

Design Matrix of Bevel Gear Apparatus

Objective:

- To develop an accurate and reproducible Power Curve of a Tidal Turbine by designing and fabricating a testing apparatus.

Method:

- Began with creating a design matrix of the qualities the apparatus must possess.
 - Ease of Mounting to Dynamometer
 - Sensitivity in Shaft – Reduction of Frictional Losses
 - Hydrodynamics of Apparatus – Turbine Mounted behind Keel
 - Strength and Vibrational Resistance of Keel
 - Collects Power and Drag Data
 - Survivability
 - Accessibility of components
 - Manufacturability
 - Cost

Preliminary Designs:

Bevel Gear Shaft Connection

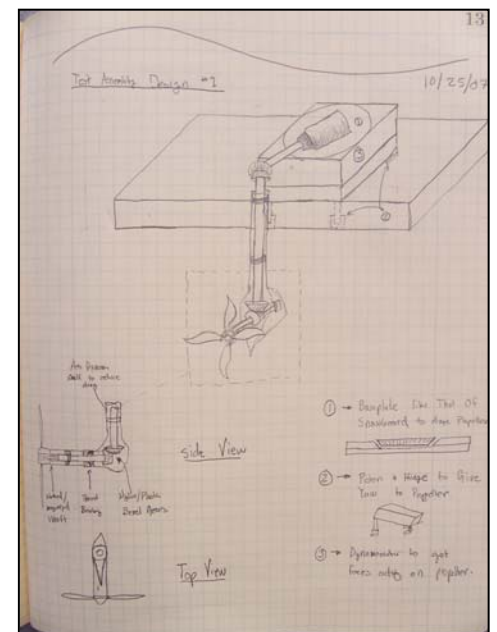
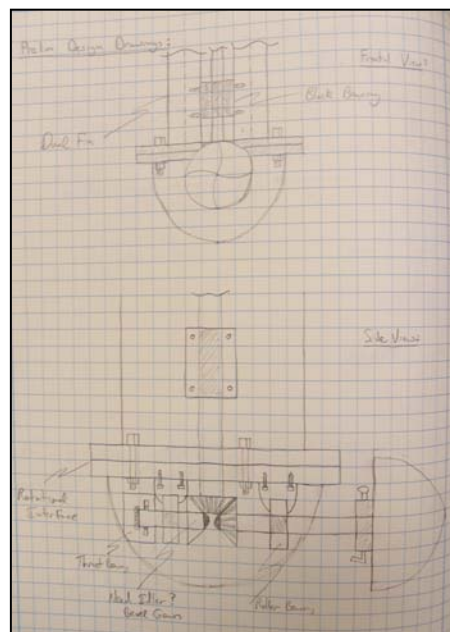
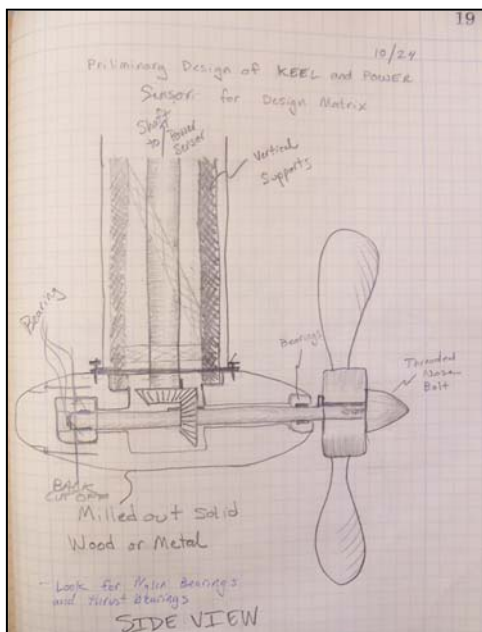


Figure 1: Preliminary Bevel Gear Design

Bevel Gear Shaft Connection Collaboration Design

- We took the best ideas from each preliminary design to develop the design seen in Figure 2-4.

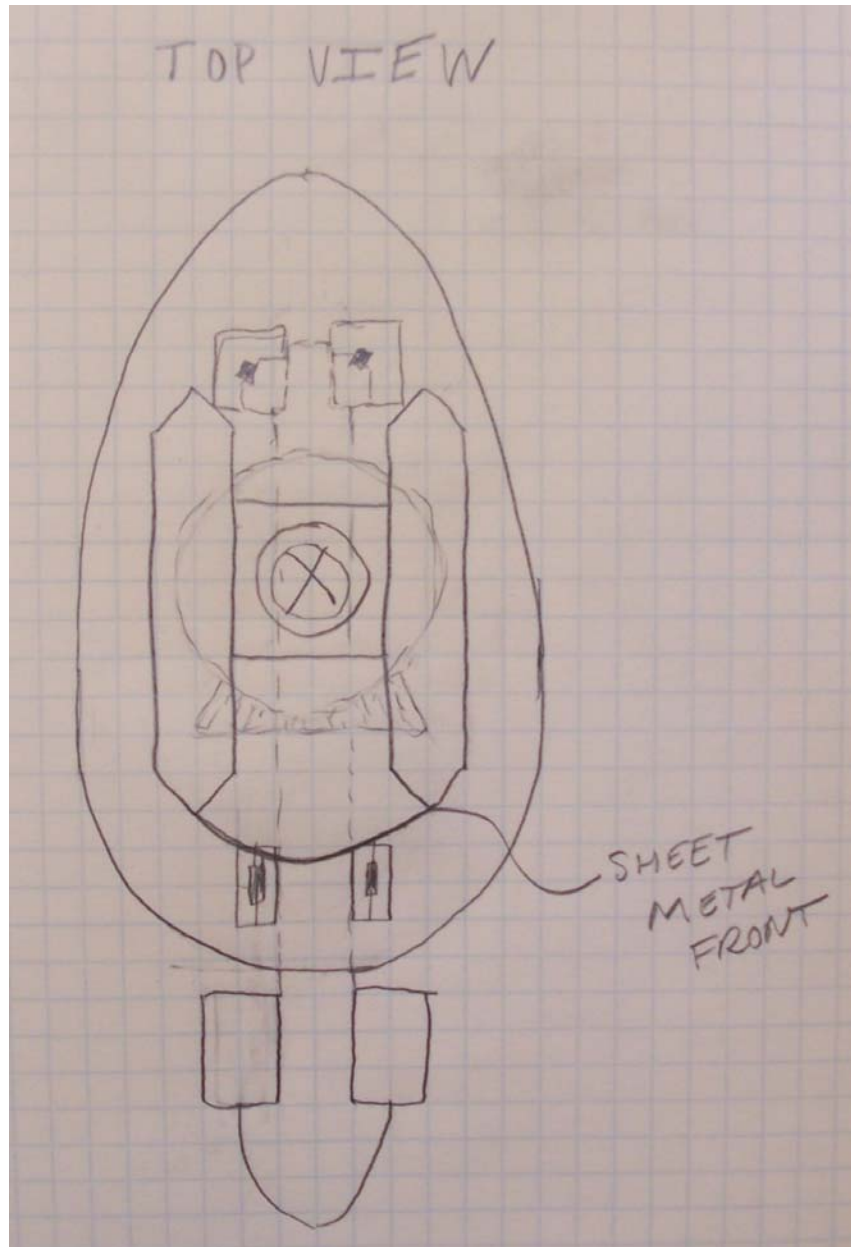


Figure 2: Top View of Bevel Gear Apparatus

This apparatus utilizes a double keel system to keep the apparatus rigid. The shaft runs vertically between the instrumentation housing and the dynamometer with two bearings for maintaining shaft position and reducing vibrational losses in the vertical shaft. The front of the keel is covered with sheet metal to deflect flow around the rotating shaft

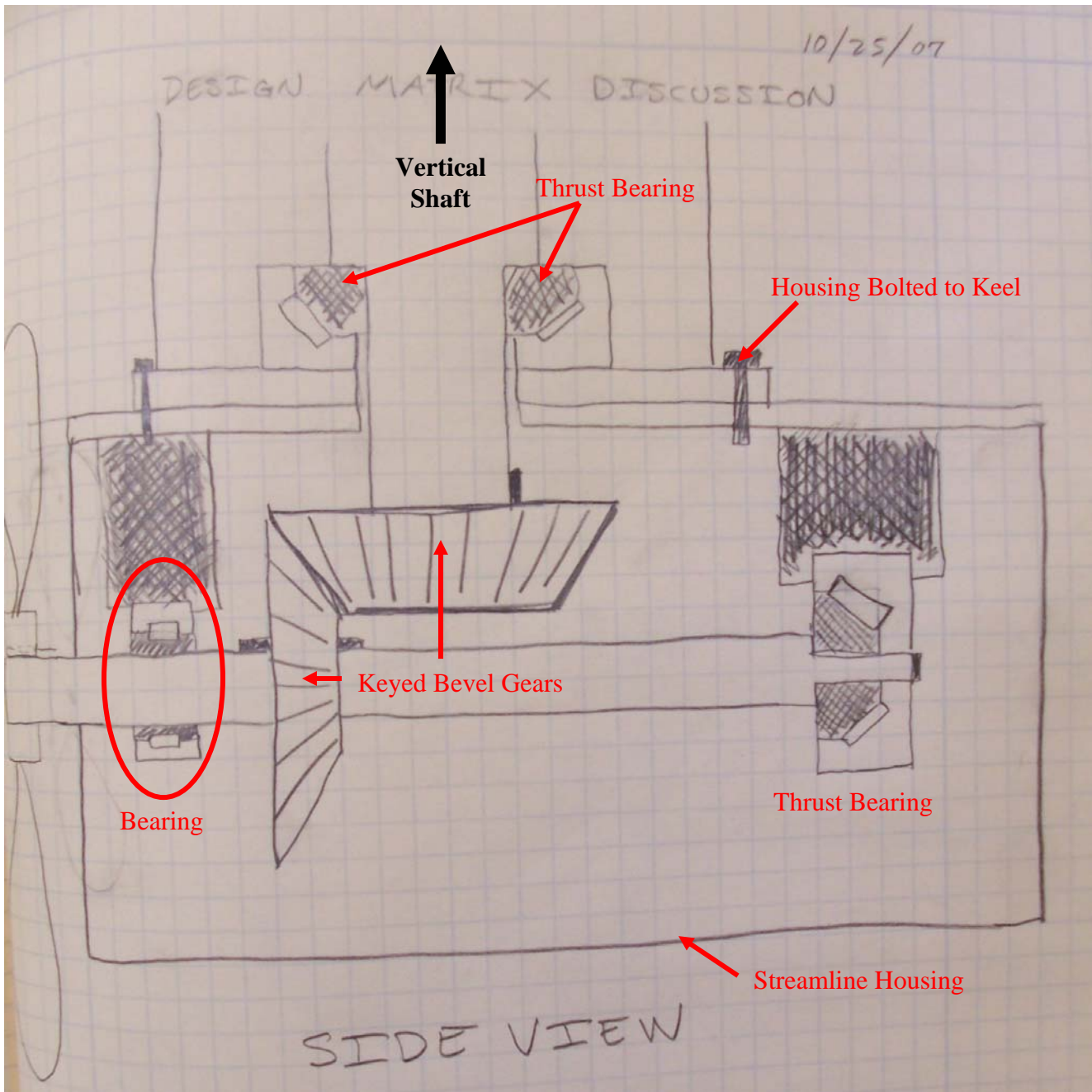


Figure 3: Side View of Bevel Gear Apparatus

A bevel gear was chosen to transfer the horizontal rotating shaft power to a motor raised vertically above the housing. The driving factor to consider for this design is the alignment of the gears. There will be high frictional losses within the gears if the shafts are not aligned properly. To align the gears, the horizontal shaft and vertical shafts would have to be adjustable and still able to be fixed in place. This alignment decreases the accuracy/sensitivity in the shaft and the housing makes for the accessibility to the shafts difficult. Due to the water within the housing, the gears would be made of Delrin plastic. This brought up the question of survivability of the gears.