

*EE/CprE/SE 491 WEEKLY REPORT 5 (11/12/19 – 11/25/19)*

*Group number: sdmay20-27*

*Project title: Gauss Sensor for Magnet Array Filter*

*Client: Dennis O'Neel*

*Advisor: Dr. Mani Mina*

---

*Team Members/Role:*

*Muhammad Lutfi Latip -Team Manager*

*Irfan Rafie – Test Engineer*

*Vishal Patel – Meeting Scribe*

*Muhammad Aiman Zulkefli – Research manager*

*Wei-nee Long – Report Manager*

---

**o Weekly Summary**

The objective for these 2 weeks was to discuss the plans in conducting the experiment of designing a Hall Effect Sensor, and the setup of the workspace in Dr. Stewart's lab to conduct our testing of the sensor. We also discussed further the following topics:

1. Positioning within the collar
2. Methods of acquiring an Arduino board
3. Improving the design of the PCB and sending the design out for printing

Based on the topics listed above, we successfully created an early design of the Hall effect sensor probes that are to be latched around the magnet ring collars in getting data on particle build ups around the filter. On top of that, the team successfully discovered a few models of the Hall sensors from different companies that can be used for testing and comparing their sensitivity and accuracy. Aside from that, we had initiated the early design of the software for the sensor that is

connected to Arduino in converting analog data into digital that is to be used and transferred to the computer to be shown to the user.

## o Past week accomplishments

- *Everyone: Discussion on Timeline and Budget*
  - o Discussed with the client on the overall timeline of the project, and overall budget estimation to be used later throughout the 2 semesters
  
- *Irfan, Vishal, Aiman: Further research on Current Gauss and Eddy Current Sensors and their capabilities and limitations*
  - o Researched on implementation of gauss and eddy current sensor that is to be used in detecting particle buildup in the filter and the oil engine.
  - o Discussed on the capabilities of the sensors in requiring data with having other ambient sources that have effects in the sensitivity of the sensors.
  
- *Lutfi: Research on the acquisition of used engine oil for the experiment*
  - Research on the team's current idea of using the used dirty engine oil that Cyride is willing to provide. Data would be used in the development of a threshold for the measurement of particle build-ups inside the filter.
  - However, using used engine oil has a lot of ambiguity. The particle content of the dirty oil is undeterminable, hence it is difficult to know exactly what is going on during the experiment.
  - Dirty engine oil might not have any metal particles at all. Hence, he emphasizes on doing the controlled-setup first, so that we can first proof that our concept worked before we can apply it towards a real-life situation to get the real-life data.
  
- *Irfan: Research on the framework of the Coding for the Software*

- o Improvise the design code of the software that is to be used in connecting the sensor probes and Arduino in getting data measurements
  - o The software helps in converting analog signals from the sensor probes into digital signals to be used in recording data of the change in the magnetic field caused by particle buildup in the filter
  - o The data will be used in the early development of the threshold indicator for changing filter that will be further discussed in its implementation
- *Lutfi, Vishal: Research on the feasibility of the project*
  - As advised by Dr. Stewarts, we decided to start with a controlled environment set up as a start. We would use clean oil and inject metal particles into the system.
  - The current goal for our testing right now is for a proof of concept, where we are using hall effect to detect the changes in the magnetic field inside the filter as an indication of the increase of particle build-ups around the filter.
- *Weinee: Research on the possibility of using the knowledge of Eddy Current to detect changes in the magnetic field*
  - Gained knowledge of the concepts of eddy current and found out that it is not possible to utilize the knowledge of eddy current in this project
  - Eddy current is useful only on stationary objects and systems
  - Currently, there's no research using eddy current on moving systems
- *Aiman: Arranging the availability of facilities for our experiment*
  - Dr. Stewarts offer to provide us with the training of using the lab
  - The team will set up another meeting with him where he will demo and explain to us how to use the equipment in the lab and how to set up the workspace to conduct our testing.

## o Pending issues

- *Everyone: Determine the best position of Hall Effect Sensors on the filter*
  - o We need to research on the optimal position to place the sensor in the filter collar and research on how to accommodate that into our circuit design.
  
- *Everyone: Research on adding section to choose type of vehicle in code*
  - o The sensor will need to be capable of working on different types of machines therefore a selection will be necessary

**o Individual contributions**

<b>NAME</b>	<b>INDIVIDUAL CONTRIBUTIONS</b>	<b>HOURS THIS WEEK</b>	<b>HOURS CUMULATIVE</b>
Muhammad Lutfi	- Further testings and researches on sensors to understand positioning within the collar	12	60
Irfan Rafie	- Researched on the GUI and started on the coding of the software for the sensor with Arduino in data acquisition later during the testing - Completed the code for interpreting the incoming data from the sensors	12	60
Vishal Patel	- Designed an improved draft of project design for the sensors and their optimal position to be latched onto the magnet collar - Completed Report 4	12	60
Muhammad Aiman	- Set up meeting with cyride to discuss about the possible usage of our collar on their vehicles and collection of their older oil	12	60
Wei-nee Long	- Helped in planning the upcoming week's duties and presentation. - Research on the possibilities of utilizing the concept of eddy current in our project	12	60

**o Plans for the upcoming week**

- *Everyone: Acquiring gaussmeter from ETG or Ames Laboratory*
  - o Need to obtain gaussmeter from either the ETG or Ames laboratory to be used for testing

- *Irfan Rafie: Emailing Dr. Brian Steward*
  - Keep him updated about the progress of the project and asking for his professional opinions on the project
- *Wei-nee Long: Further research on Temperature Sensors and Eddy Current*
  - Look into how we can implement the sensor in calibrating with the hall effect sensor in getting data, having temperature as a variable in fixing data measurements from the sensors.
  - Look into how we can implement the Eddy currents in order to detect different metals that escape the filter and go downstream of the system
- *Vishal Patel: Send out PCB schematic for printing and look into the need of stepping up the voltage coming out of the sensor*
  - Further research on improvements and other modifications that can be made to the design of the sensor
- *Aiman: Emailing CyRide to obtain used engine oil*
  - Meeting CyRide to obtain dirty used engine oil that Cyride is willing to provide in developing the threshold for the measurement of particle build-ups inside the filter.

#### ○ **Summary of weekly advisor meeting**

- Successfully outlined the duties that need to be done in the following weeks which includes research on the design, obtaining sensors from different companies to be used during testing, and collecting data regarding gauss measurements.