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EE 463

STATIC POWER CONVERSION I

HARDWARE PROJECT SIMULATION REPORT

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# **INTRODUCTION**

This report includes details of 3 Phases 1 Company’s topology selection, computer simulation results of the topology and component selections for driving a DC Motor with either a single phase or 3 phase adjustable AC voltage input.

# **TOPOLOGY SELECTION**

Our first aim is converting AC input to DC input which can be done by either using diode switches or thyristor switches. Using thyristor switches are advantageous since controlling firing angles also enables us to control DC voltage level. Speed of the motor is proportional to DC voltage applied to armature winding and controlling its speed is our second aim. However, synchronization of gate signals might be problematic in implementation. In single phase thyristor rectifier, this problem becomes easier due to number of thyristors but ripple frequency of a single phase rectifier is 100 Hz which is one third of the 3 phase case. Lower ripple frequency means a filter with lower corner frequency needs to be used which would require higher inductance and capacitance in the filtering elements.Another problem with the single phase thyristor rectifier topology is requirement for components with higher current rating in order to transfer enough power.Cooling them would be another issue. As a result, both thyristor topologies have some disadvantages.

On the other hand, using a diode rectifier topology does not have a problem like synchronization of the gate signals and 3 phase input can be used. The problem with the diode rectifier is we cannot control output voltage. Hence, we cannot control the speed as well. In order to achieve both our goals with diode topology, we need another stage to control DC output. Since our voltage output from previous stage is high enough and we need to lower it, our DC-DC converter topology will be buck converter. Buck converter is not hard to implement but requires a PWM signal to control on and off state of the transistor. To conclude, 3-phase diode rectifier and buck converter will be our topology to implement.