Design of Solid-State On-Load Tap-Changer for Transformer Using MATLAB Software

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Abstract - *The on-load tap changing (OLTC) regulators have been widely used in various industry. The main function of OLTC is to change the turns of transformer winding, so that the voltage variations are limited without interrupting the secondary current. In other word the voltage can be regulated with the changer without any supply interruption.*

Key Words:Solid State on Load Tap-Changer, semiconductor tap changer consists of a thyristor, MATLAB Simulation.

1.INTRODUCTION

The on-load tap changing (OLTC) have been widely used in various industry. The main function of OLTC is to change the turns of transformer winding, so that the voltage variations are limited without interrupting the secondary current. In other word the voltage can be regulated with the changer without any supply interruption.

Today mechanical OLTC can be regulating the voltage dips within few seconds that maintain the equipment in good operation. But they had considerable limitations and drawbacks likes Arc in the contacts of the diverter switches during the tap changing process, High maintains and service cost, Low tap changing speed, High losses of tap tap-changer during tap changing, Create noise disturbance during tap changing process.

2.SYSTEM OVERVIEW

This paper proposes to Design of Solid-State On-Load Tap-Changer for Transformer using semi conductor devices like as Thyristor using MATLAB/Simulink Software.
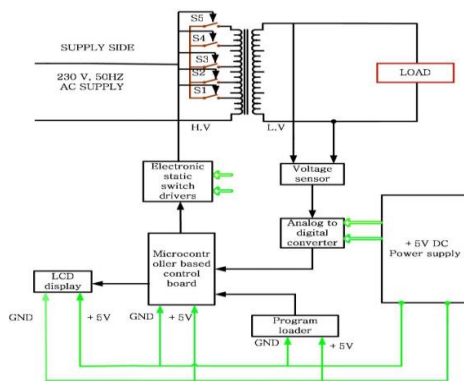

Fig 1 functional block diagram of "solid state OLTC for distribution transformer

This prototype semiconductor tap changer consists of a thyristor as the switching device to turn on the selected tap of the power transformer. As displayed in Figure 1 the low voltage circuit is separated from the high voltage circuit in order to protect the Micro controller from damage.

3.SIMULATION RESULTS

The simulation model was designed in MATLAB/Simulink Software. There is two types of simulation done in MATLAB software.

In figure 2 power strategy of load tap-changer with open loop control is simulated using the MATLAB 2009a software. Transformer is design with two tapping at LV side. At that time 230 V supply feed at input (HV) side.
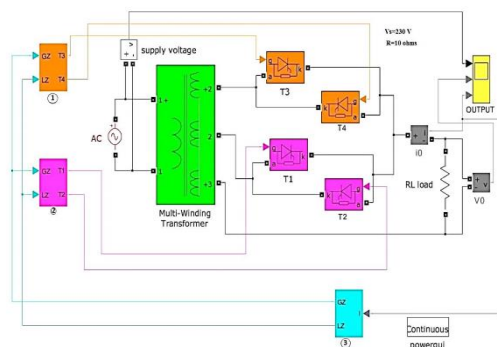
1.   Open Loop Simulation

Fig 2 Simulation model of R load for taps on LV for LV variation

When the shown in figure 3 the waveform of R load for open loop control. at the time of 0 to 0.04 ms thyristor T1 conduct for positive half cycle and T2 conduct for negative half cycle. Similarly for time of 0.04 to 0.08 ms thyristor T3 and T4 conduct for positive and negative half cycle respectively.
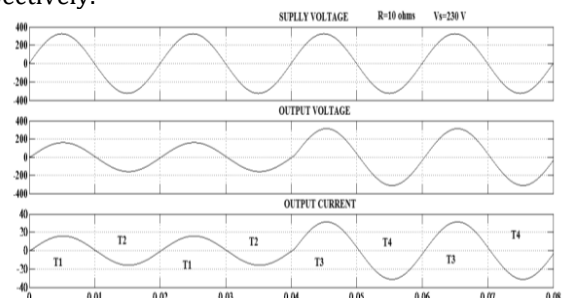
Fig 3 Waveform for R load

2.   Closed Loop Simulation

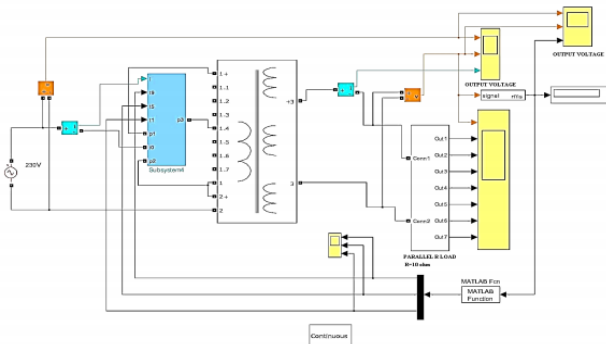Show in the figure 5 after 0.2 ms RMS voltage is maintained.

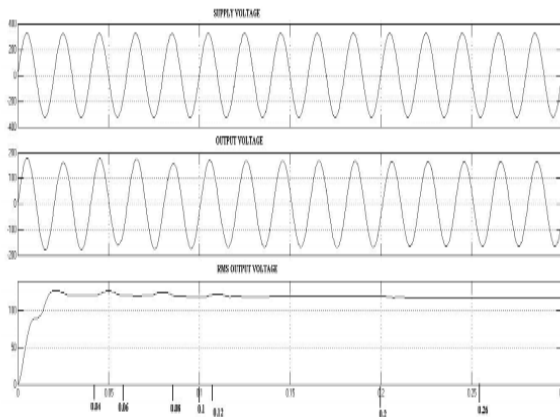Fig 4 Simulation model with thyristor close -loop control

Fig 5 Waveform of model

4.CONCLUSION

By using semiconductor Devices On-load Tap Changer is better than Mechanical On- load Tap charger. Because of

Remove sparking problem

Reduce switching losses

No require of regular maintenance

Fast reaction time

More reliability

No requirement of separation from the transformer

Reduce size

5.REFERENCES

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BIOGRAPHIES

Ashish Gamit is a Asst. Professor in MSCET,Surat. He has 2.7 year of experience in Electrical Engineering.