

Progress Report



Group 12: Bevel Gear Test Bed

David Jones
Brad Childers
Darrel Anderson
Andrew Dalesandro



Overview

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

Problem Statement

- ◆ Harris Corporation previously ran tests on bevel gears for a project
 - Results did not achieve the expected standards
- ◆ Possible problems
 - Misalignment of gears
 - Overloading of gears
 - Anodic coating failure
 - Leads to abrasion of teeth
- ◆ Objective
 - Design a highly precise bevel gear test bed capable of testing a variety of bevel gear sizes and materials with variable input parameters



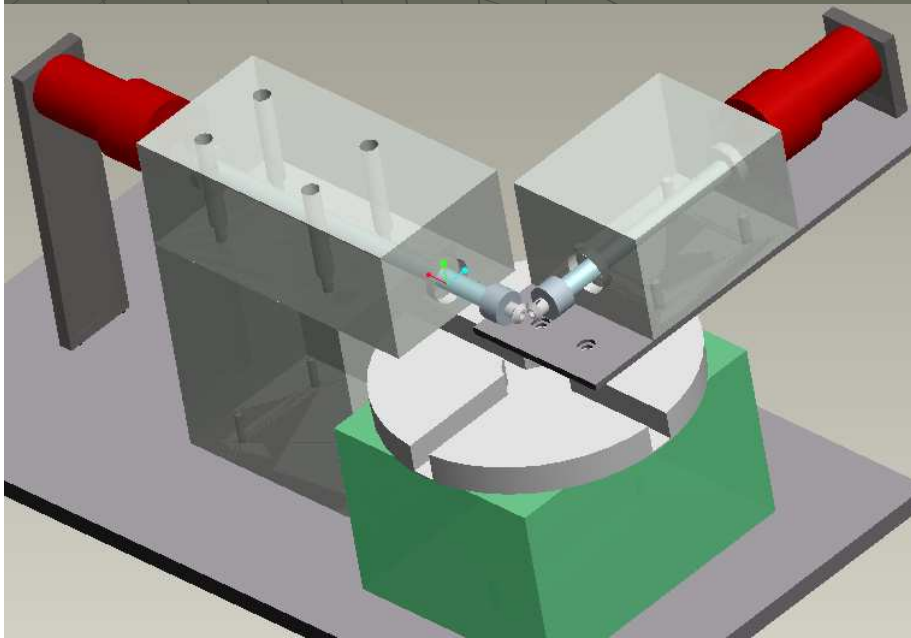
Fig. 1 – Worn Bevel Gear Teeth

Product Specifications

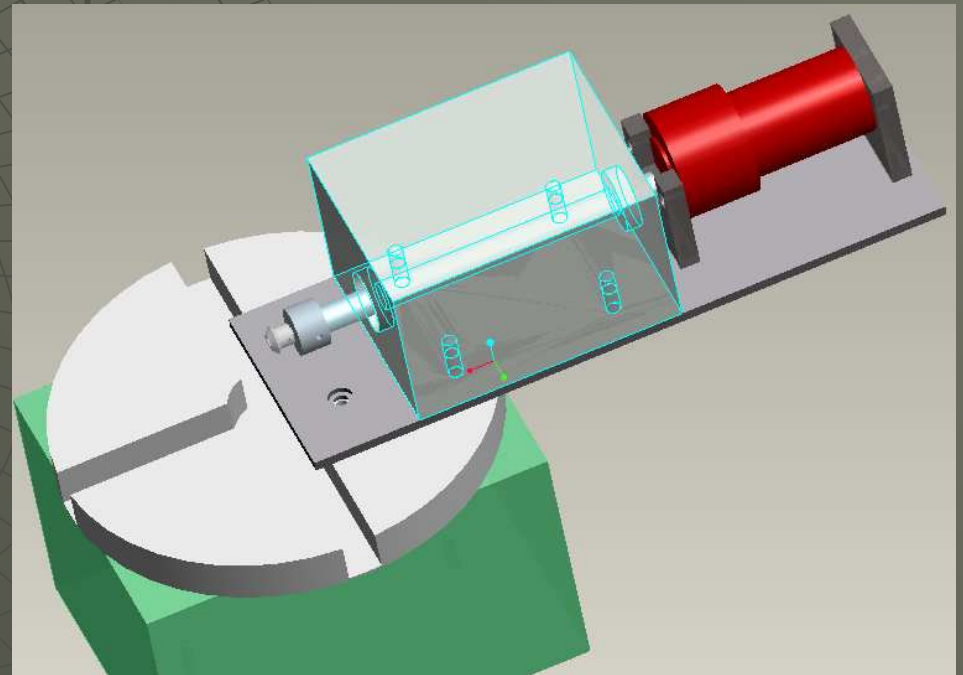
Specifications	U.S. Units	SI Units
Variable Speed	0 rpm – 100 rpm	0 rad/s – 10.4 rad/s
Variable Torque	0 in·lb - 50 in·lb	0 N·m – 5.6 N·m
Mounting Distance Accuracy	± 0.001 in.	± 0.0254 mm
Variable Shaft Angle Range	± 0.5 degrees	± 0.00873 rad
Shaft Angle Increments	± 0.05 degrees	8.727·10 ⁻⁴ rad
Gear Size Range	1/3 in. – 5 in.	8.467 mm – 127 mm

Current Design

Iso-View of Testbed

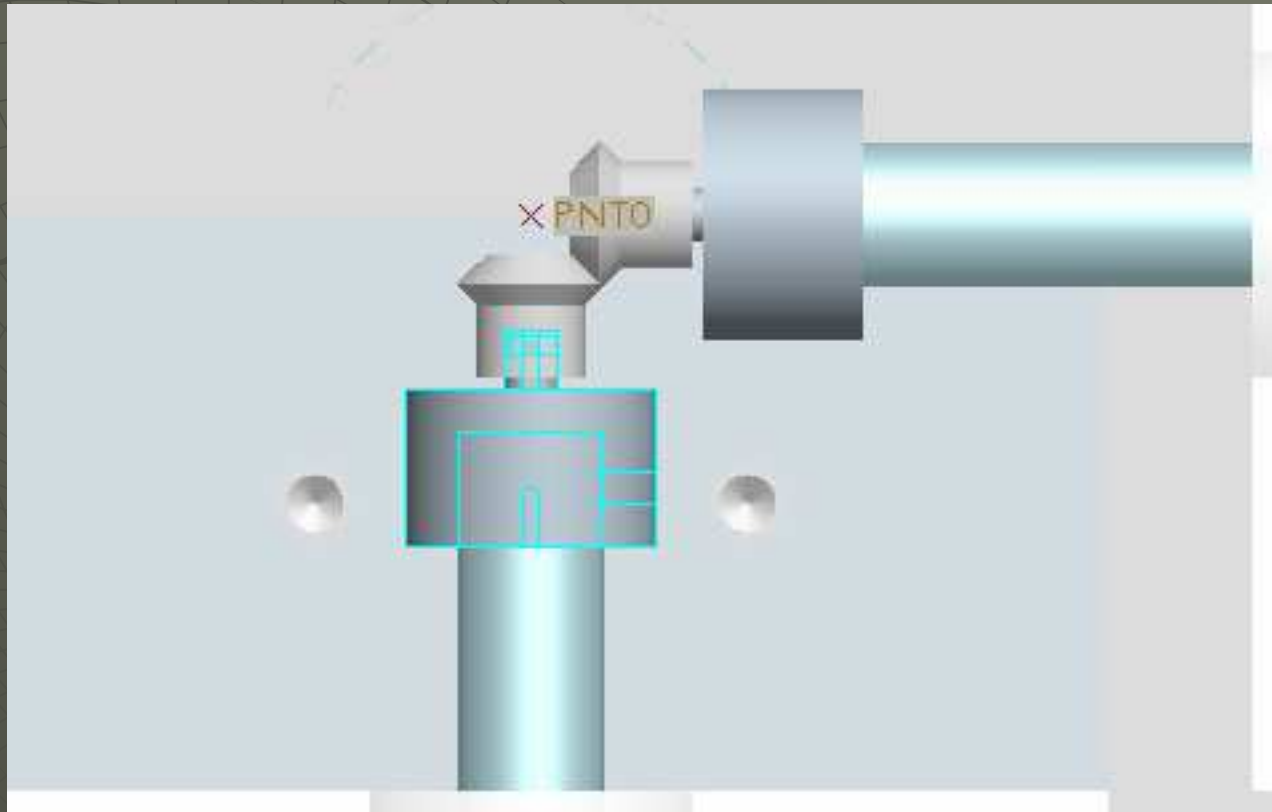


Top View of Pitch Cones

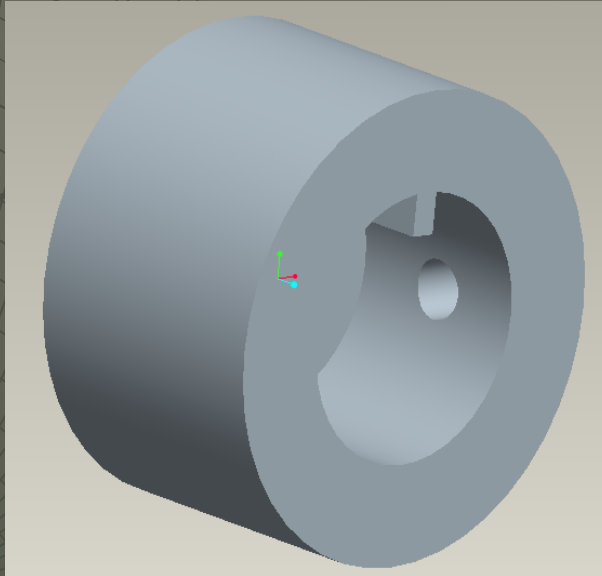
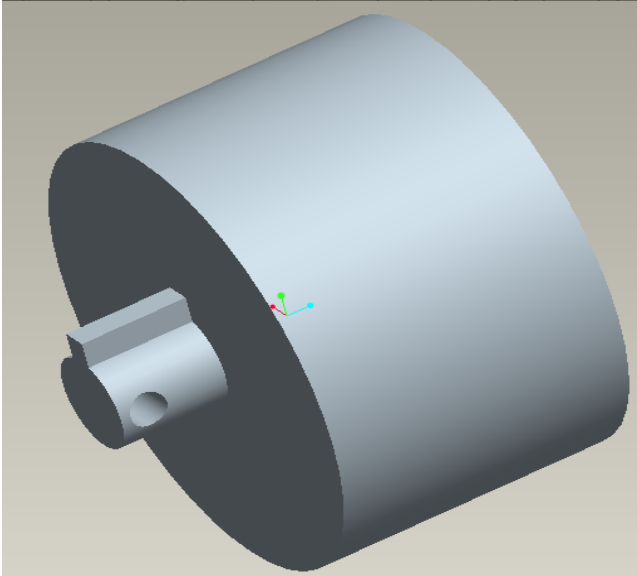


Current Design

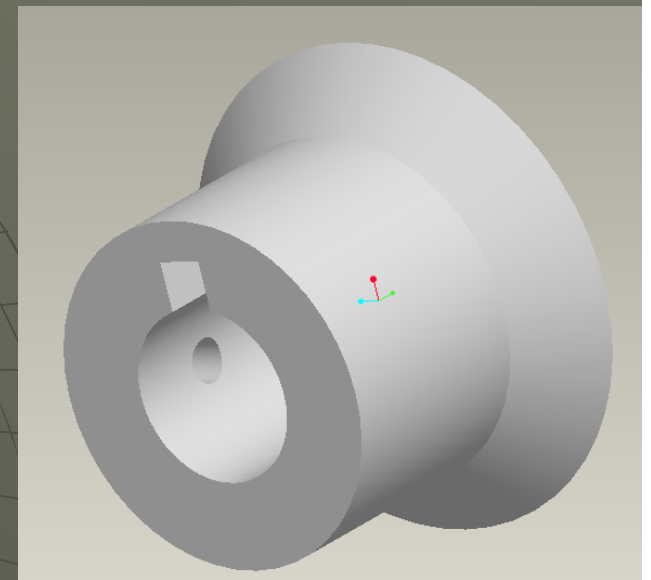
Top View of Pitch Cones



Connection Tooling Cont.



Tooling Connection from 0.5" shaft to
Miniature Bevel Gear



Miniature Bevel
Gear

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

Parts Ordered and Received



Cross-Slide Rotary Table



Bearing Block (4"x6"x12")



Adapter Plate (4"x12"x0.1875")



Base plate (12"x24"x0.5")

Parts Still Needed

- ◆ Controller for resistive motor
 - Servo Amplifier Brush Type – 25A 80V by Advanced Motion Controls
- ◆ Shafts
 - 1/2" diameter connecting motor shaft to tooling
 - 7/8" diameter tooling material
- ◆ Bearings
 - In-transit



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	\$295.00	1	\$295.00
Shafts	\$20.00	2	\$40.00
Motor Mounts	TBD	2	TBD
Totals		11	\$1,335.42

2 Motors and 3 Gear Sets provided by the Harris Corporation

Parts still to be ordered

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

Future Plans

- ◆ Preparation for Building
 - Schedule Machining Time
 - Finish Part Ordering
- ◆ Building
 - Assemble parts as they are received
 - Incorporate our machined parts
- ◆ Testing
 - Troubleshooting
 - Optimization

Acknowledgments

◆ Dr. Hollis

- Calculations review
- Design guidance

◆ Brent Stancil

- Providing the motors and gears sets
- Clarifying critical specifications
- Teleconference meetings on a weekly basis
- Simplifying our design

References

- ◆ Equipment Condition Monitoring - Reference Site. 25 Jan. 2009
<<http://www.vibanalysis.co.uk/vibcases/vibch08/vibch8p2.jpg>>
- ◆ RCI Home. 25 Jan. 2009
<<http://www.researchconcepts.com/Files/20a14.pdf>>

Questions

