Design Matrix of In Line Motor 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:

In Line Motor Connection

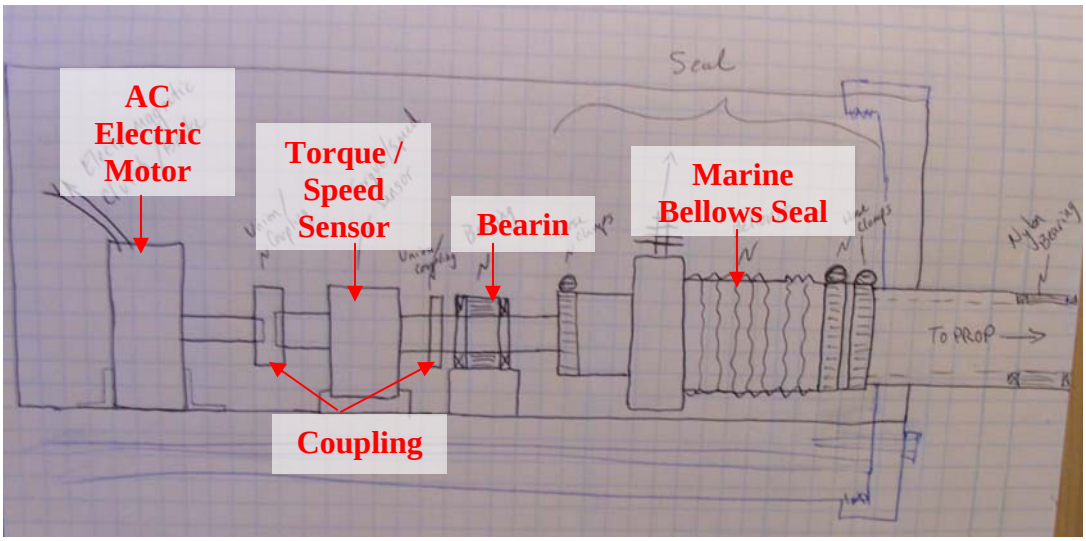

Figure 1: In Line Motor Component Drawing

The AC electric motor will be calibrated to provide a known torque to the shaft at a given input current. This will be coupled to a torque sensor to double check calibration and increase accuracy, while obtaining the shafts speed. The shaft will stay aligned with a bearing and a water tight seal around the shaft with a marine bellows seal system.

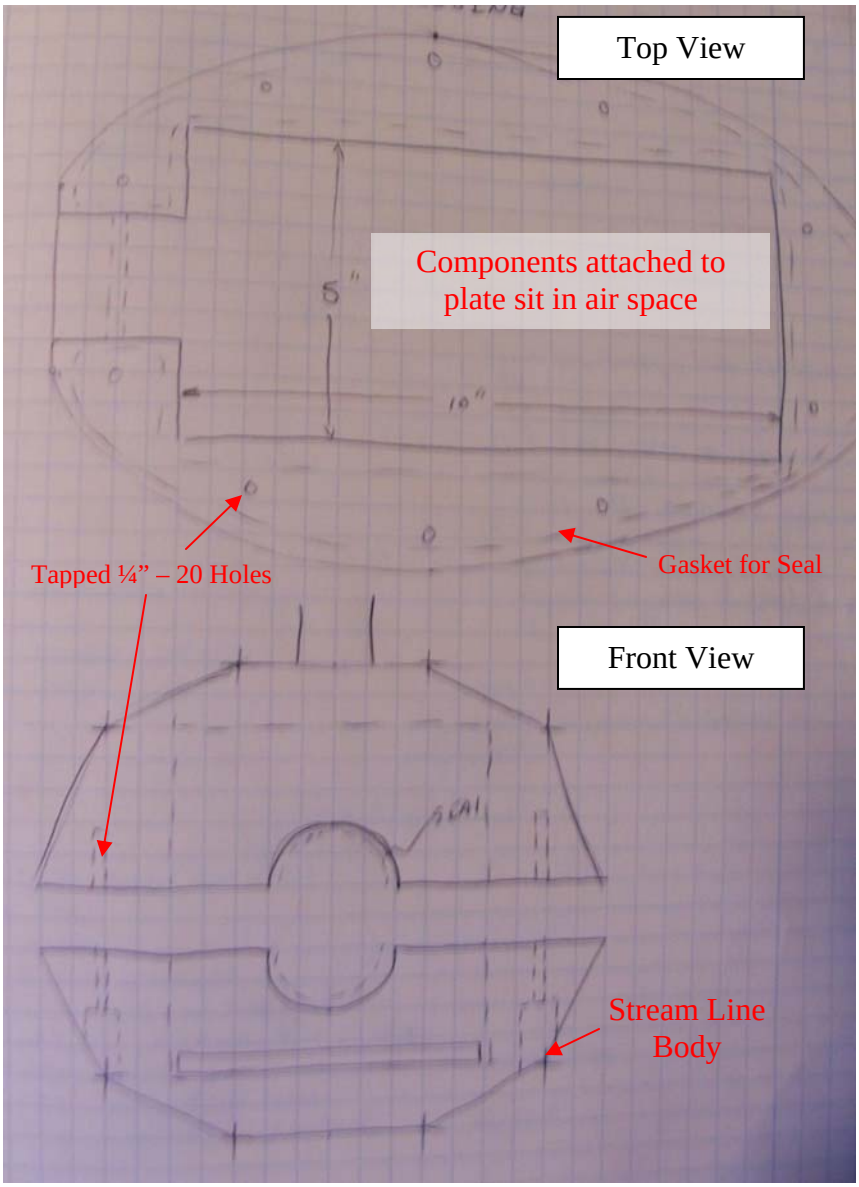

Figure 2: Front and Top View of Housing

This apparatus was chosen so that the instrumentation would run inline with the turbines shaft and not have any frictional losses of gears or chains. Along with the milled out housing a pipe was also considered. We chose the milled out housing for its stream line shape and the support it provides close to the turbine. The big question with this apparatus is the seal on the shaft and making the housing watertight with a gasket. Using a plate gasket between the flat surfaces of the two halves of the housing would seal the air space within the housing. For sealing the rotational shaft, two things were accounted for. The seal must work when the shaft is not rotating and have low frictional losses when rotating at speeds between 50 rpm and 3000 rpm (preliminary calculations of shaft speed). The seal we chose is for a marine prop for a motor boat. The manufacturer assured us that it would seal the shaft at speeds between 0 and 6000 rpm, however they were unable to give us a resistance torque or frictional lose metric for the seal.