

Production Test Fixture for Sensor Ring Testing

Group # 5

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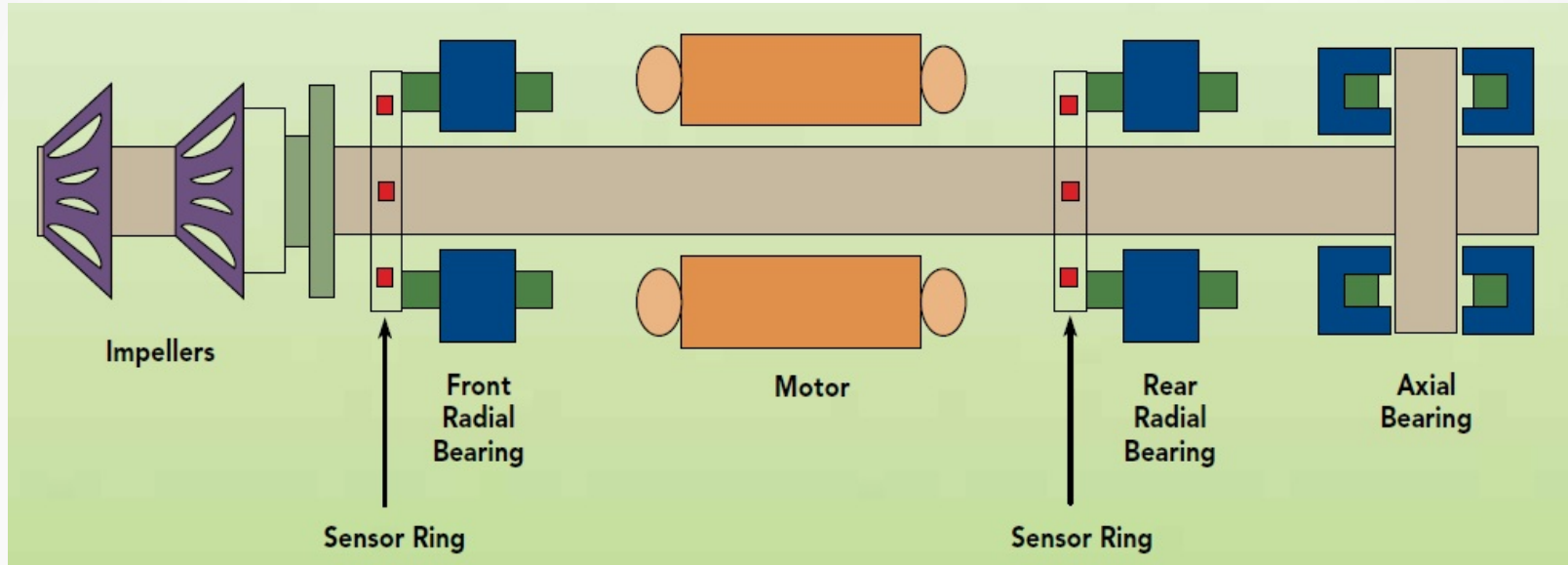


Project Sponsor: Turbocor

Overview

- Introduction
- Problem Statement
- Constraints
- Evaluation
- Proposed Design
- Challenges
- Future Work Plan

Introduction



Sensor rings monitor shaft location to ensure precise positioning.

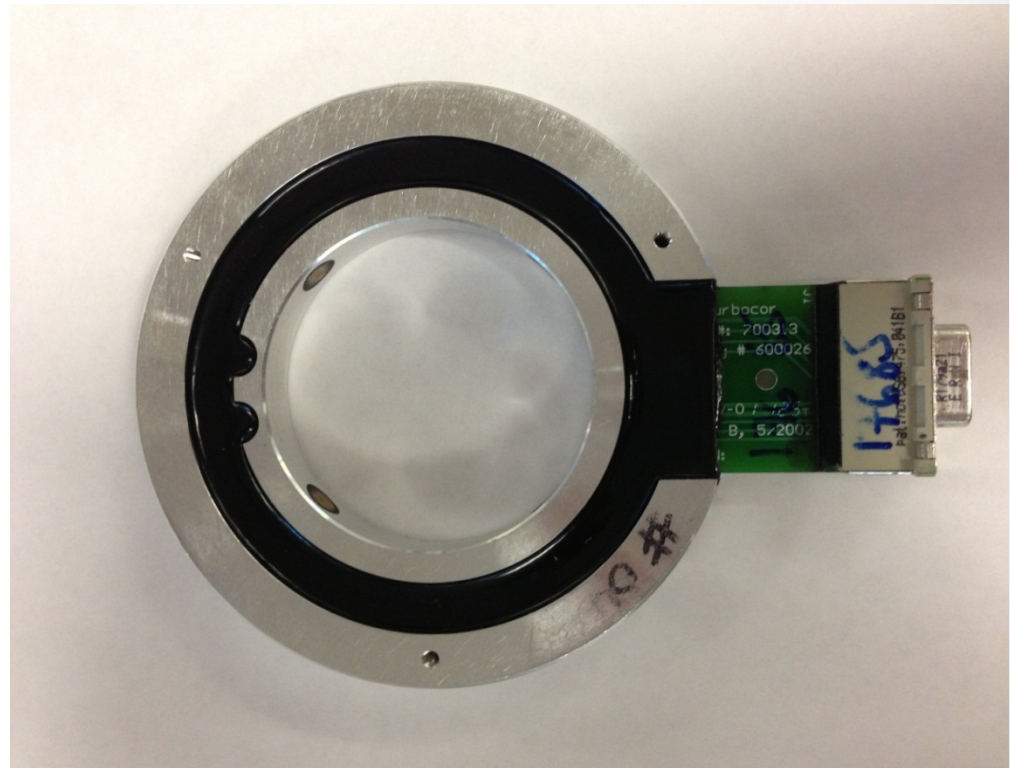
Problem Statement

- Problem Statement

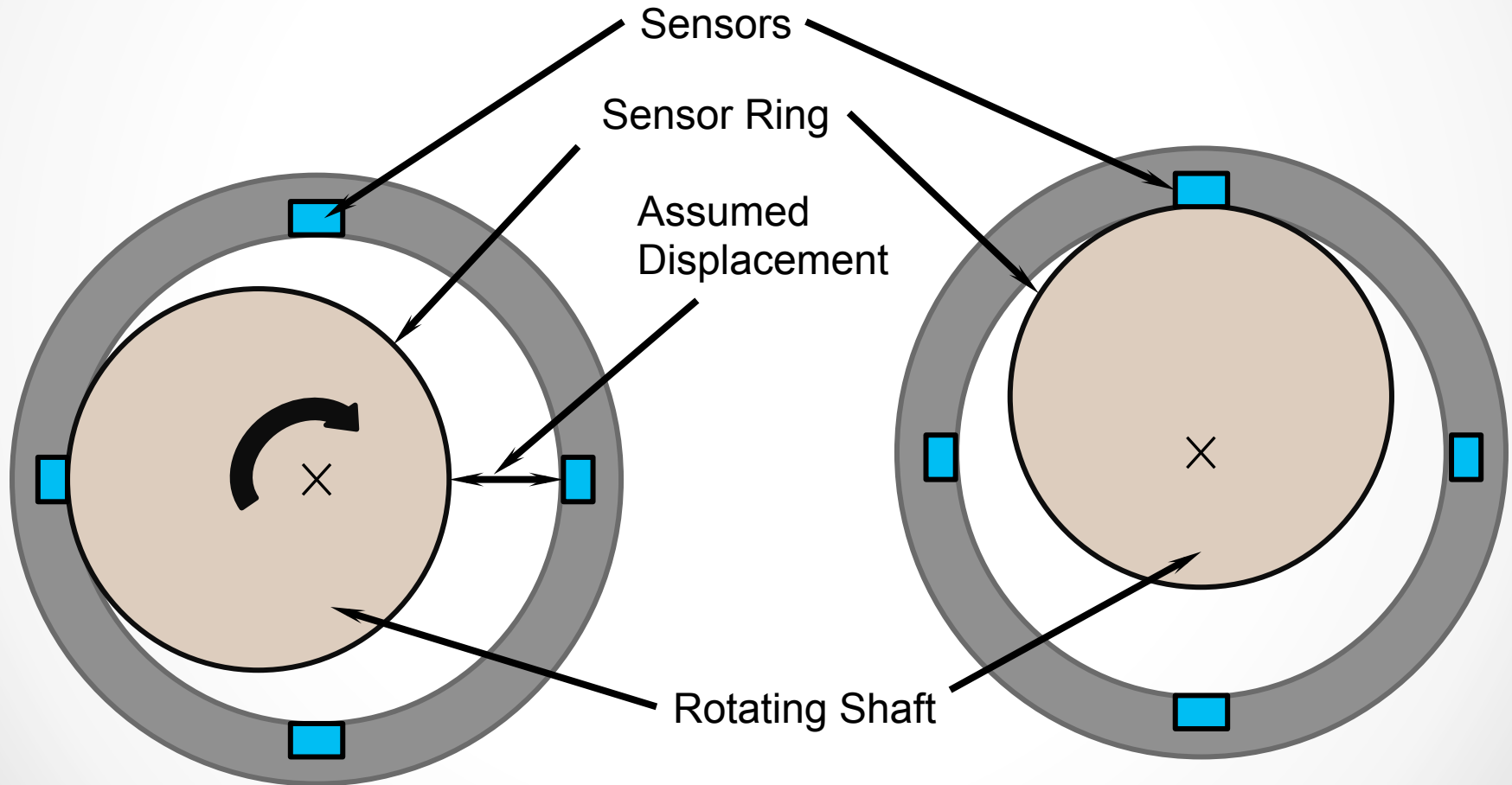
- Current testing fixture is inaccurate and unreliable
- Only tests in the X-Y directions

- Proposed Solution

- Design fixture with XYZ movements and “zero” backlash



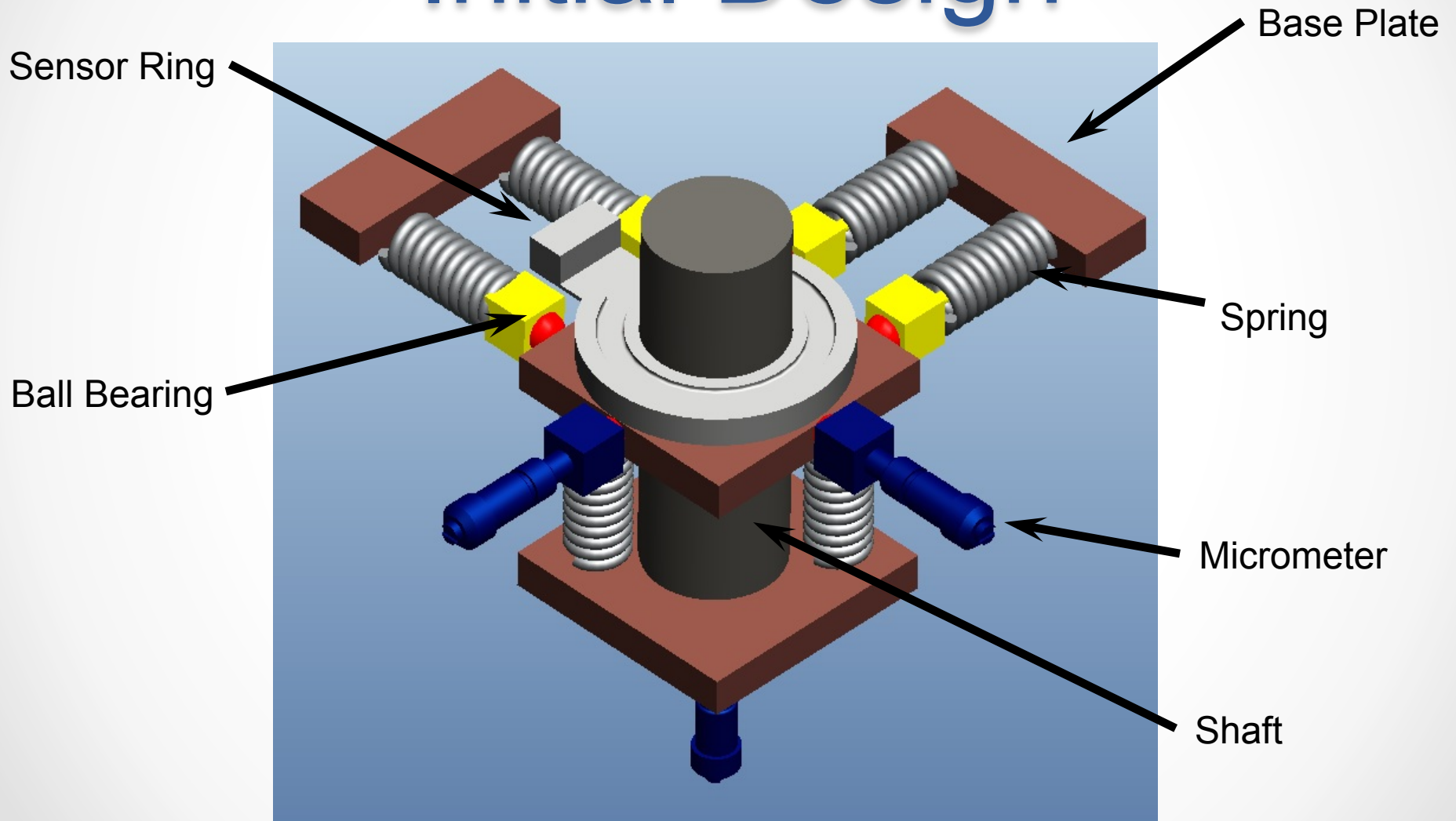
Current Fixture Schematic



Constraints

1. Independent XYZ movements
2. Measurements required at 3 different positions
3. Accuracy of 2 micrometers
4. Total displacement of 400 microns
5. “Zero” backlash

Initial Design



Concept 1: XYZ Table

XYZ Tables

Model	Travel	Accuracy	Price	Max Load	Platform Size
Newport 9063-XYZ-M	25.4 mm	3 μm / 25 mm	\$1,170	8 lbs	65 mm x 65 mm
Deltron R401MM-LO-XYZ	13 mm	3 μm / 25 mm	\$844	9 lbs	50.8 mm x 44.5 mm

Actuation Decision Matrix

		Cost	Accuracy	Repeatability	Speed	Mounting Capability	Built in Measurement	Score
Type	Weight	0.2	0.2	0.2	0.2	0.1	0.1	Total=1
Solenoid		5	3	3	5	2	0	3.4
Hydraulic		5	2	2	5	3	0	3.1
Motorized Actuator		2	5	5	4	4	5	4.1
Manual Micrometer		5	5	5	2	5	2	4.1

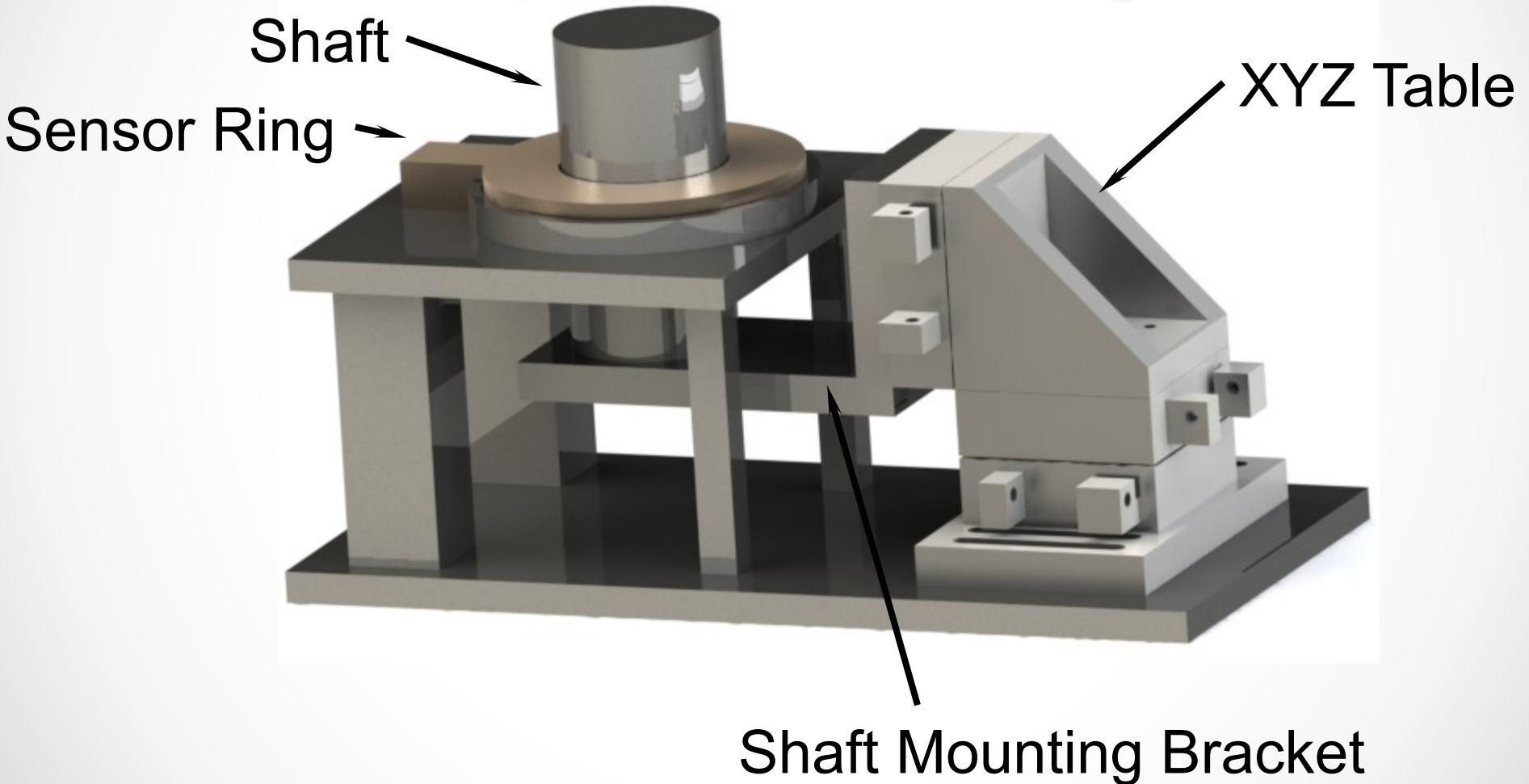
Score Range:

0	Lowest
5	Highest

Linear Actuators

Actuator	Type	Travel	Resolution	Accuracy	Price/unit	Notes	Additional Cost
Zaber LAC	Stepper	10 mm	0.024 μm	6 μm	\$566	Requires 3 units, controller/encoder	\$670
Newport NSA12	Stepper	11 mm	0.2 μm	5 μm	\$382	Requires 3 units, controller/encoder	\$830
Newport Starrett	Manual	12 mm	0.0004 μm	10 μm	\$85	Requires 3 units	\$0

Proposed Design



Challenges

- Achieving minimal, measurable backlash
 - LVDT-Measure movements and backlash
- Deflection of shaft
- Mounting Sensor Ring onto fixture
- Automated vs. Manual
- Attaching motorized actuators and LVDT

Future Work Plans

- Load Analysis
- Cost Analysis
- Identify needed parts
- Preparing purchase orders
- Prepare engineering drawings

Special Thanks

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Dr. Chiang Shih

Dr. Kamal Amin

References

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