International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Flexible Power Electronic Transformer

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Abstract: ***In every country, transformer is the main source for transmission and distribution. Transformer is a device which can transfer electric energy from one place to another with stable frequency. The main solution for voltage change in transformer is only possible by vary the number of turns. Now FPET is a programmable device who can vary the frequency and voltage as we desire. We can get many outputs but it is depend on the bus power. It is very useful for industrial purpose. This paper proposes a new flexible power electronic transformer. The proposed of flexible electronic transformer is quite flexible to take future needs of power electronic centralized systems. The main merit of flexible power electronic transformer is that it can vary output and get it multiple outputs. It can improve the efficiency and power factor of transformer. FPET is indirectly save energy.***

Keywords: flexible power electronic transformer, bus power, ferret core transformer, flexible output, multiple outputs.

1. Introduction

Transformer is an electrical energy transfer device. Transformers have undesirable characteristics which give some technical challenges such as; it's not controllable by itself, losses, Stability of output & single output. The FPET have potential to solve some problems in transmission and distribution such as; improve power factor, Improve efficiency, and multiple outputs, Output flexibility, Reduce losses and save energy.

Transformers have some properties like it can't vary the output. Still we didn't vary the frequency and voltage by transformer. We know that voltage change in transformer is only possible by change in turns. Change in tur difficult process. Now it will going to easy, chan by FPET. FPET can do frequency and voltag running time. We can get output as we desire. We take keypad connection where to we can control the output. FPET used for industrial application where a single type of transformer can work everywhere. It can control the output and give the output as they desire.

2. Literature Review

Recent year, there are many implementation is going for the FPET for industrial to make it more efficient day by day. Many researches are implementing to optimize the efficiency of the FPET. FPET implement to give flexible and multiple output. Practically we can implement the FPET by many researchers to optimize the better result and to improve the technology for the less consumption of electricity & more efficient.

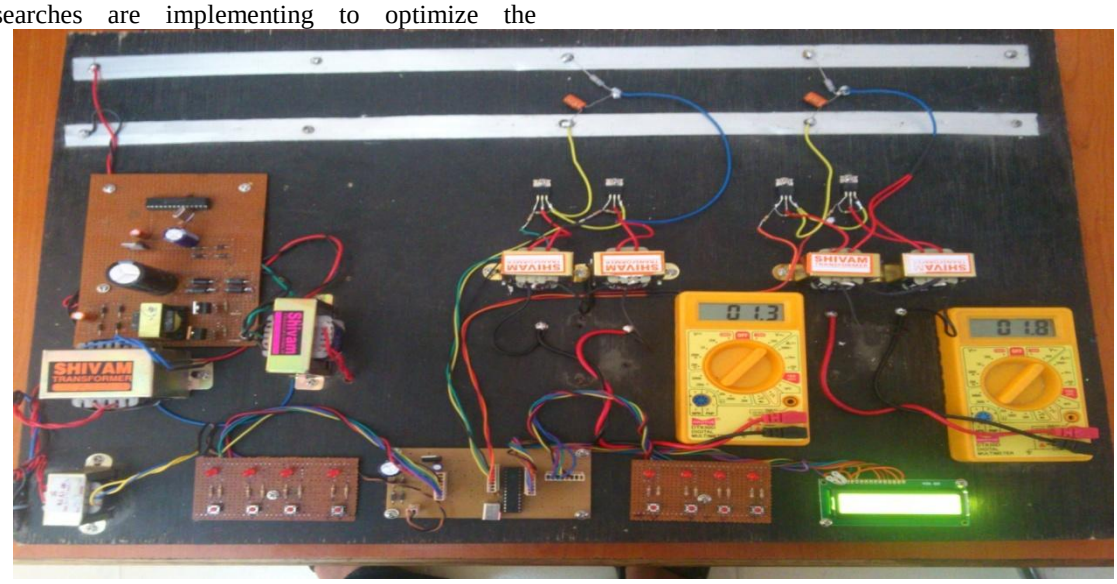
3. Materials and methodology

Through electronic components and programming FPET has been done. We observed the flexibility in output, and take multiple outputs also because of the programmed in c language. All the process is programmable. How to get high DC bus with high frequency and connect output port on the bus.

t multiple output nodes on the high voltage DC umber of output is depending on the bus power. We get voltage and frequency on the output node as we desire. We use the 16F73 PIC microchip to feed the c language program in it. It will work only with the output voltage of +5V. We feed the coding in PIC microchip to run the system according to the feed coding.

Hardware implementation

The hardware implementation of the proposed thesis work is shown in fig below:



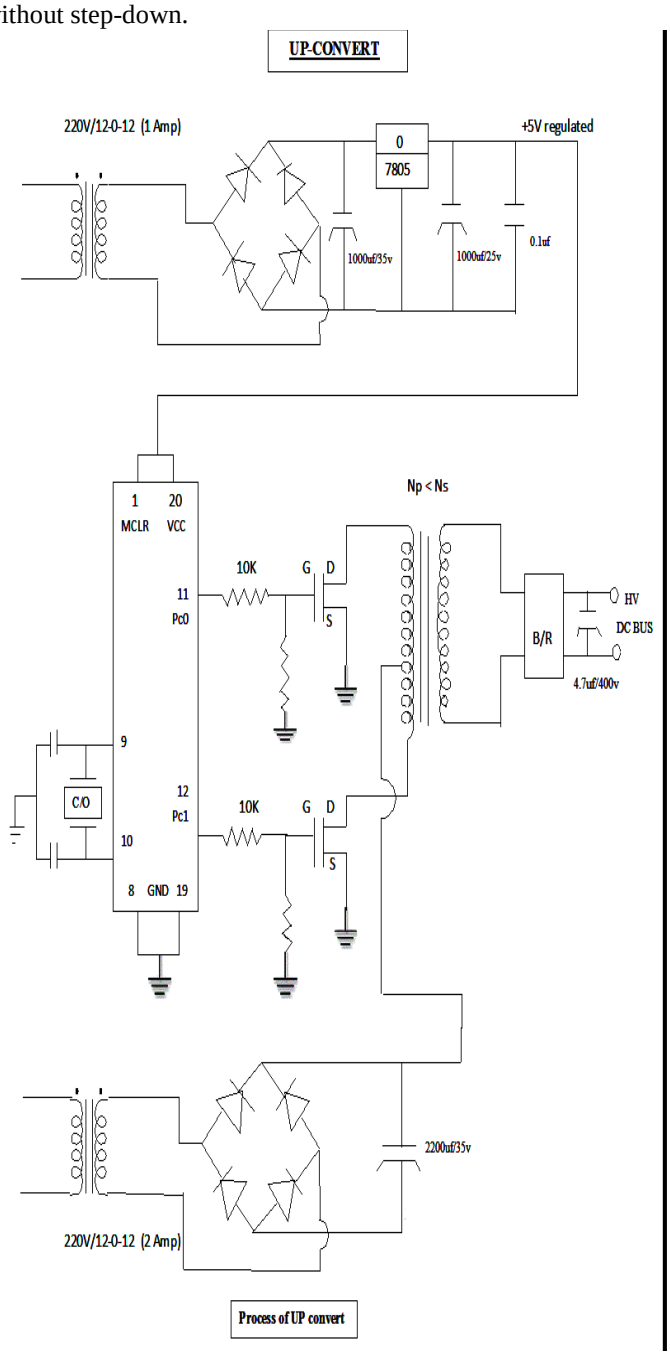
Working of Model Project

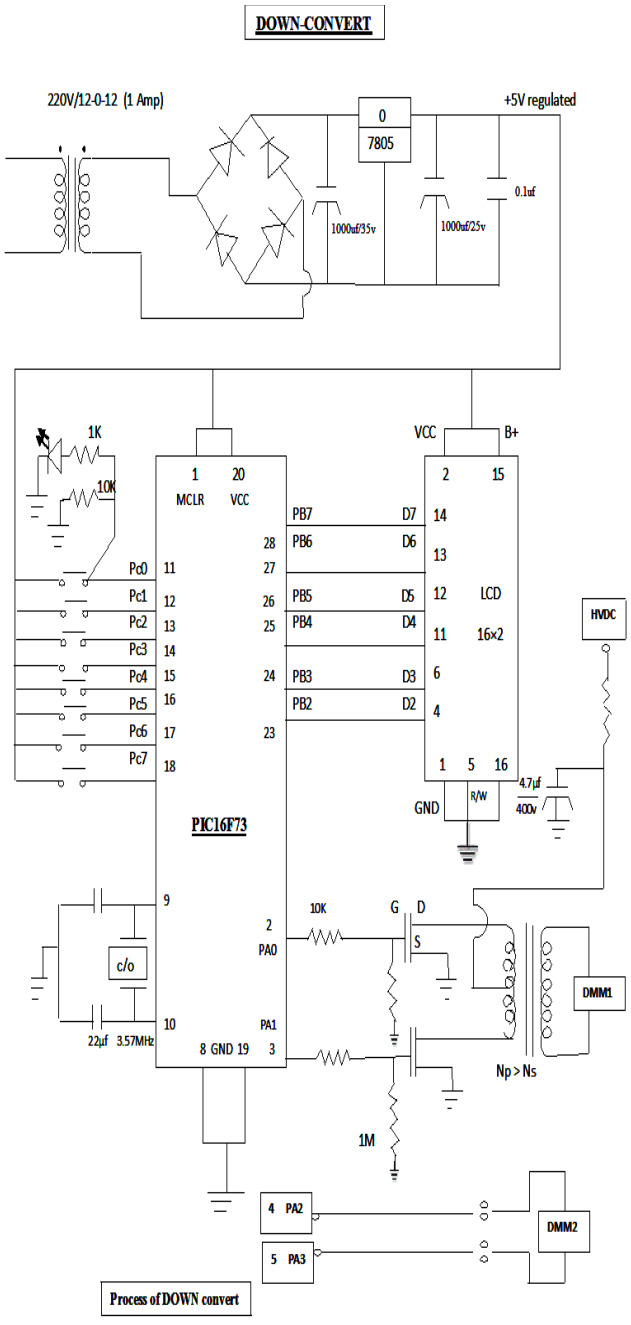
First AC current step down by transformer and convert in 12v AC. This 12v AC current converts in DC by rectifier. This unregulated DC creates a high frequency by chopping. Again I am using rectifier and convert AC to DC current. It is the high voltage DC current, which is given to bus. Now we get it high voltage DC bus.

This process of get high DC voltage on bus is lengthy process but it is done because of protection another way we set up direct connection and get high voltage DC current by direct line frequency of 220v to chopping and get high DC without step-down.

We connect multiple output nodes on the high voltage DC bus. The number of output is depending on the bus power. We use the 16F73/72 PIC microchip to feed the c language program in it. We get voltage and frequency on the output node as we desire.

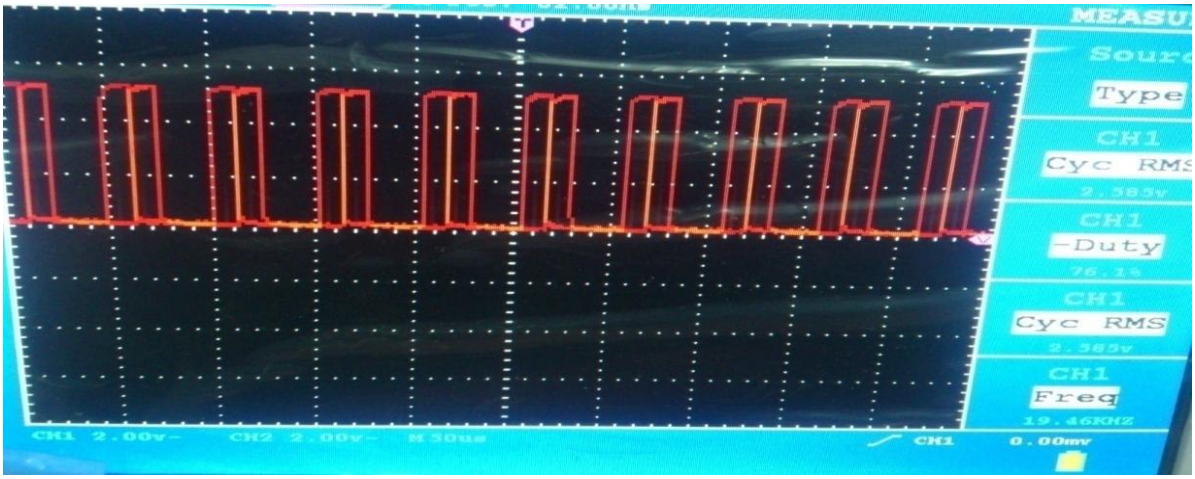
In this setup losses will be reduces because of multiple transformer add on the line which lag multiple power factor. If only one transformer directly drive the rectifier load which is improve the power factor. Efficiency also increases and save the energy. FPET is control manually.





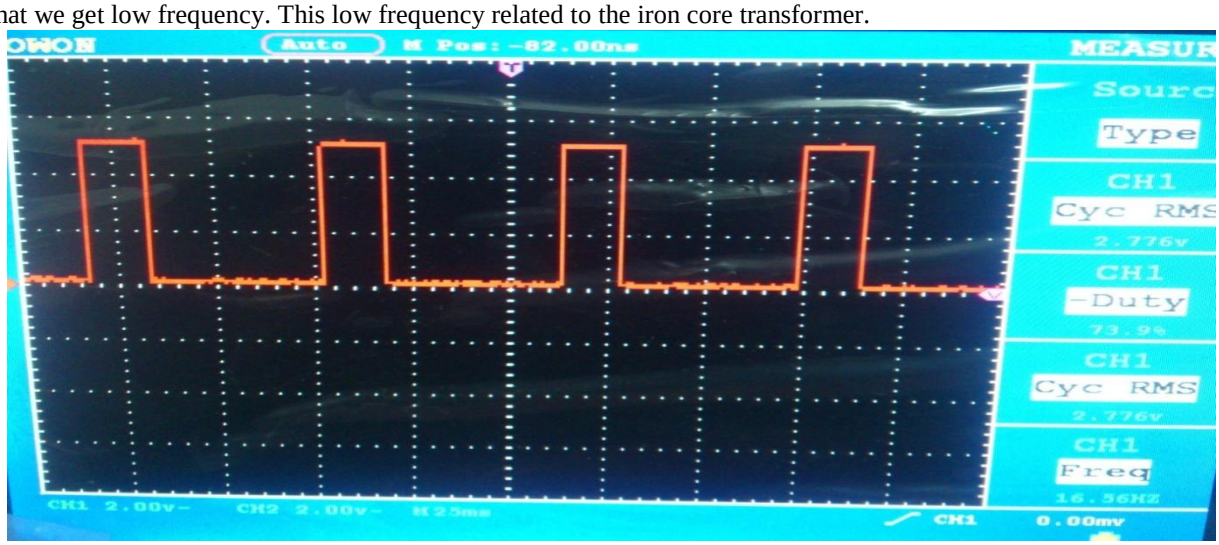
4. Result

For obtaining the result from working model project, we connect the C.R.O probes across the working project. We get waveform for the high frequency MOSFET drive signal (up convert circuit) with 19.46 KHz frequency. This high frequency is for ferret core transformer.



SOURCE	CHANNEL 1	CHANNEL 1	CHANNEL 1	CHANNEL 1
TYPE	CYC. RMS	DUTY	CYC. RMS	FREQUENCY
OUTPUT	2.585V	76.10	2.585 V	19.46 KHz

This waveform explains the down convert circuit. That mean it is describe the mosfet drive signal. In this wave form we had seen that we get low frequency. This low frequency related to the iron core transformer.



SOURCE	CHANNEL 1	CHANNEL 1	CHANNEL 1	CHANNEL 1
TYPE	CYC. RMS	DUTY	CYC. RMS	FREQUENCY
OUTPUT	2.776V	73.9	2.776 V	16.58 Hz

This waveform shows the output waveform for transformer 1. We get mosfet gate frequency. We get output after the step down. We saw that we get same frequency as we give it to input.

SOURCE	CHANNEL 1	CHANNEL 1	CHANNEL 1	CHANNEL 1
TYPE	CYC. RMS	DUTY	CYC. RMS	FREQUENCY
OUTPUT	2.960V	48.8	2.960 V	16.58 Hz

When we change in voltage & frequency of transformer 1, now it is 20V voltage and 60Hz frequency. Waveform for this condition is-

Source	CHANNEL 1	CHANNEL 1	CHANNEL 1	CHANNEL 1
Type	CYC. RMS	DUTY	CYC. RMS	FREQUENCY
Output	2.964V	3.10	2.964V	21.11 Hz

5. Conclusion

Flexible power electronic transformer for the Industrial use is achieved successfully. We are successfully implemented a flexible electronic transformer for 20W output power and 2 output nodes which can be enhanced in future as per requirement. We develop a multiple transformer who is able to give output as we desire. That's change of output are very useful for various application. A single type of transformer could be use everywhere. It will reduce losses because of multiple transformer attach in a line sequence which lag of multiple power factor but there is single transformer work. This single transformer FPET directly drives the rectifier load which is improves the power factor and save energy. FPET also reduce the size and weight of transformer. We can take multiple output by single FPET.

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