

Three Phase Thyristor Controlled Rectifier

Project File

bridge thyristor 1ph.sqproj

Introduction

The primary objective of this example is to study the three phase thyristor based controlled rectifier with the most common type of loads and filters at the output.

Simulation Example

The three phase thyristor bridge rectifier circuit is shown in Fig. 1 with R-L load at the dc-side. Here, the output resistor is kept at 1Ω and the inductor is kept at 10mH . The per phase source voltage is kept at 325V (peak). The firing angle is chosen as $\alpha = 60$. To control the dc output voltage the firing angle can be changed in subsequent simulations.

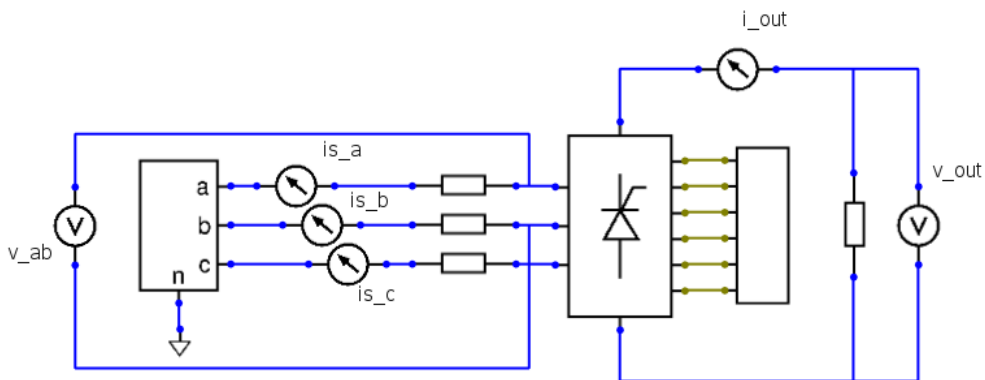


Figure 1: The Schematic circuit for the three phase thyristor-bridge rectifier with R-L Load

Sample Plots

The thyristor rectifier circuits are non-linear, uncontrolled rectifier circuits. The output voltage and the source current are generally considered as the important parameters to analyze such circuits.

The simulation results of the thyristor bridge circuit with R-L load are shown in Fig. 2. Here, the rectified output voltage, the source current are shown along with line-line source voltage. Due to highly inductive load the source current appears as a square wave. The notches on the source voltage is clearly seen due to the presence of source inductance and the thyristor firing.

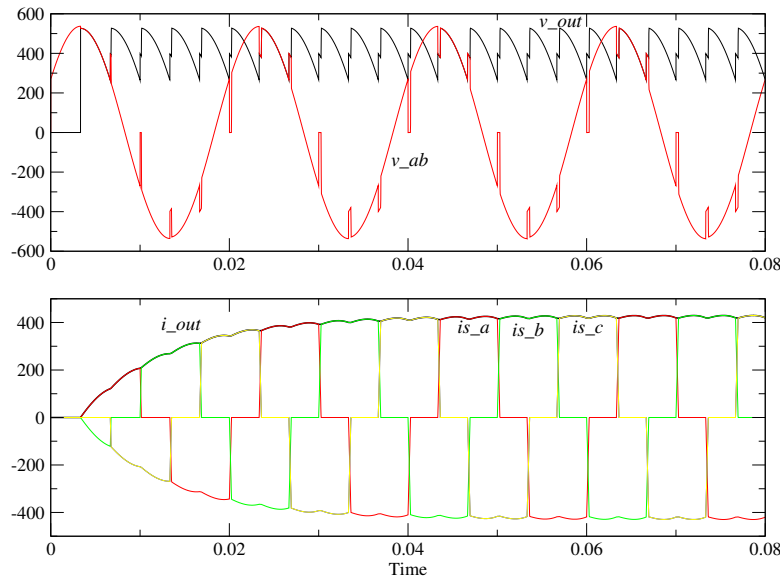


Figure 2: Simulation Plots for a three phase thyristor bridge rectifier with R-L Load.

Few sample exercises are given here to get the complete understanding of the topic.

Exercises

1. Vary the firing angle α and re-run the simulation to study the variation in output dc voltage and source current harmonics. Verify the relation between thyristor firing angle and the average output voltage.
2. Vary the load and see the effect on source current
3. Add source impedance and study the notches generated in input voltage due to thyristor switchings.

References

- [1] Ned Mohan, T.M.Undeland and W.P. Robbins, *Power Electronics: Converter, Applications and Devices*, Second Edition, John Wiley and Sons, 1995