



Department of Electronic and Telecommunication Engineering
University of Moratuwa

Project Self Evaluation Report

Multi-turn Absolute Magnetic Encoder

Epa Y.L.A.	210156U
Epa Y.R.A.	210157A

This report is submitted as a partial fulfilment of module EN2160

Feb 2024

We are making a multi-turn absolute magnetic encoder for this project. These encoders can count the angle revolved along with the number of total revolutions up to that point. They are mostly used in industrial machines where precise motion control is required along with the exact rotations did. Specially after a power failure, the knowledge of the exact position of the motor's shaft is crucial to ensure the safety in some applications.

(1) Apply what you learn as engineering principles during last three semesters.

We should consider the user's needs in making this encoder. It should be reliable and should provide the correct angle output in top of all. It's also desirable to get some feedback after making this encoder and testing it. Also, we need to consider the efficiency and feasibility of the circuit. It is also desirable to make our encoder with proper quality and performance to be presented as a fine engineering product.

(2) Apply Mathematics and Science you learned during your A/L and last three semesters.

For this project we have many Mathematics and Science knowledge in practice. As the main objective of the encoder, we have to know the correct angular position of the shaft. Also we can calculate the angular velocity and we need calculus for this. Since this is a magnetic encoder, we can use linear algebra to analyse the magnetic field of the encoder using vectors and it's effect. We also have to use the knowledge of torque and friction to study the motion of the shaft.

Moreover, we have to apply the theories of electromagnetics to understand the magnetic field of the encoder and more things about it like flux. More importantly, we have to use all the knowledge about electronics we learnt throughout our first three semesters to do this project.

(3) Apply hands on skills you learn during last three semesters.

We apply the hands on skills we learnt during the last three semesters in many aspects. Programming, soldering and circuit designing, simulation, testing, designing PCBs and enclosures are the major skills we use here. Circuit design skills are used when implementing a circuit that can power the encoder, read sensor signals and communicate with the controller. Programming is used when writing the code for controller. Other skills come to use when testing and implementing the circuit.

(4) Applicability of your project for solving an industrial problem in Sri

Lanka.

Our project can reduce the dependency on imported encoders and save foreign exchange while having all the benefits of a multi turn absolute magnetic encoder. By improving the accuracy and precision of the encoder in measuring the rotational position and speed of equipments such as robots and conveyors, and we can enhance the efficiency and performance of the industrial processes.

(5) The cost of main items needed are within the budget (what you can spend as a team)

We have identified main components needed for this project. One of the main ones is the hall effect sensor. Also, magnets, encoder disc, microcontrollers, PCB and a proper enclosure will be the main costs in this project. All of these fall within the budget constraints of our team.

(6) Suitability of the project to achieve the learning outcomes of the EDR course.

This project involves creating schematic diagrams, layout designs and circuit simulations, and then following the best practices and guidelines for PCB design with industry standards. It also involves considering the factors such as size, shape and material that affect the appearance, functionality, and usability of the encoder.

We need to prepare documents on design specifications, schematics, layout files and user manuals that describe the design process, components, features, and operation of the encoder. This is a real-world scenario where we have to design, test, and document an encoder that meets the customer's needs and expectations, and then demonstrate its functionality and performance. So most of the learning outcomes of EDR course are achieved by this project.