

SHEET METAL FATIGUE FIXTURE

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OBJECTIVE

Design and Build affordable equipment for generating S-N curves for sheet metal materials

BACKGROUND

Inherited initial design, parts, and code from a prior Capstone team



Wooden mock-up from prior team

VALUE PROPOSITION

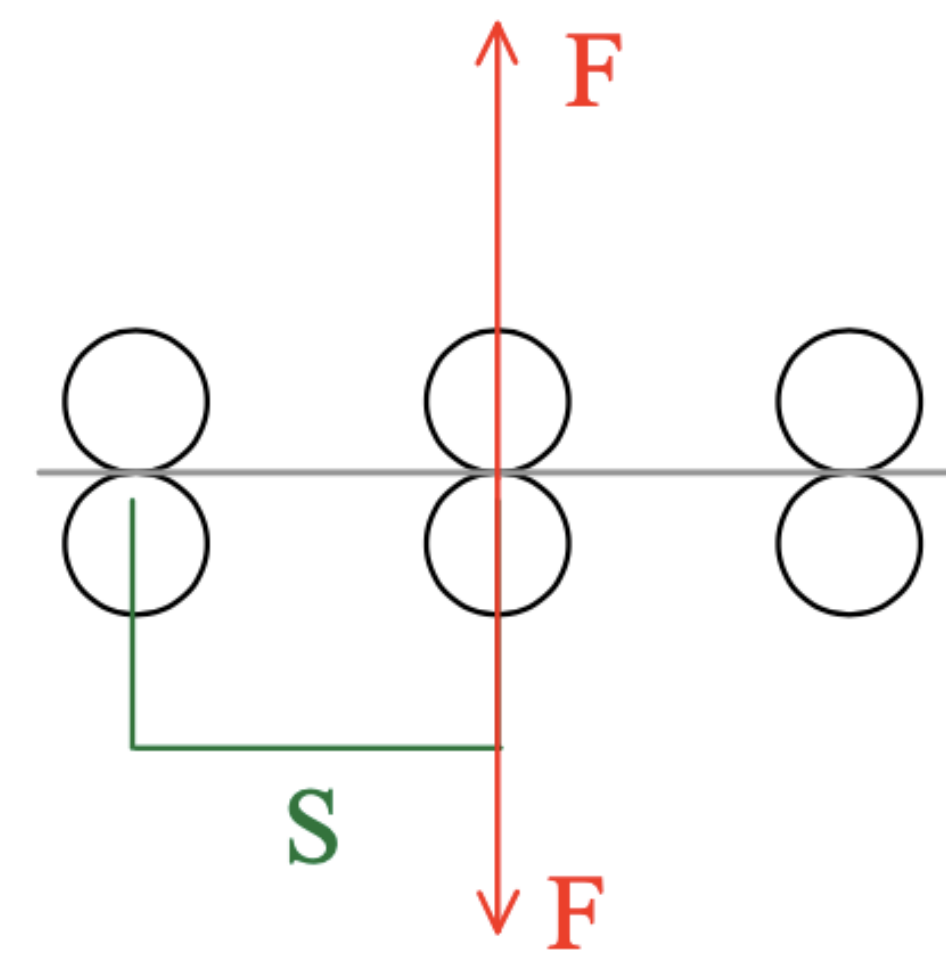
- Material properties are unavailable or hard to find
- The goal of the machine is to provide data
- Must be an affordable machine
- Give reliable data on aluminum sheet metal
- Finished product will be able to enter varying sample sizes, select parameters
- The machine will be able to run safely by itself and collect data and terminate automatically
- Create Stress vs. Number of cycles curve (SN curve)

KEY REQUIREMENTS

- Safely run without supervision
- Stop by itself once test is over
- Produce precise and accurate S-N curve
- Store Data in spreadsheet

VALIDATION

- Machine can run at max force and pressure
- Machine can run for long periods of time
- Machine runs at less than 80 dB (lab environment)



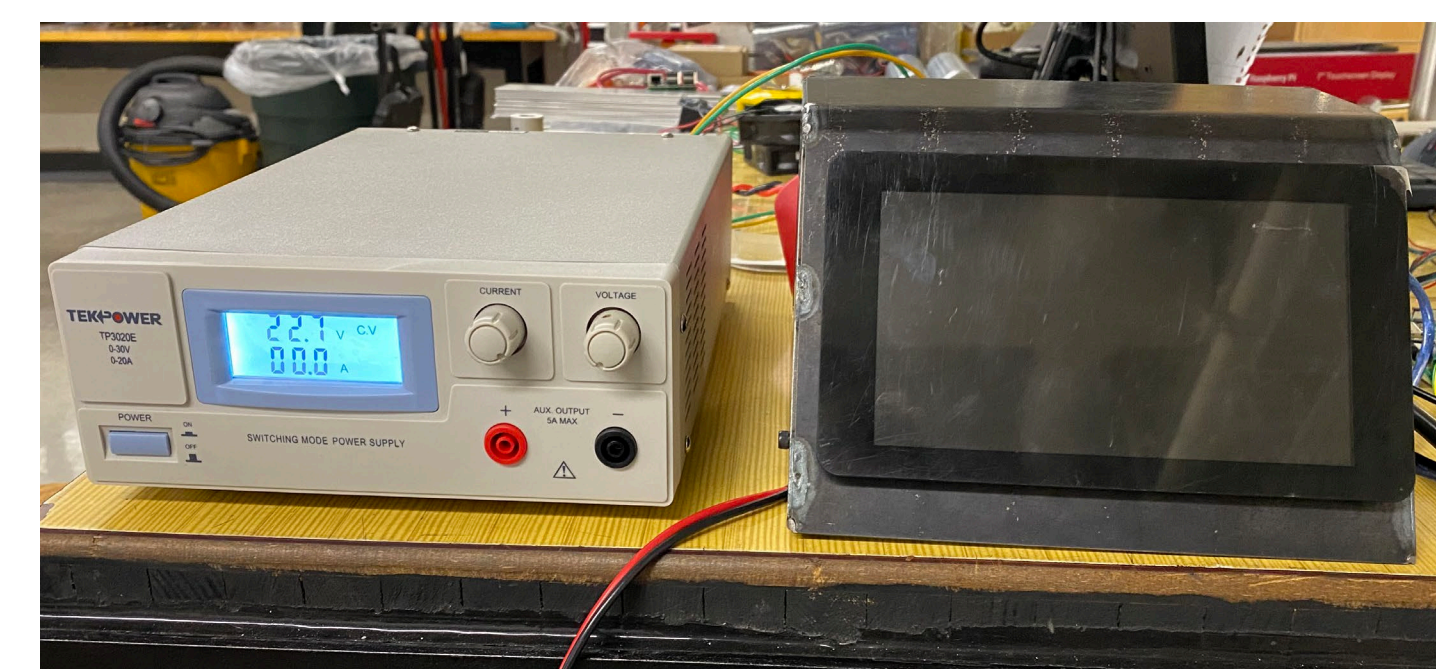
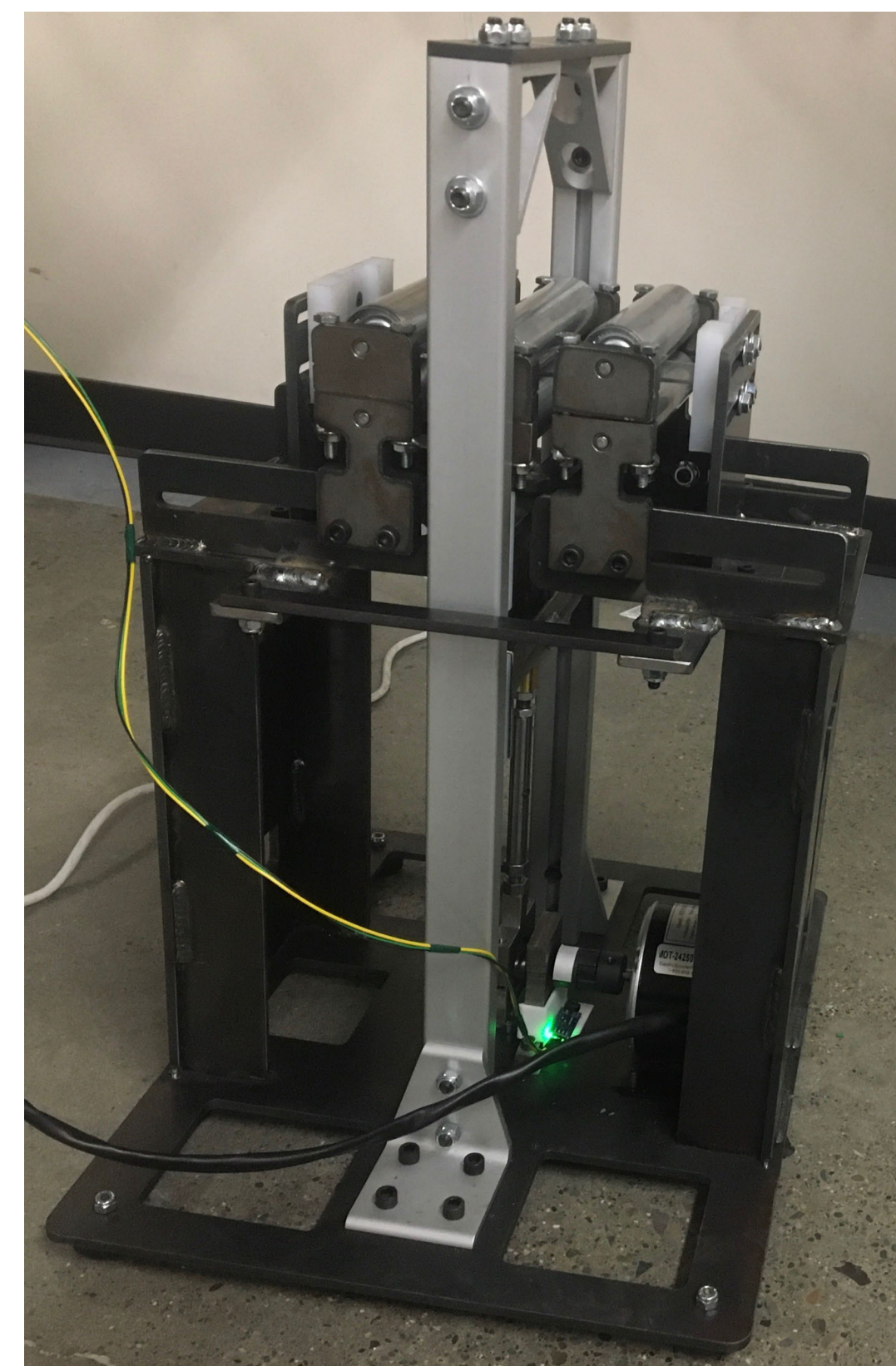
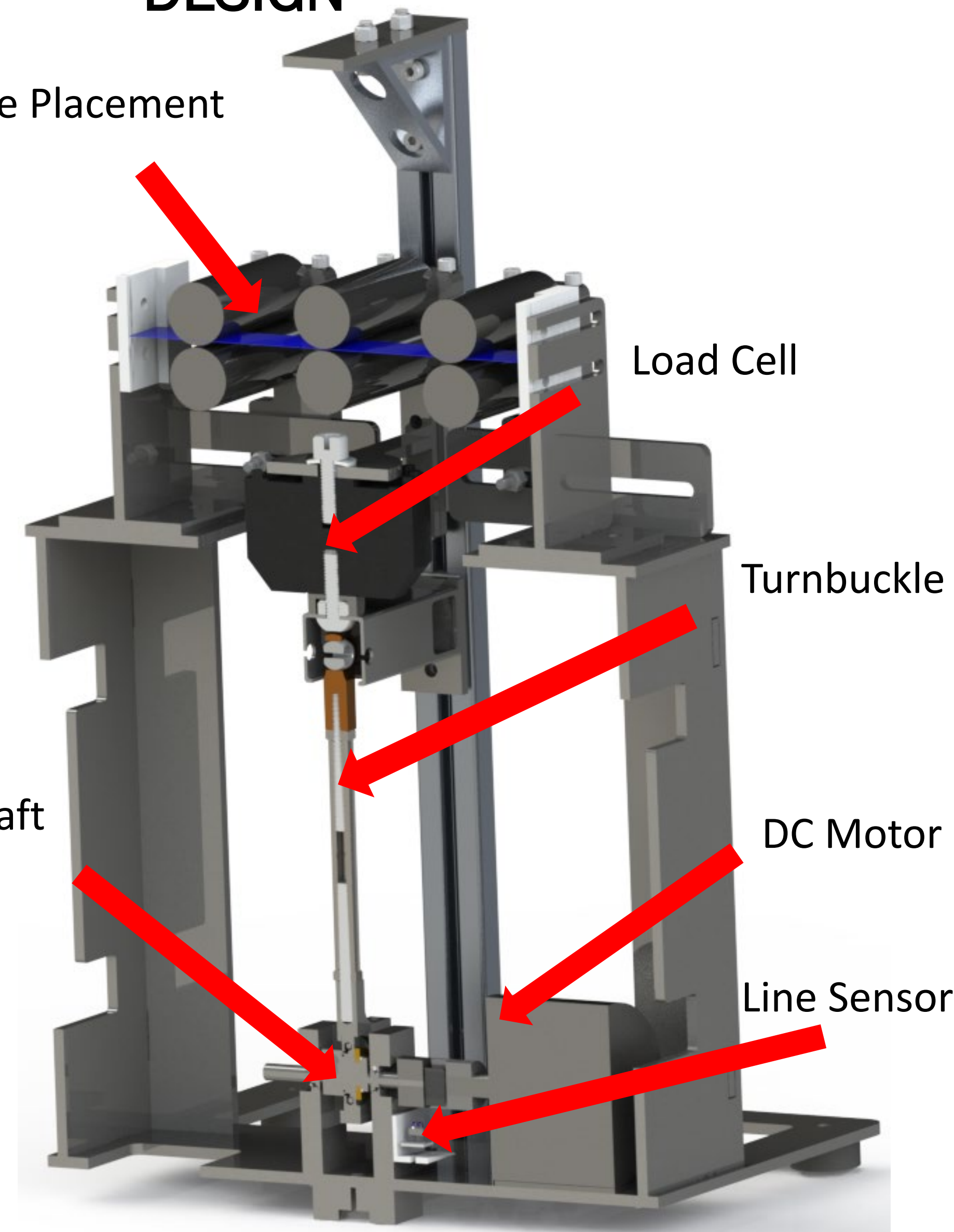
$$M = F * S$$

$$\sigma = \frac{M * y}{I}$$

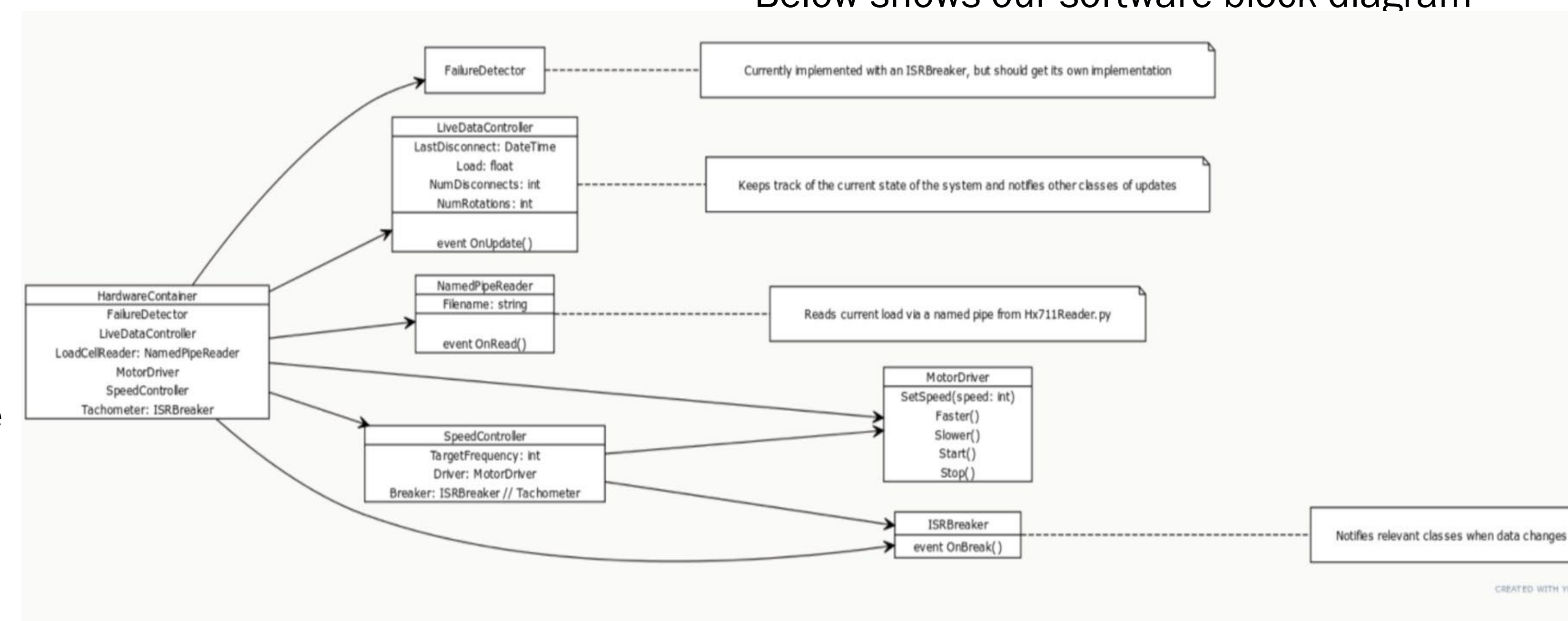
Eccentric Shaft

DESIGN

Sample Placement

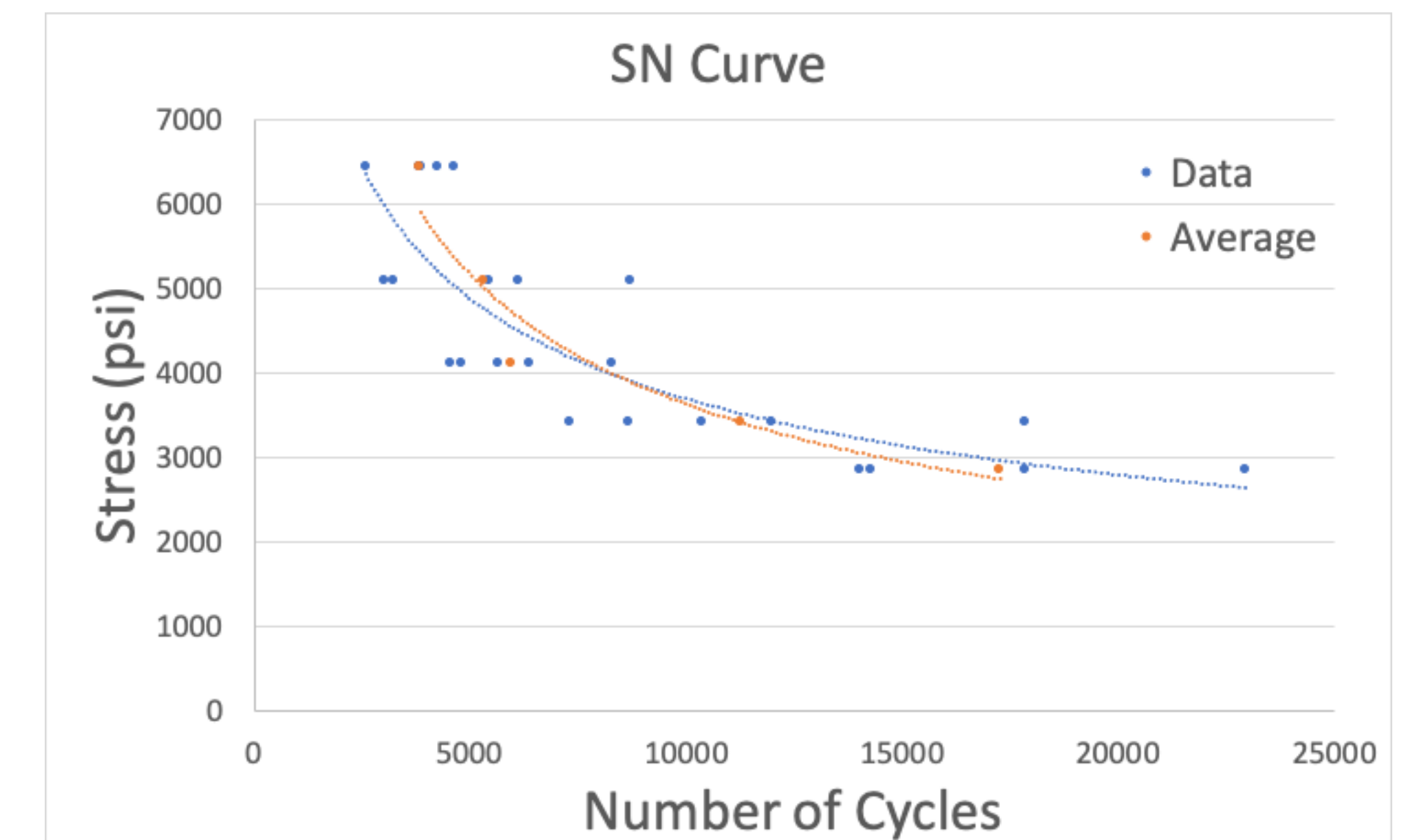


Below shows our software block diagram



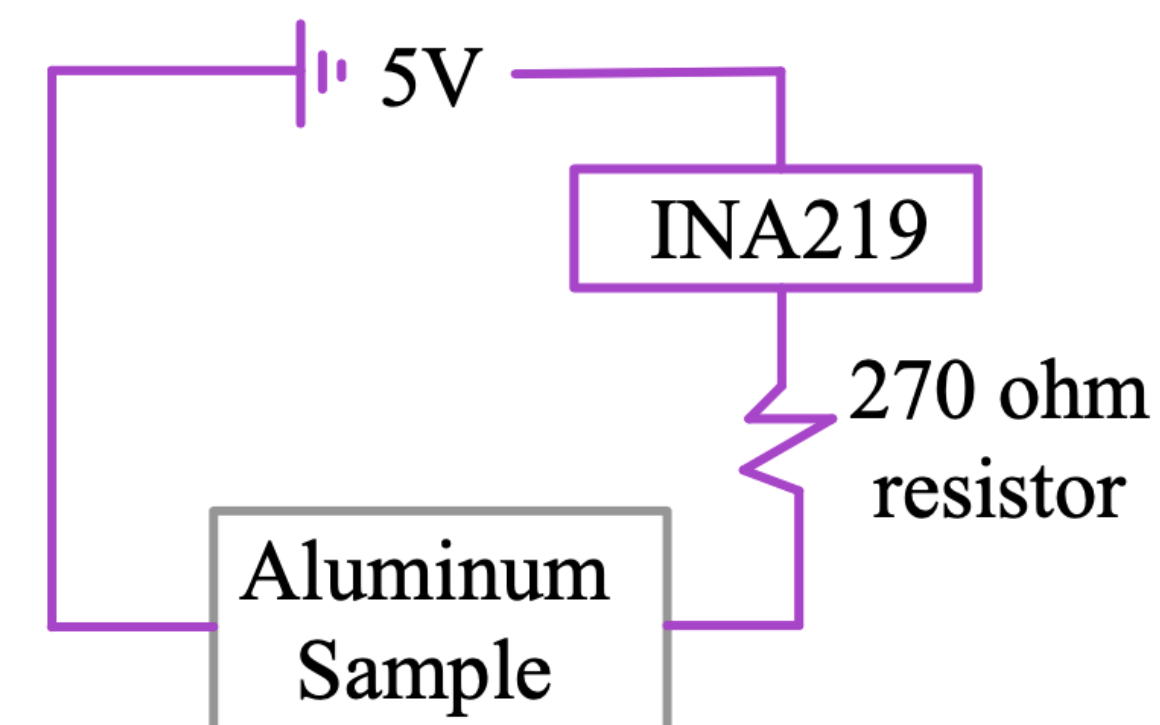
SUMMARY

- Created acrylic S-N curve
- Bent sheet metal modification design



FUTURE WORK

- ME Future improvement
 - Testing the bent sheet metal design
 - Running the fixture with Aluminum
- CS Future improvement
 - Parallelize the load cell script to increase sample rate
 - Simplify integration
- Failure Detection (circuit)
 - 5V from the pi
 - Aluminum resistance is smaller than the fixture
 - When the sample breaks the amperage will decrease



ACKNOWLEDGEMENTS

- Clients – Sally Mei, Jonathan Richards, Alex Olson
- Instructor – Dr. Matthew Swenson
- Mentor – Max Johnson
- Shop Manager – Bill Magnie
- Electrical Advisors – Dr. Herbert Hess and Mike McMenemy
- Break Detection – Dr. Shovic