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Smart Induction Cooking Using Matrix Converter Based On IOT

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Abstract: The main aim of our project is to implement an induction with multiple loads. Now a days, higher output frequency for multiple load induction cooking is obtained by three leg inverter configuration. The power loss occurs due to the presence of dc link. This can be overcome by matrix converter where high frequency is obtained without dc link. Matrix converter is a bidirectional switch which boost or buck the frequency according to our load. The induction can be operated automatically by arduino and also manually. Here INTERNET OF THINGS is used to turn off the induction from anywhere in the world.The induction cooking process is monitored and operated from anywhere by IOT. Thus the manpower is reduced and it can be user friendly.
Keywords: Arduino, Internet of things, Matrix conveter, Multiple load.

1. INTRODUCTION

Induction cooking is based on the principle of induction heating. Induction Heating is transfer of heat to the object by conduction or radiation process. The current flowing through the coil produces eddy current which results in I2R loss Nowadays people move towards electric cooking for quick finish of cooking. Domestic Induction Heating (IH) technology has become more popular in recent years due to features such as cleanliness, safety, quicker warming, and higher efficiency[2] which outperforms other traditional heating systems. If multiple inductions are used, the electric power usage will be more.

The main motive of our project is to provide a multiple output with a single input source. Through this, the load can be increased by using a proposed topology of matrix converter. Thus, matrix converter topology that can provide ac-acpower conversion with both a variable output voltage and a step-changed frequency.

1.1 MATRIX CONVERTER:

1.Sinuosoidal input and output current
2.Regeneration capability
3.Simple switch commutation
4.Generation of load voltage with arbitrary amplitude and frequency.

1.2 INTERNET OF THINGS:

The on and off of the induction cooking is done with IOT.WIFI module is used for interfacing hardware controller and laptop and it acts as server. The laptop requires net connection and it is provided by either Ethernet or wifi. BLYNK app is installed in mobile phone. By using this app, all the required information of set temperature and induction 1 temperature is viewed anywhere in the world through mobile phone.

1.3 ARDUINO:

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.The Arduino Nano can be powered via the Mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source. The ATmega328 has 32 KB, (also with 2 KB used for the bootloader. The ATmega328 has 2 KB of SRAM and 1 KB of EEPROM.The arduino nano can be powered via the mcomparison process of set and induction 1 temperatre will be done by ardino nano. The indction 1 will be in ON condition till set temperature 1is greater than the induction 1 temperature.

2. BLOCK DIAGRAM AND WORKING

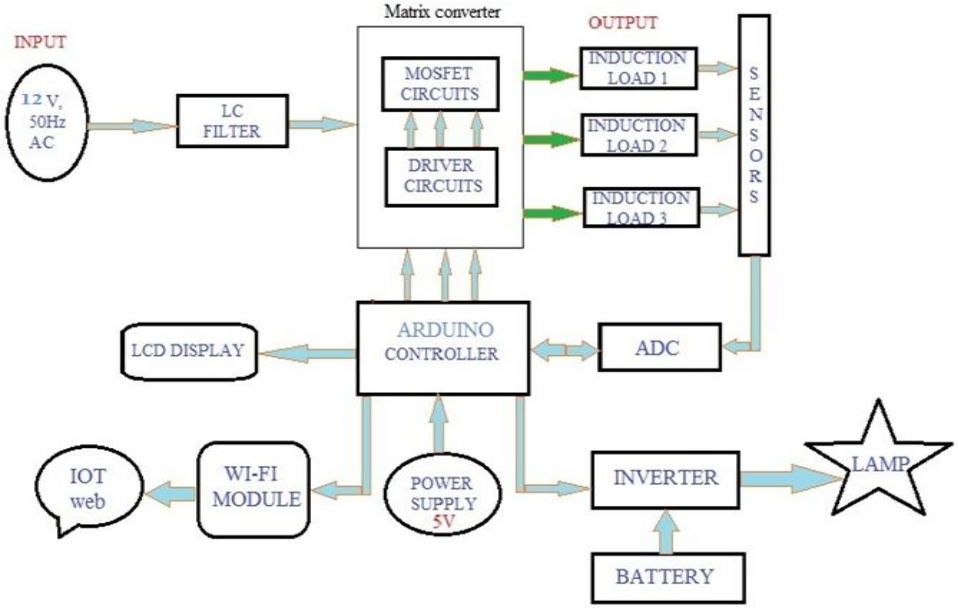

Fig: 2.1 Block diagram

The power supply of 230 volt is step down and given as input to the LC filter which has inductor, capacitor, and a MOSFET connected which is used to boost the voltage. The MATRIX CONVERTER is used to boost the frequency and the induction loads are connected at the output of the matrix converter. Each induction load is operated with the help of relay. The temperature of induction load is sensed by LM35 temperature sensor and converts into analog to digital with the help of ADC module. The temperature is displayed in LCD display. The 5Volt power supply is given to the AURDUINO CONTROLLER and it is not sufficient. So driver circuit is used to drive the MOSFET and it forms as a closed loop.

During power failure, inverter act as a backup power to continue the induction cooking. Hence lamp is used to continue the cooking in the night time. WIFI module is used for interfacing hardware controller and laptop so laptop acts as server. By using the BLYNK app, all the information can be viewed in the mobile phone.

2.1 SINGLE PHASE MATRIX CONVERTER

The single phase matrix converter consists of 4 pairs of 8 MOSFETS which works on both positive and negative half cycle. During positive half cycle S1a,S4a and S2a,S3a will conduct. During negative half cycle S1b,S4b and S2b,S3b conducts[6].

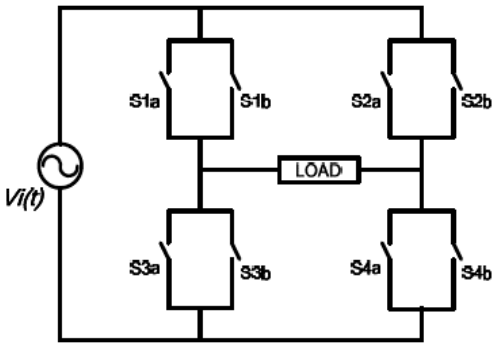

Fig: 2.2 single phase matrix converter

3. FIGURES OF SIMULATION RESULTS

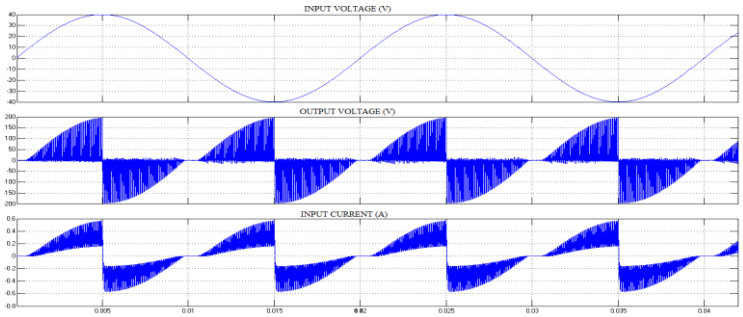

Fig 3.1 Simulated at 25 Hz buck mode

The input voltage is 40v,50Hz supply. Matrix converter converts the fixed frequency into variable frequency. The 40v is boosted into 200 volt by booster circuit. The frequency of 50Hz is buck down into 25Hz.

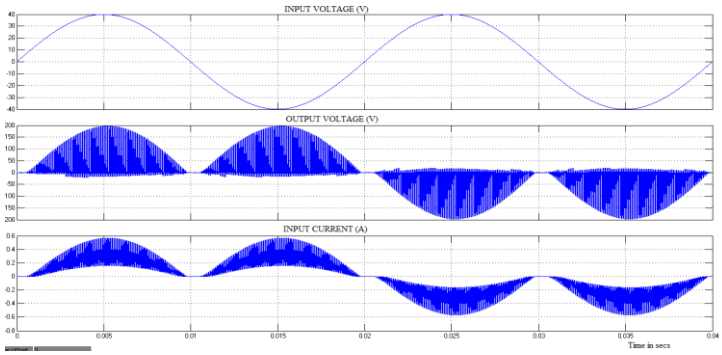

Fig 3.2 Simulated at 100Hz boost mode

The input voltage is 40v,50Hz supply. Matrix converter converts the fixed frequency into variable frequency. The 40v is boosted into 200 volt by booster circuit. The frequency of 50Hz is boosted into 100Hz.

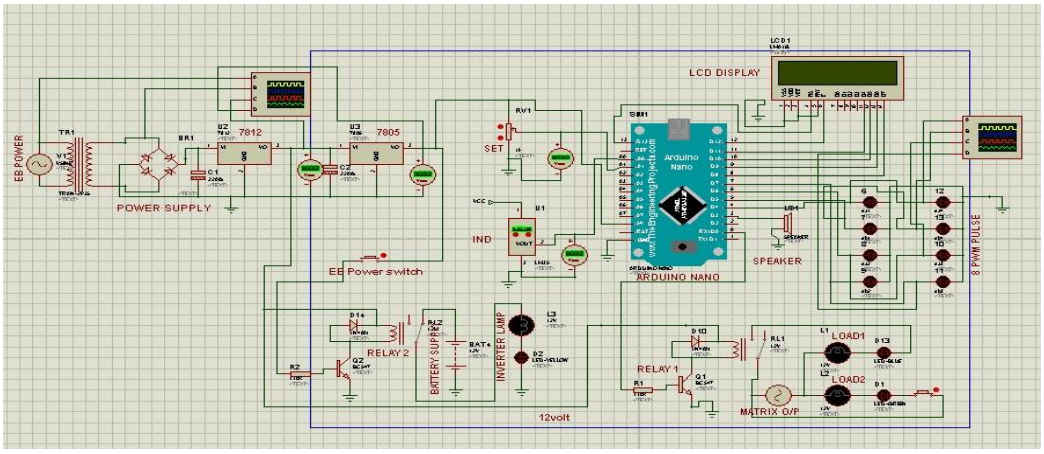

Fig 3.3 Hardware simulated at PROTEUS

The 230v is step down into 12v and 5v dc by 7812 and 7805 voltage regulator. This 5v is given to arduino nano and potentiometer to set the reference temperature. The temperature sensor is used to sense the induction 1 temperature. The 16*2 lcd display is used to display the set and induction temperature. The 4 pair of 8 mosfet is connected to arduino[3] and it operates in both positive and negative half cycle. The 0^{th} pin of arduino is connected to the relay and the output from arduino nano is 5V which is not sufficient to drive the relay. Hence driver circuit is used to boost the voltage from 5V to 12 V. The matrix converter output is connected to the load which will provide the variable frequency. To TURN ON the induction, set temperature

must be greater than the induction 1 temperature otherwise induction will be TURN OFF. Induction 2 will be turned on and off manually. If the power supply is cut off, the relay makes to provide the supply by battery.

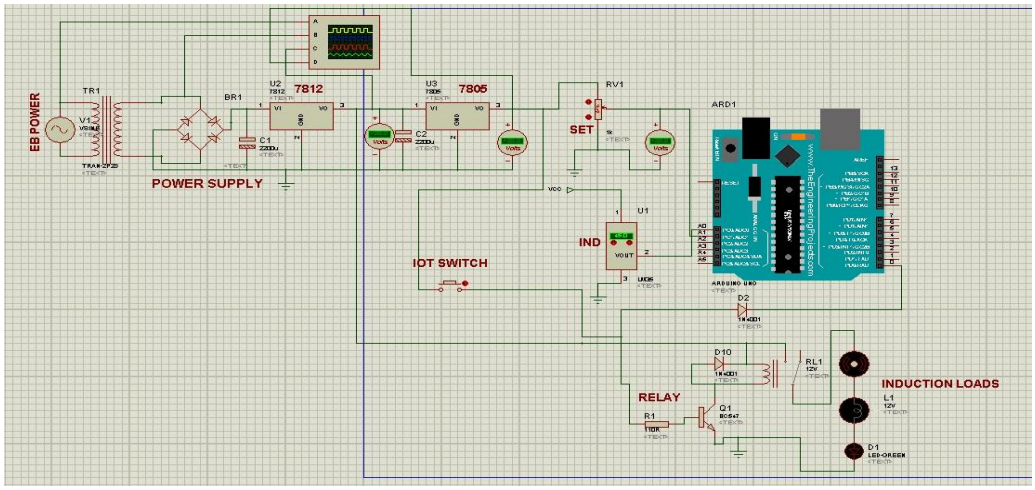

Fig 3.4 Proteus for IOT

This fig 3.4 shows the PROTEUS output for IOT. The induction load 1 can be monitored and operated by IOT anywhere from the world. For this purpose, ARDUINO UNO is used.

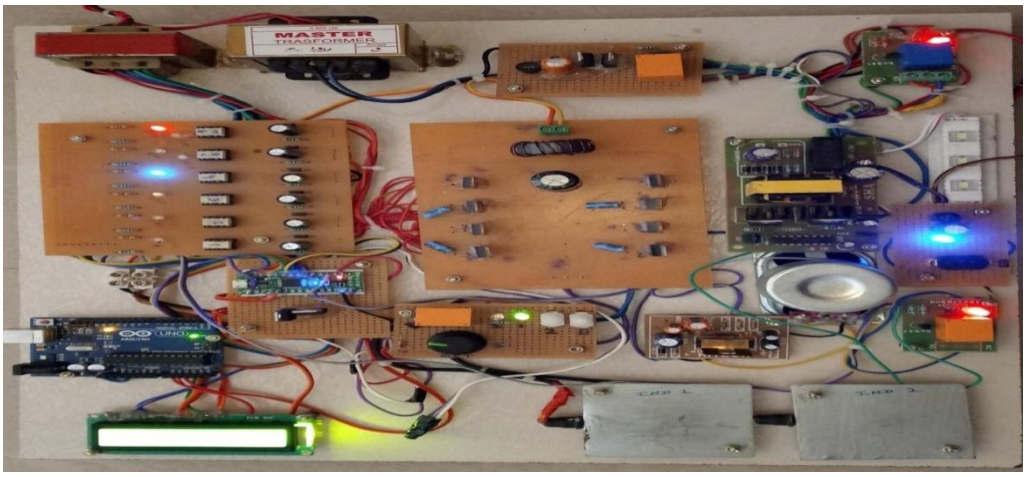

Fig 3.5 Hardware setup

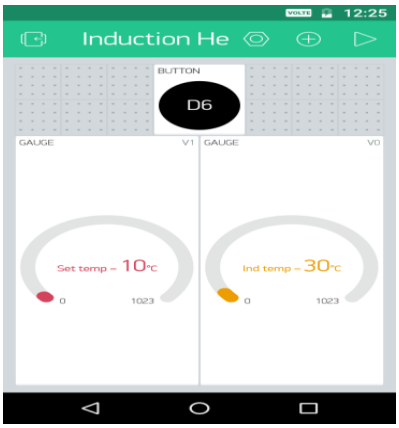

Fig 3.6 IOT by BLYNK app

This fig 3.6 shows the IOT by BLYNK app output. This app is interfaced with hardware setup. This app shows the induction 1 temperature and set temperature. The entire process of the induction cooking is monitored anywhere in the world through this app. To turn on the induction 1,D6 button is pressed. Switch in the hardware setup will be closed and the realy will provide a connection between EB supply and the induction [15]load. To turn off the induction 1,the relay will disconnect the circuit and the switch will be opened.

4. TABLE OF BOILING TEMPERATURE

S.NO	ITEMS	BOILING TEMPERATRE
1	Liquid	60
2	Milk	65
3	Rice	100
4	Chicken	150

5. CONCLUSION

Thus the three leg inverter configuration is replaced by matrix converter which reduces power loss and cost of the project. In this project required load can be controlled independently and it can be extended for more loads. Hence constant frequency has been used for powering the loads. The information about induction cooking is monitored and controlled by means of mobile phones through Internet of Things (IOT).The system is flexible to be quickly adapted and optimised for various applications.

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