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Implementation of Shunt Resonant Step up Fault Tollerant DC-DC Converter

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***Abstract-* The project deals with Parallel Resonant Converter for the case of failure in one semiconductor, which could drastically reduce the need of redundancy. Using the proposed scheme, the full-bridge based SRC can be reconfigured in a half-bridge topology, in order to keep the converter operational even with the failure [open circuit (OC) or short circuit (SC)] of one switch. As a drawback of this technique, the output voltage drops to half of its original value. Therefore, a novel reconfigurable rectifier based on the voltage-doubler topology is proposed as a solution to keep the output voltage constant after the fault. The basic operation of the PRC based on the FB and HB topologies was described. Then, a semiconductor SC fault case is evaluated for the FB-PRC and a reconfiguration scheme, in which the FB-PRC operates as anHB-PRC, is presented.**

As a result of the reconfiguration, the output voltage is reduced. To overcome this problem a modified rectifier that can be reconfigured in a voltage-doubler rectifier, keeping the output voltage constant is proposed. This PRC topology has been majorly used in SST(Solid State Transformer) in order to get a uniform output regulation. The major advantage of this method is that it reduces the redundancy (i.e the ability to make system work even with a failure component).Using this topology we can achieve the output voltage ,which is same as before the failure of component.

I. INTRODUCTION

The parallel-resonant dc–dc converter (PRC) has been frequently used in wireless power transfer application for electrical vehicle, battery charger, renewable energy system, and high-voltage power supply for specific applications, such as traveling-wave tube for satellite application. Recently, this topology became very popular in solid-state voltage regulation characteristic in open loop. The SRC has been used for traction application, where an efficiency of around 98% was achieved. In SST, telecommunication or even in renewable energy system applications, the continuity of operation is of paramount importance. For this reason, a highly reliable system (preferable with redundancies) is required. The fault-tolerant feature contributes to increase the availability of the system and several fault-tolerant methods have been proposed in the literature. Most of these methods include a significant amount of extra hardware (such as semiconductors/leg redundancy or series connection of fuses/switches to isolate the fault, increasing the cost and compromising the efficiency of the system. In this context, this letter proposes a fault-tolerant solution with minimum of additional hardware and no impact on efficiency for the SRC converter, using the advantage of inherent fault-tolerant capability of this topology. Independently from the mechanism, there are two possible failure types for the semiconductor: open circuit (OC) or short circuit (SC).

II HARDWARE CIRCUIT DIAGRAM

The hardware circuit diagram represent the proposed system of shunt resonant converter and thus all components used in the system are drawn together and thus the proposed system will help the resonant converter to get better output voltage even in the fault condition, which help to get a better efficiency even with faulty component which helps the user or operator to reduce the need of redundancy and to can continue to use faulty components and get better efficiency and output voltage.

This circuit will help to provide economy and reliability of operating system of battery charging vehicle. It is kind of dc-dc converter, which to helps to provide higher level of dc voltage for the given amount of input voltage of system.

The fault switch (s_f) is used to connects the diode with voltage doubler. Thus the voltages get doubled in secondary side, which is the desired output of proposed hardware circuit. The Figure 4.1 shows hardware circuit of the proposed shunt resonant step up dc to dc converter.

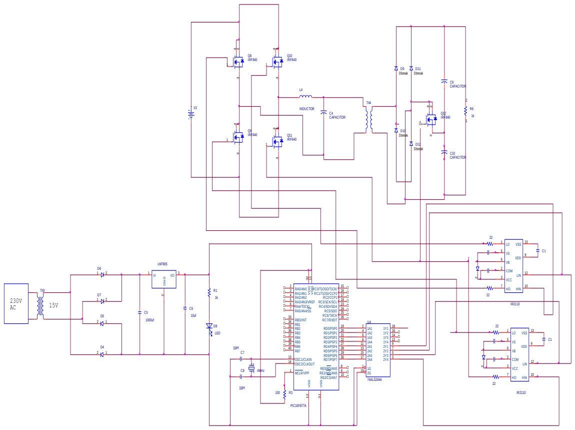


Fig. 1.2 Hardware circuit diagram

NORMAL CONDITION

The Figure 3.1 discuss about the simulation circuit of dc-dc convertor .In this simulation circuit MOSFET (metal Oxide Semiconductor Field Effect Transistor) switches is used. The switches is controlled by the pulses, the special techniques used to control the pulse is that "square wave pulse width modulation" technique.

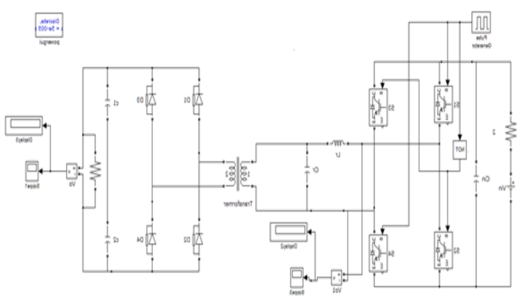


Figure 1.1 simulation circuit of normal condition of SRC

INPUT VOLTAGE

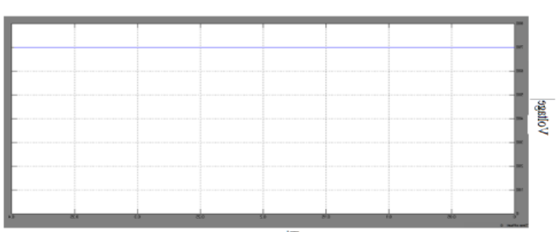


Figure-1.3 Input voltage of the shunt resonant converter

The input voltage for the normal condition is 700V, which is to be converted using converter circuit consisting of MOSFET switches. It is provided directly from the supply without any change in supply frequency.

INVERTED OUTPUT VOLTAGE

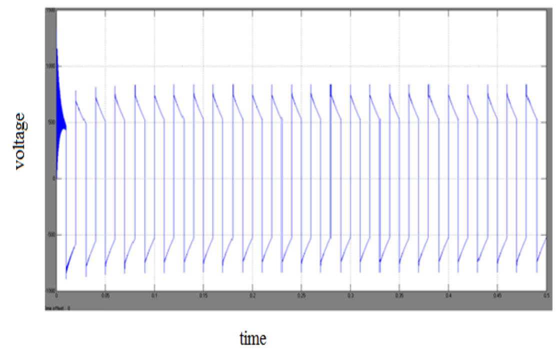


Fig.1.4 Inverted Output voltage

OUTPUT VOLTAGE

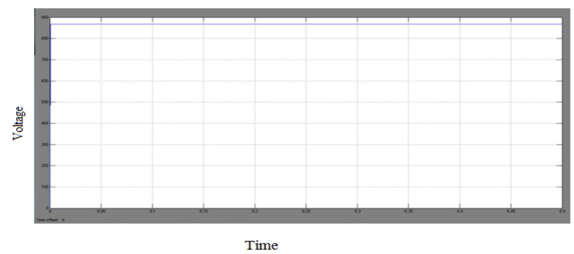


Fig. 1.5 Output voltage

shows the waveform of output voltage of the DC-DC convertor before the fault it is obtained between the voltage (v) and time(t). In this waveform , we can see that the output voltage is normal and it will be same as the input because there is no fault condition in it. Hence there will be no problem in the getting the output voltage from the normal src as there is no faulty component in it.

PROPOSED SYSTEM UNDER FAULT CONDITION

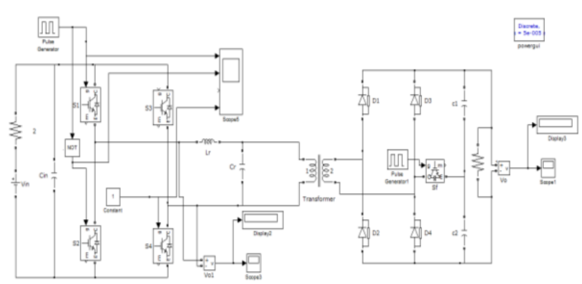
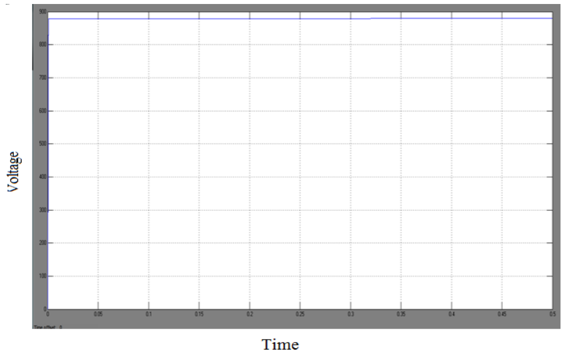


Fig 1.6 Fault condition Diagram

The Figure shows output voltage waveform. the output voltage is achieved like a normal condition even during a faulty condition which ensures that the proposed converter is overcome the fault.



III. CONCLUSION

Implementation of shunt resonant step up tolerant dc-dc converter was discussed, simulated and hardware was developed with its outputs verified. It is now clear that there is an alarming need for the development in dc-dc converter in order to get a better efficiency even in fault condition. It is inferred that the proposed system is advantageous including the reducing the need for redundancy, which produce better efficiency even fault component. The advantages along with future scope of this project is discussed in chapter.

IV. FUTURE SCOPE FOR ENHANCEMENT

The future means of transport mainly depends upon the electrical vehicles and thus it require battery and charging. For this purpose we will require a converter in order to convert the ac to dc voltage for charging purpose of electrical vehicle. The proposed system make use of VDR, which helps to normal output even with the fault electrical components. Thus, this component will be playing a major role in battery charging of electrical vehicle which is going to be our future vehicle.

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