Introduction

Thank you for taking some time to peer into the current phase of team Barracuda's senior design project. The ASNE PEP propulsion team (Team Barracuda) consists of five seniors. Each one of us were attracted to this project due to the complexity, topics, and general curiosity. We look forward to sharing more with you as we progress through the project.

The Current Status

The team has been in a basic research, modeling, and general design phase. So far, the team has agreed on an outboard design to suit the hull team design, which will be a design utilized by other students or teams in the future. The team has also made a simple mathematical model of the system using transfer functions, which will be utilized for analysis in MATLAB. A DC motor was chosen for overall simplicity and to reduce drive system costs. Outboard casing will be salvaged to utilize the waterproof capabilities and to stay within the team's budget.

Constraints

A fast-outboard motor will require a DC motor with the capability to drive the rotational system greatly. In order to use a more powerful DC motor, battery capacity must be increased in order to meet performance and operation time. This introduces the weight constraint, which is a huge constraint for the team, design. Machining capabilities at the Mason Manassas workshop provides another constraint when constructing custom couplings, gears, and bearings. The team is still working to figure out what mechanical components are buildable with the tools provided.

Design Ideas

Three designs have been proposed in the team so far. Two conventional outboard designs utilize a lower horsepower range motor, and a higher range horsepower motor. The lower horsepower motor will add less weight to the hull but will sacrifice overall speed to do so, while the higher range horsepower motor has the opposite scenario. The third design proposed is a waterjet outboard. This design will utilize nozzles built by the team in order to focus jet flow for better propulsion forward.

Overall System

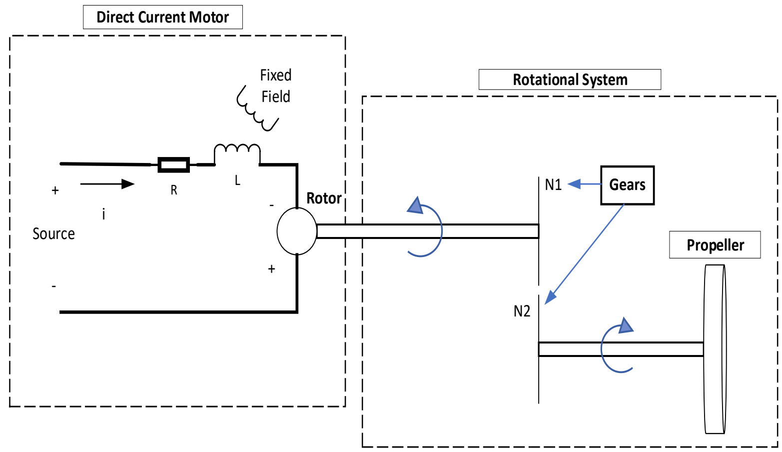

Figure 1. General EPS Model

The general system design is shown, this system is simplified for the predesign phase in order to mathematically model the system simply. The overall drive system from the battery to the DC motor is shown below. The diagram components may change, further testing on a smaller DC motor/servo will be carried out to test throttle controls and any other components deemed necessary.

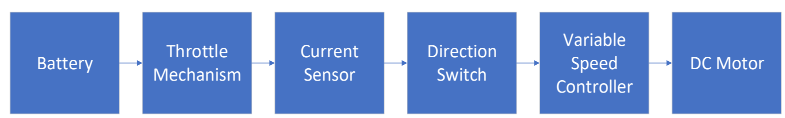

Figure 2. Drive System Breakdown

A current sensor will provide necessary feedback for the current inputs. A throttle sensor may also be utilized, this will be decided upon in the preliminary design report.

Next Steps

The team will have a systems requirement report in early October. The system designs will get more specific in regards to thrust output as soon as sourcing for necessary components (DC motor, battery, casing) finalizes and the team has set specifications to design with. Testing procedures for the drive system will be conducted using smaller components for the DC motor and the battery. Construction of the propulsion system will begin in late December, or as soon as materials come in.

Topics for Resources

For further detailed research it would be helpful to have personnel that may have more direct or relative experience/research with electric propulsion systems. The team's current topics that require resources are listed below.

- Electric propulsion design for small vessels
- Battery use and management
- Variable speed controllers
- Outboard design
- Propeller dynamics
- Marine propulsion modeling or simulation software

BARRACUDA

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