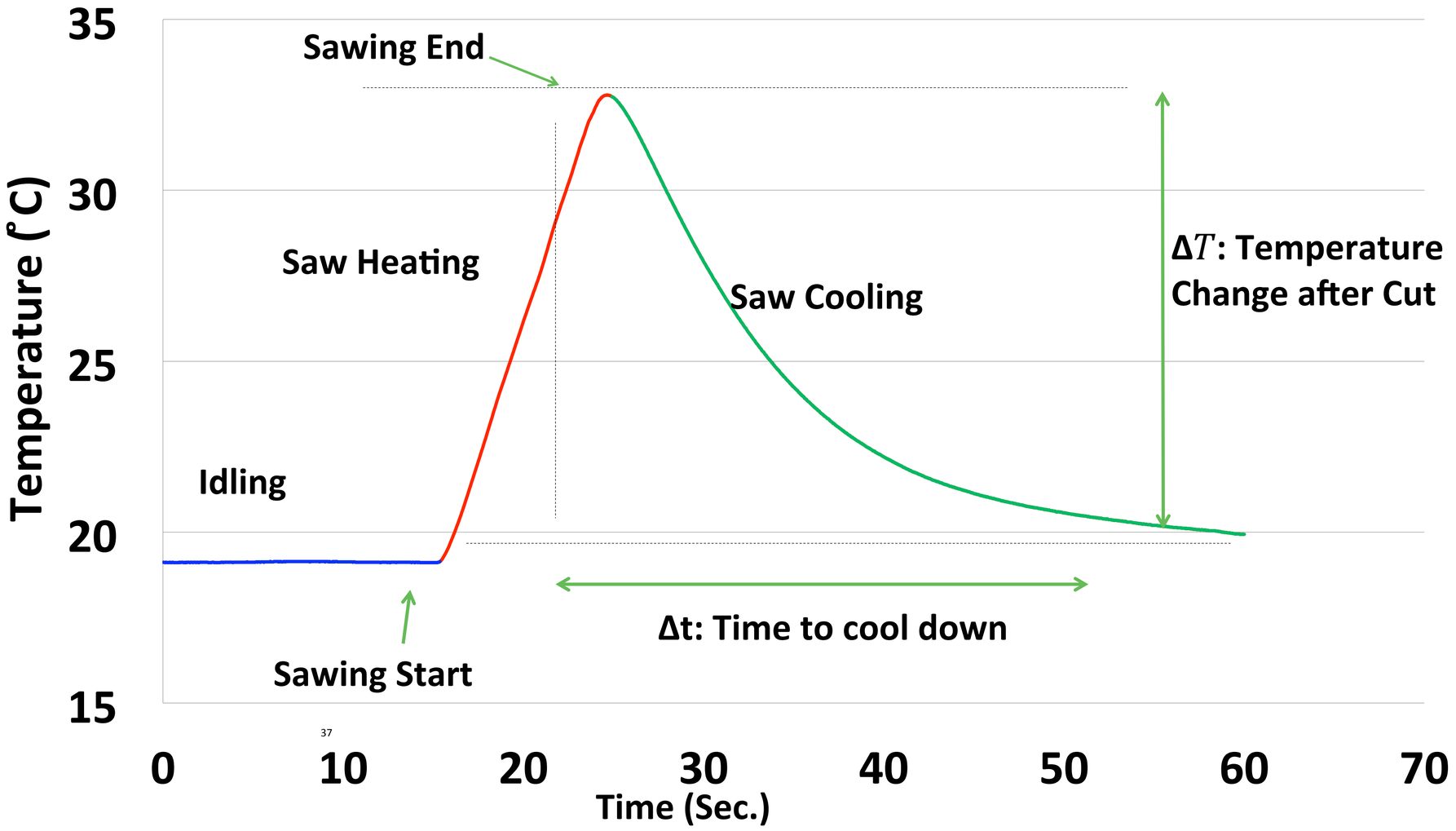
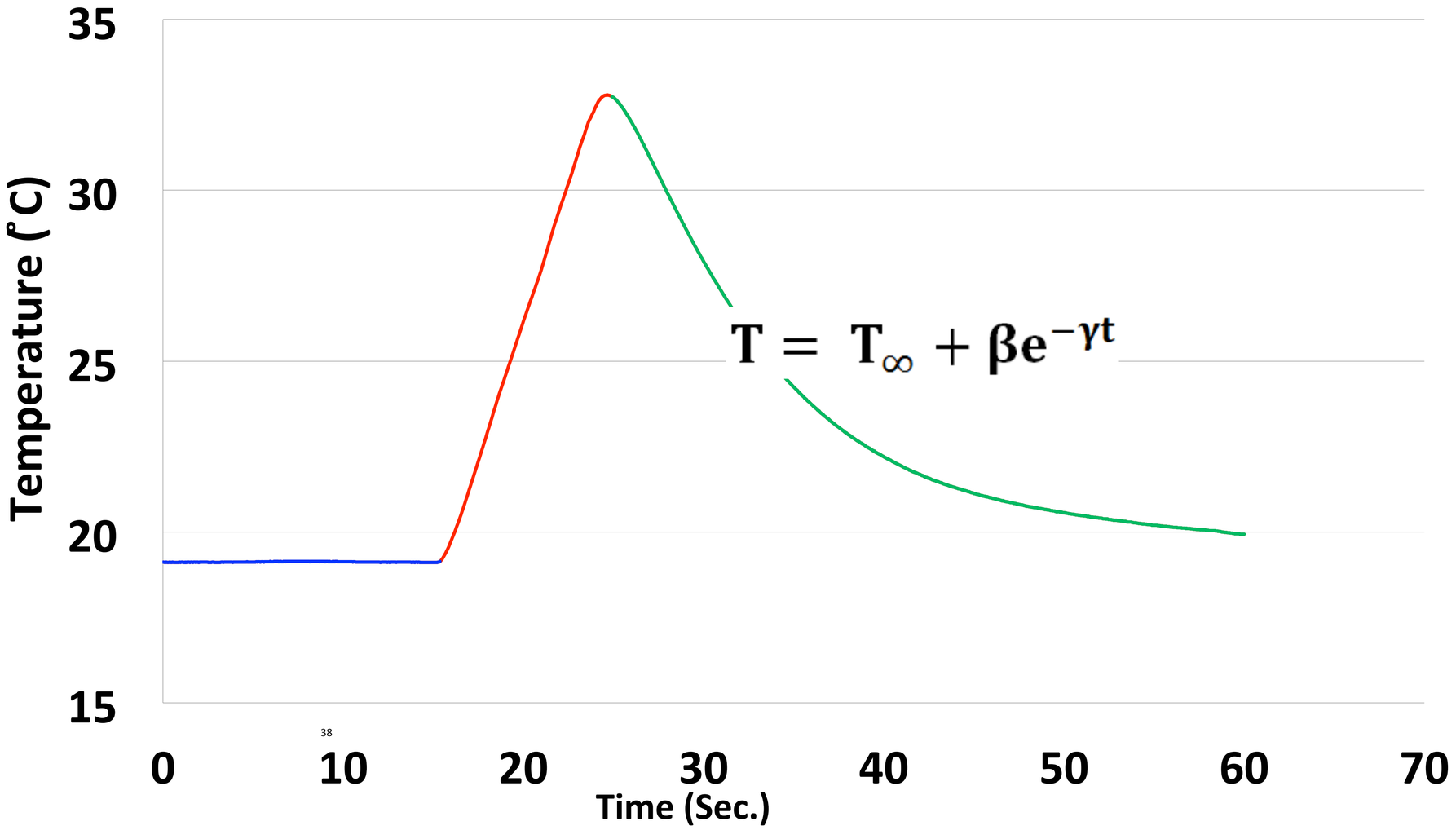


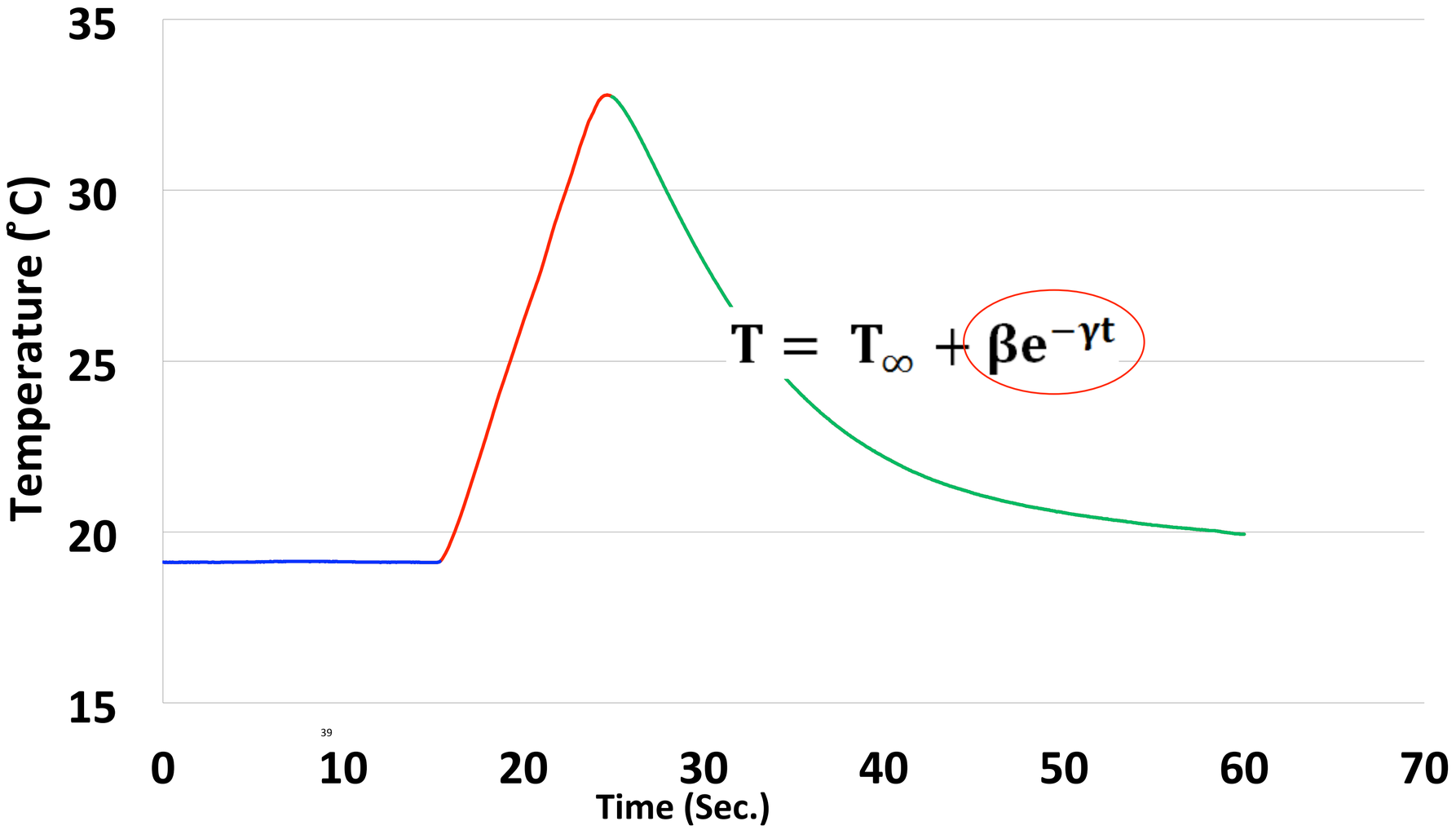
BLADE TEMPERATURE IN A CUT



BLADE TEMPERATURE IN A CUT



BLADE TEMPERATURE IN A CUT



APPLICATIONS OF THE TEMPERATURE DATA

- Warnings, perhaps before problems become critical
- Adjust amount of guide water
- Adjust gap between cuts to allow saw to cool
- Feed speed control is possible.

SUMMARY

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- ✓ Indirect measurements (Force, Acceleration, Acoustic) does not correlate to what is happening in the cut.

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- ✓ Indirect measurements (Force, Acceleration, Acoustic) does not correlate to what is happening in the cut.
- ✓ The temperature sensor can be used for some monitoring options, such as gap between cuts.
- ✓ The temperature sensor can indicate poor cutting conditions, and provide warning before it becomes critical.
- ✓ The temperature sensor can be used as a trouble-shooting tool.

FPInnovations

GET IN TOUCH

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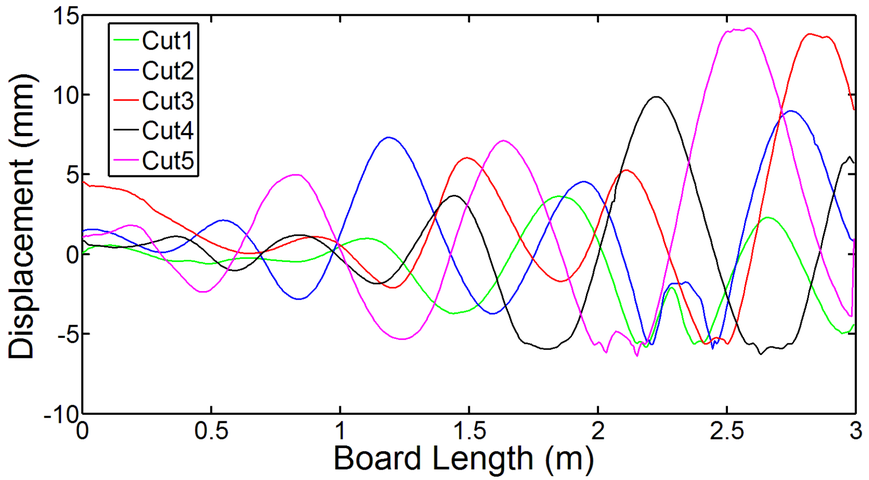
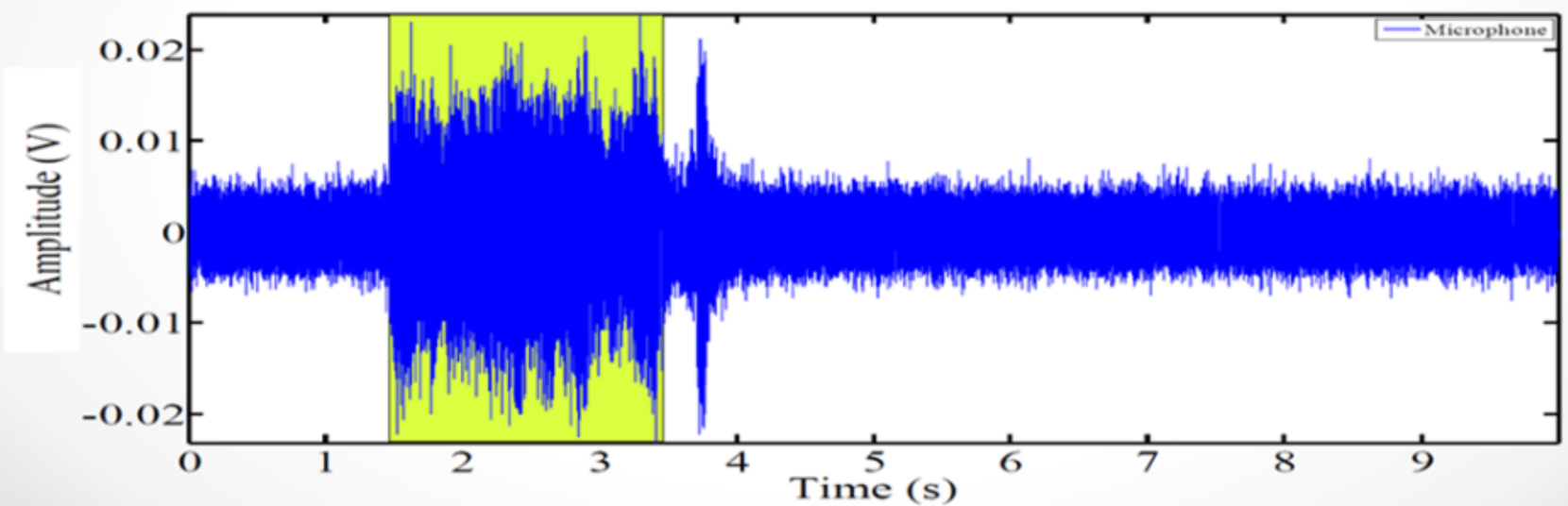
604-222-5613

HOW TO EVALUATE CUTTING PERFORMANCE?

HOW TO EVALUATE CUTTING PERFORMANCE?



HOW TO QUANTIFY SENSORS DATA?



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