

Control and Implementation of Permanent Magnet Synchronous Motor in Cowbrush unit

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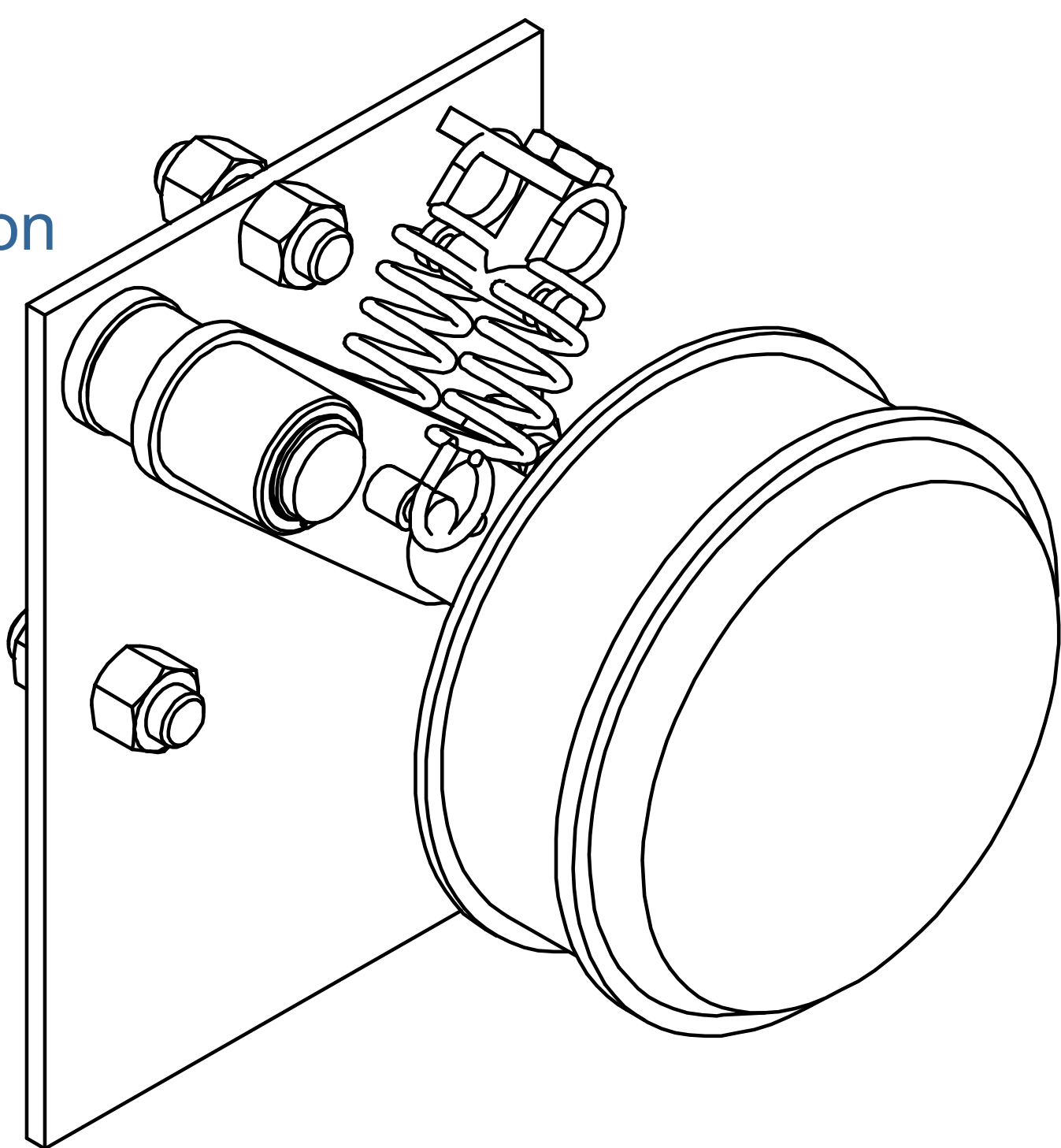
Introduction

This project has dealt with a redesign of a Cowbrush's power transmission. The redesign has mainly dealt with three engineering areas: Mechanical design and construction, Electrical PCB design and fabrication and theoretical modelling with FOC control.

Mechanical Concept

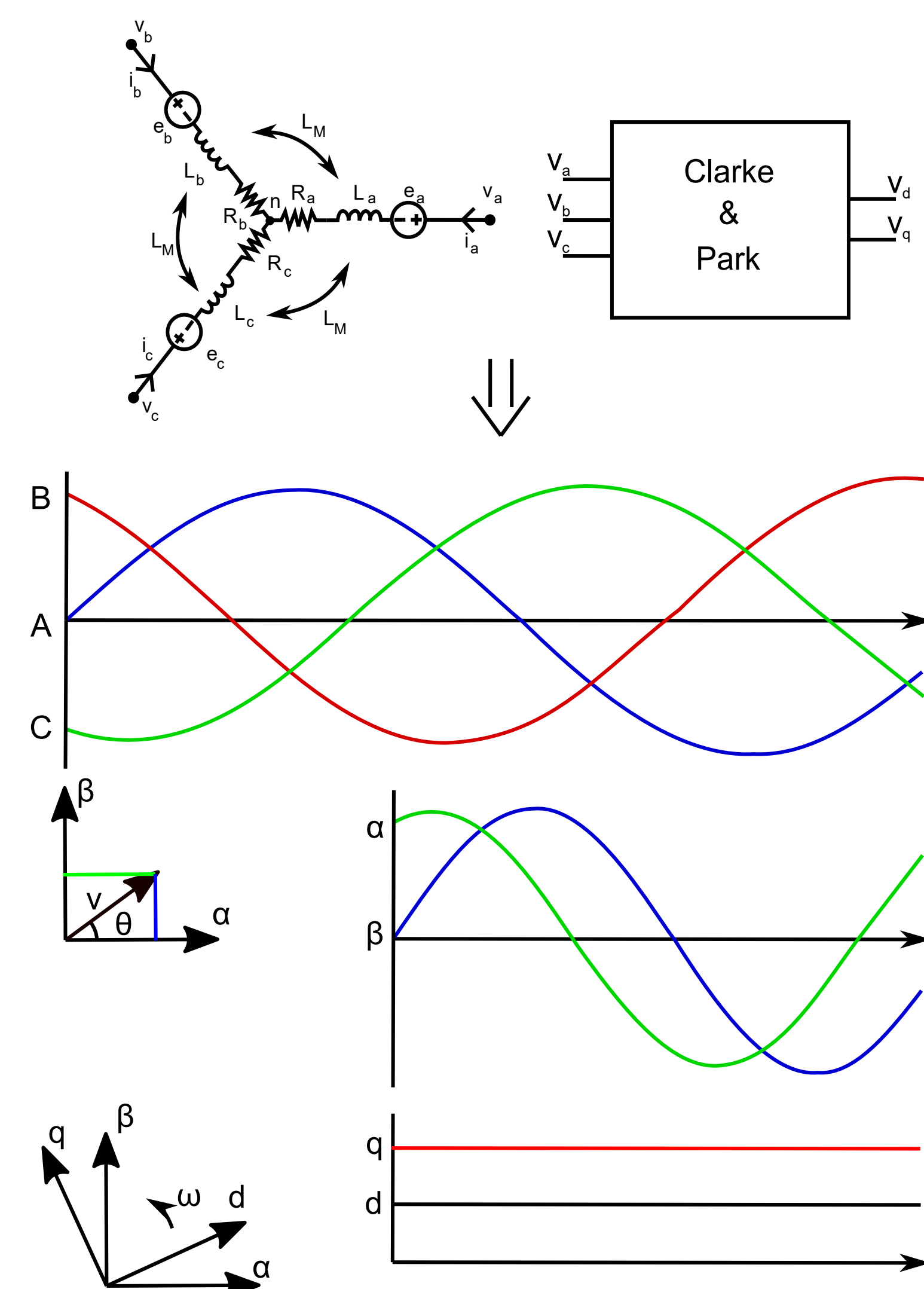
The mechanical constructed design is a belt driven transmission where the belt is tensioned with a two springs. The deformation of the springs can be changed with a nut.

The design is integrated in one setup which makes it easy to implement for different units of brushes.



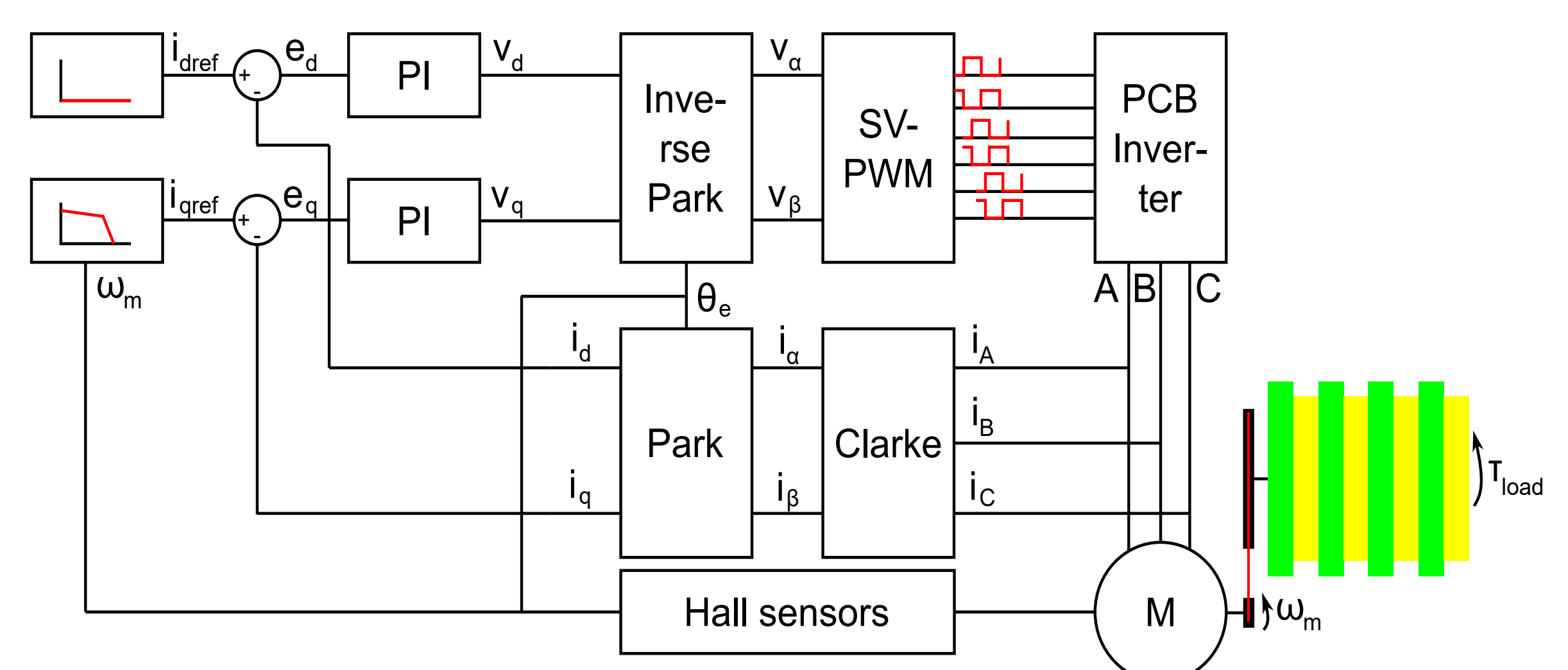
Modelling

A time domain model is established for the electromechanical system, where differential equations described the dynamic and steady state responses of the system. A transformation from the three phases to a rotor fixed system is utilized in the motor model, to simplify it.



FOC Control Structure

A Field Orientated Control structure is established for the system, which drives the system with a desired torque control. The torque is controlled by two PI controllers that regulates the currents, that transfer into a smooth operation of the brush seen from a cow.



Conclusion

It can be concluded that the project has done a redesign of the drive train for the Cowbrush unit. The redesign implements a new belt transmission with a PMSM, where a DSP and corresponding PCB utilizes a FOC control to active and run the brush. In the project a error and correction of the physical PCB needs to be done.

Acknowledgement

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Inverter Design

The electrical PCB design is based on a general three phase inverter. The PCB is plugged together with a DSP, which is programmed to do FOC.

Besides a inverter function, it is also able to activate the brush when the housing is rotated more than five degrees, with the use of a gyroscope.

