Midpoint Review

Group 12: Bevel Gear Test Bed

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Overview

- Introduction
  - Problem Statement
  - Product Specifications
- Design Overview
- Procurement of Parts
- Cost Analysis
- Conclusion
- Future Plans
- Acknowledgments

Problem Statement

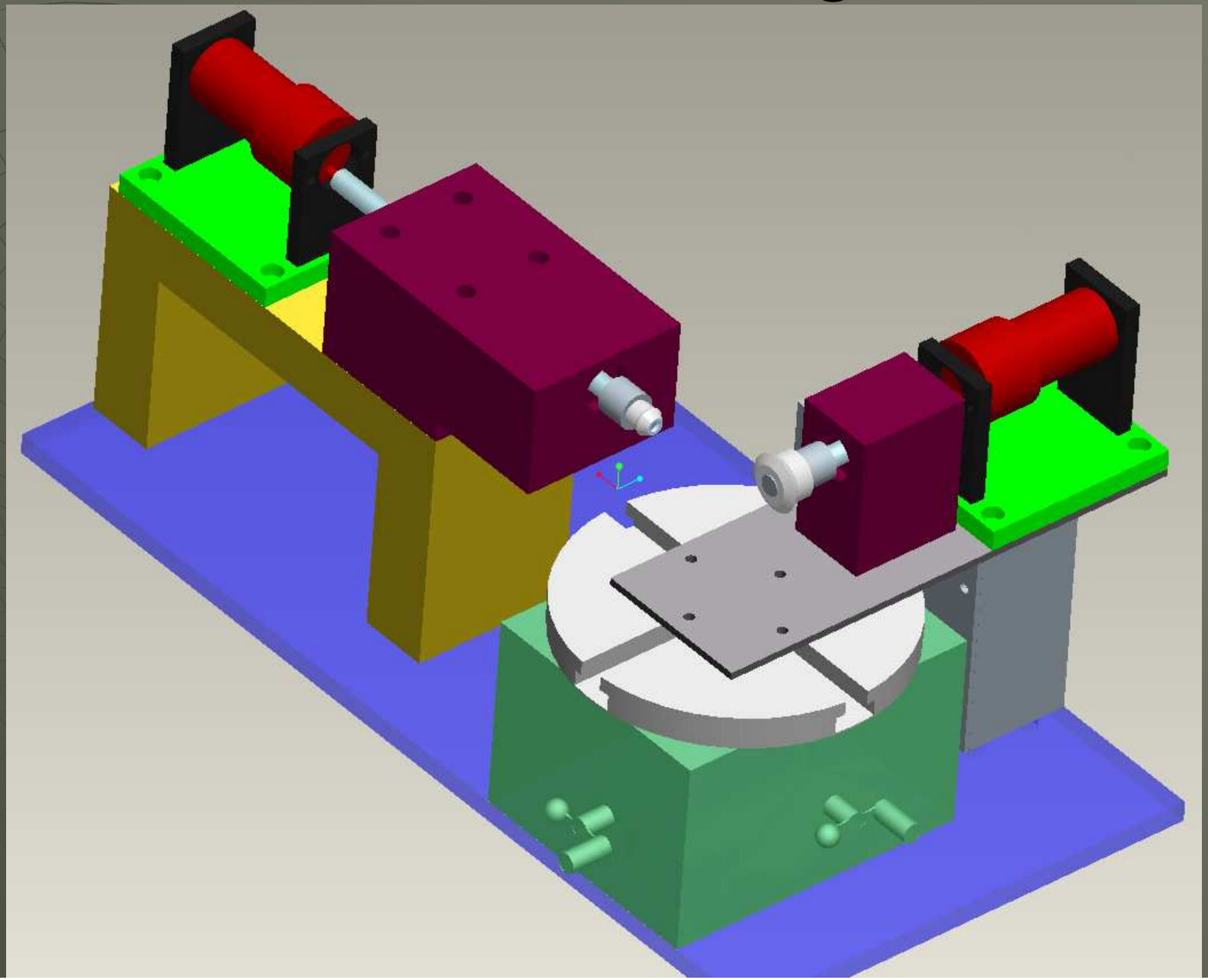
- Test Bed Design
  - Highly Precise
  - Fully Adjustable
- Bevel Gear Sets
  - Variations in Size
  - Variations in Materials
- Parameters
  - Life Span Test
  - Variable Input Speed
  - Variable Output Resistive Torque

Fig. 1 – Worn Bevel Gear Teeth

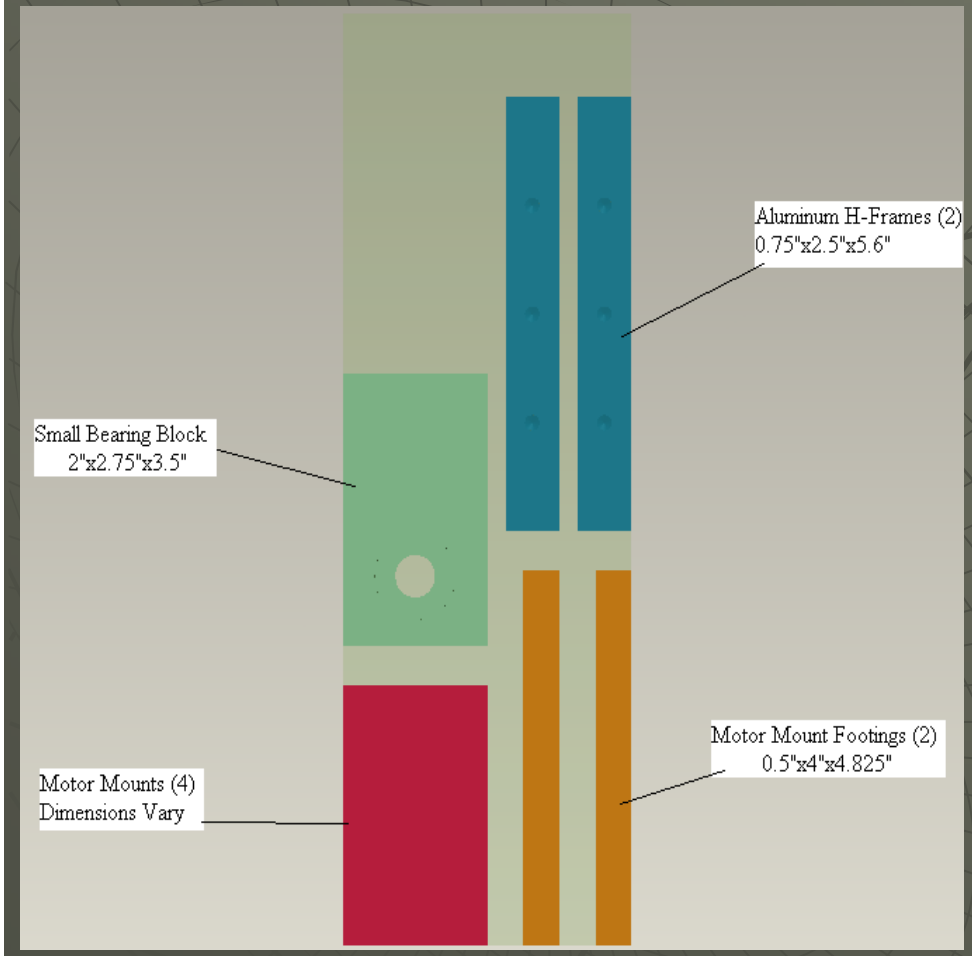
Product Specifications

Specifications	English Units	SI Units
Variable Speed	0 rpm – 100 rpm	0 rad/s – 10.4 rad/s
Variable Torque	0 in·lb – 31.25 in·lb	0 N·m – 3.53 N·m
Mounting Distance Accuracy	± 0.001 in	± 0.0254 mm
Variable Shaft Angle Range	± 0.5 degrees	± 0.00873 rad
Shaft Angle Increments	± 0.05 degrees	± $8.727 \cdot 10^{-4}$ rad
Gear Size Range	1/3 in. – 5 in.	8.467 mm – 127 mm

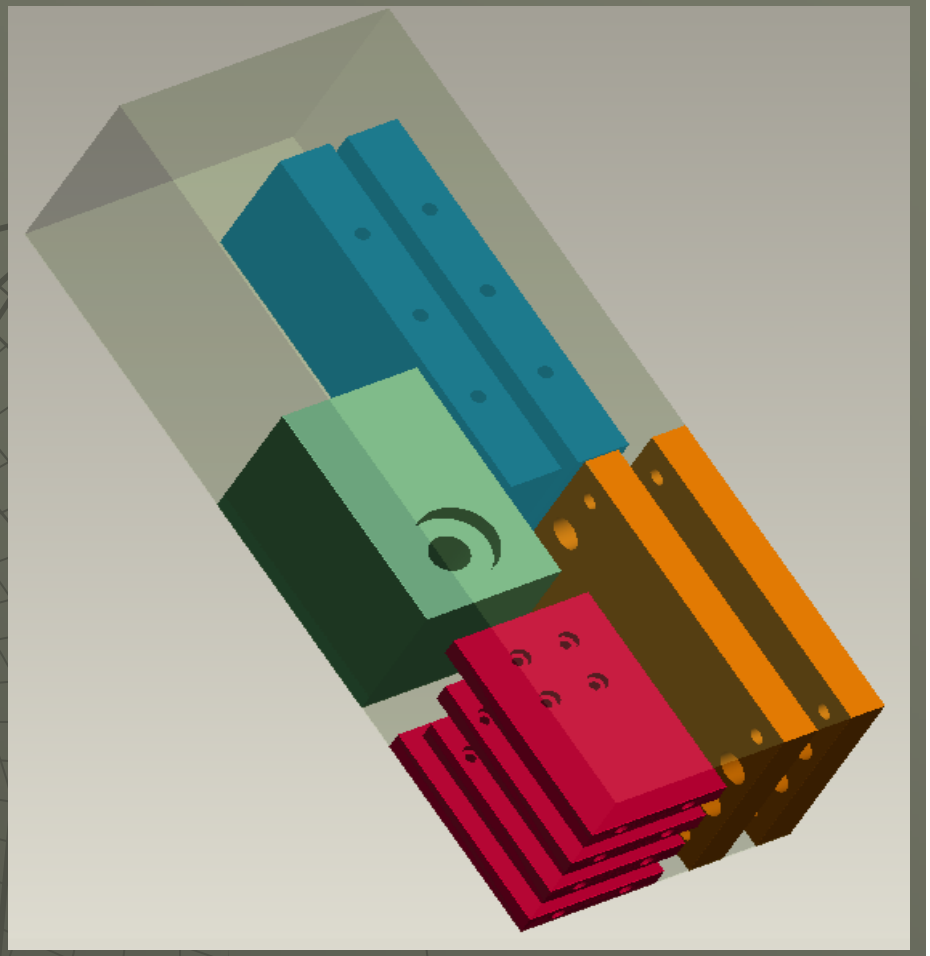
Current Design



Minimizing Stock Aluminum Costs

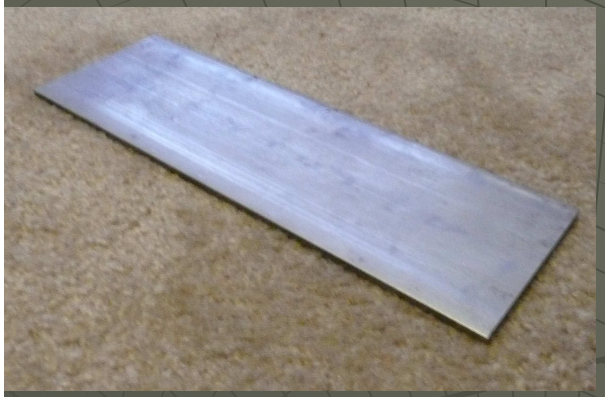


Top View of Configuration



Isometric View of Configuration

Parts Ordered and Received



Base plate
(12”x24”x0.5”)

Bearing Block
(4”x6”x12”)

Adapter Plate
(4”x12”x0.1875”)

Cross-Slide Rotary Table

Bearings (4)
OD =
ID =

Controller
Servo Amplifier Brush Type
25A 80V by AMC

Gear Sets and Motors

1:1 Straight Bevel Gears
(B=0.1875”)

2:1 Spiral Bevel Gears
(B=0.5” and 0.3125”)

2:1 Straight Bevel Gears
(B=0.5” and 0.375”)

24V DC Motor

Current Cost Analysis

Name	Price Per Unit	Quantity	Total Price
Cross-Slide Rotary Table	$674.00	1	$674.00
Adapter Plate	$23.65	1	$23.65
Bearing Block Material	$132.15	1	$132.15
Base Plate Material	$128.30	1	$128.30
Bearings	$10.58	4	$42.32
Controller	$200.34	1	$200.34
Aluminum Stock	$90.49	1	$90.49
Stainless Steel Material	$20.11	1	$20.11
7/8” Shafts	$14.08	1	$14.08
1/2” Shafts	$15.23	2	$30.46
Totals		14	$1,355.90

2 Motors and 3 Gear Sets were provided by the Harris Corporation

Parts still to be received

Conclusion

- Resolved and Unresolved Issues
  - Resolved
    - Reduced Cost
    - Achieved Given Tolerances
      - Cross-Slide Rotary Slider
      - Input and output motor
      - Machining Tolerances
  - Unresolved
    - Controller function
    - Currently under budget, but issues may arise
      - Budget Extension Proposal
    - Time Constraints

Future Plans

- Building
  - Finish Machining Parts
  - Finish Assembling Parts
- Testing
  - Troubleshooting
  - Optimization
- Write-ups
  - Full assembly guide
  - Testing Results
  - Future recommendations

Acknowledgments

- Dr. Hollis
  - Calculations review
  - Design guidance
- Brent Stancil
  - Providing the motors and gear sets
  - Clarifying critical specifications
  - Teleconference meetings on a weekly basis
- Richard Robards
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  - Donation of ¼”-20 bolts
- Angela Scharnetski & Rene Ymzon
  - Discount on Controller
  - Controller Application and Implementation Guidance

Questions