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Analysis on Industrial Energy Management

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***Abstract:** This paper deals with the energy management of an industry, which is used to reduce the power consumption effectively. Nowadays there are more number of tools are used for energy management. Similarly, in this paper we discuss about the development of a new energy management tool with the help of Arduino that the authorized user can only view and analyse data in the host system and only some users can view the status from the client system in these changes cannot be done in the client system. The application is very much useful in industries consuming heavy power. The energy management to the system is initially monitored by an energy audit where the power consumption due to the loads which exceeds the ages can be identified and a report can be framed in which we can suggest changing the loads.*
***Keywords:** Energy auditing, Arduino, Phpmyadmin, MySQL, Python, flask*

I. INTRODUCTION

In today's modern world, energy is an integral part of our day today activities; there are several applications, which is used to conserve the energy to be utilized by the future generation. The use of electric energy efficiently reduces the operating cost and increase profit for the loads such as commercial and industrial loads. The maximum percent of the energy generated is used for electric motor driving system. The cost effective way is to check each component of the system for an opportunity to reduce electrical losses. Arduino[6-8**]** is an computer hardware and software in which we can do n number of task in a single board by connecting external peripherals to it and it is an open source software in which sample codes are available in large we can modify it according to our need. Arduino paves way for a new digital world in which the processing of the data can be done easily using it. The Arduino is a single board powered with ATMEGA 2560 processor in this more number of the inputs[8] (Analog and digital) can be processed. The Arduino was connected to the Host System by means of wired, wireless communication systems. Energy Audit[3,5] is the key to a systematic approach for decision-making in the area of energy management. Industrial energy audit is an effective tool in defining and pursuing comprehensive energy management program. A walk through energy audit can gives an detail idea about the loads and the power consumption in the system.

Python is an user friendly language in which we can write our statements in an easy manner. Phpmyadmin is an local database server used to store the data and it can be accessed anywhere.

Flask is an interpreter which is used to align the energy manager process into an assigned individual task.

End of Introduction Section I describes about Introduction, Section II describes about Literature survey, Section III describes about Existing System, Section IV describes about Proposed system and finally the Section V describes about the Conclusion.

II. LITERATURE SURVEY

Vivek Jadhavt et.al, described about the energy conservation through an energy audit day toward day, vitality interest keeps climbing thus that it will be vital to decrease Vitality utilization for that vitality preservation may be required. For protection about energy, the best choice may be vitality review. Vitality review may be a procedure on determine when, where, the reason what's more entryway vitality may be utilized within An plant or fabricating. Gathering of these data serves to recognize the circumstances the place there is requirement will enhance vitality proficiency What's more diminish creation expense. Normally, an vitality review may be conveyed out Toward confirmed vitality Auditors. Toward directing vitality review transform to industry, workers start recognizing vitality as An reasonability expenditure What's more attempt should save it in normal movement. This task points on do lighting review and electric load administration review in Rajarambapu Patil Sahakari Dudh Sangh Ltd, Islampur. The primary target of this one task is to assess utilization of vitality clinched alongside over industry to lighting end goal What's more figure out the chances for vitality sparing for vitality productive equipment's alternately systems must a chance to be embrace done business should make industry a greater amount vitality productive through vitality review.

Peter G et.al, illustrated in detail about an energy management system (EMS) is An committed machine that camwood a chance to be programmed with control know of a building's energy-related systems, including heating, cooling, ventilation, heated water, inner part lighting, outside lighting, on location force generation, Furthermore automated frameworks for shading devices, window

actuators, Also twofold exterior components. As of late another module to simulating a EMS might have been included of the vitality Besides whole-building vitality Recreation project. A fundamental a piece of the EMS module may be the vitality in addition to Runtime dialect (ERL), which may be An straightforward modifying dialect that is used to detail those EMS control calculations. Those new EMS controls and the adaptability about ERL permit vitality Pluss will mimic a number novel control methodologies that need aid not time permits for the past era for building vitality reproduction projects. This paper surveys those standard controls in vitality Plus, displays those new EMS features, portrays the usage of the module, What's more investigates a few of the time permits provisions for the new EMS competencies to vitality Besides.

Srividyadevi P. et.al, Depicted the estimation about vitality with Arduino Concerning illustration the interest to control need expanded exponentially again the most recent century. Person boulevard through which today's vitality issues could make tended to is through the diminishment from claiming vitality use for families. This need expanded those accentuation on the requirement to exact and financial routines of control estimation. Those objective of giving such information is on streamline and decrease their force utilization. This paper demonstrates the transform of a condensed outline demonstration and execution of a research center – scale model that incorporates the vitality estimation of the provided for load Furthermore its preferences

III. EXISTING SYSTEM

In the old system the measurement of the energy was done manually and the readings are processed in the Microsoft excel sheet. The distinguished input is further analysed for any changes or problem occurs in the system. The accumulated data from the control room is gathered by means of an telephonic exchange or walkie-talkie.

Disadvantages:

A. The System is lagging with the Real Time Monitoring of the System data
B. By Connecting with the host system any authorized user can view and collect data about the energy consumption data currently
C. Data is not logged which future analysing of the data is difficult

IV. PROPOSED SYSTEM

The Proposed system is used to analyze the energy consumption and the data is logged[4](stored) in a database to view and analyze the data for future verification and use. It is majorly used for chemical industries, laboratories, etc. The Fig 1 represents the basic block diagram of the system

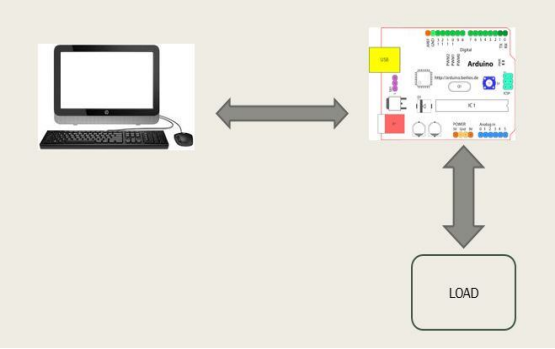


Fig 1 Block Diagram

The Arduino is an interfacing platform, which is used to feed data to the system or the analysing tool in the real time manner[9]. All The data was stored in a continuous interval of time.

Sensors such as current sensor and voltage sensor is used to measure data from the load and fed it to the Arduino in case of industrial loads precise meters are there to measure the Voltage [1], Current, THD, Power quality [2]etc. and so on by means of the communication cablessuch as Rs232, Propbus communication, Modbus communication the data from the meter is taken as input to the Arduino.

Arduino ATMEGA consists of a vast collection of pins in which analog inputs [6, 7,8] and digital inputs are obtained and it is processed by the Controller in it and the data was analysed in the host system for processing the data.

The figure 2 represents the voltage Measurement circuit in which the single phase and Three Phase supply is limited and an 5v input is fed to the Arduino which is further processed to calculate the Actual voltage in the system by means of several conversions.

The Arduino is connected to the host system by means of serial communication [5,10]system(wired) and wireless communication(By means of Router).
The current is measured by means of a current sensor it measures the load current flows through the load connected to it.The figure 3 represents the current sensor.

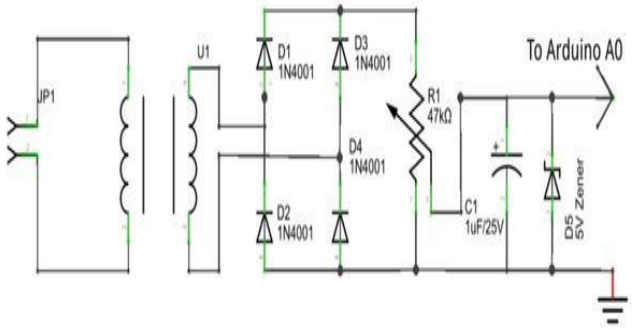


Fig 2 Voltage measurement circuit

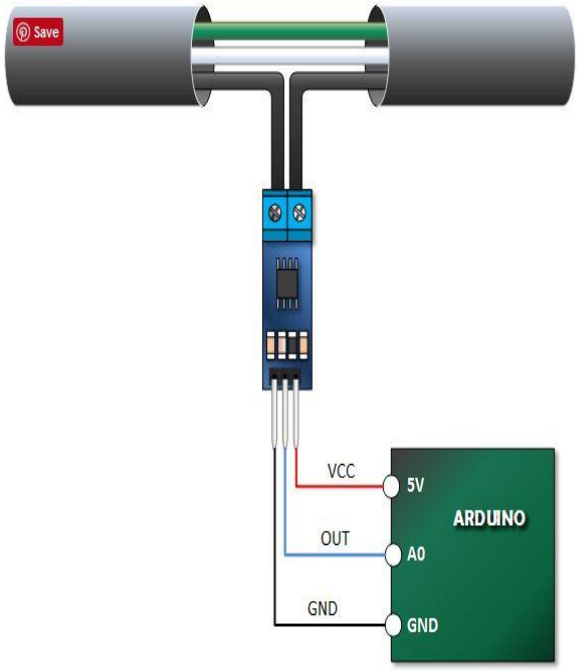


Fig 3 Current Sensor Circuit

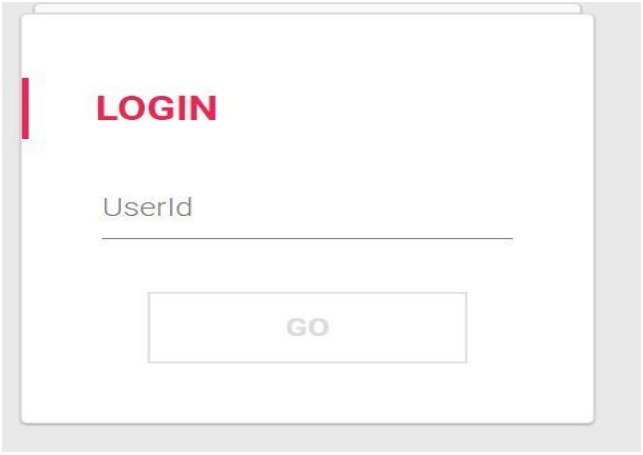
The Energy manager is developed by the following

A. Python
B. Flask(webpage development framework)
C. Phpmyadmin MySQL(database)
D. Arduino

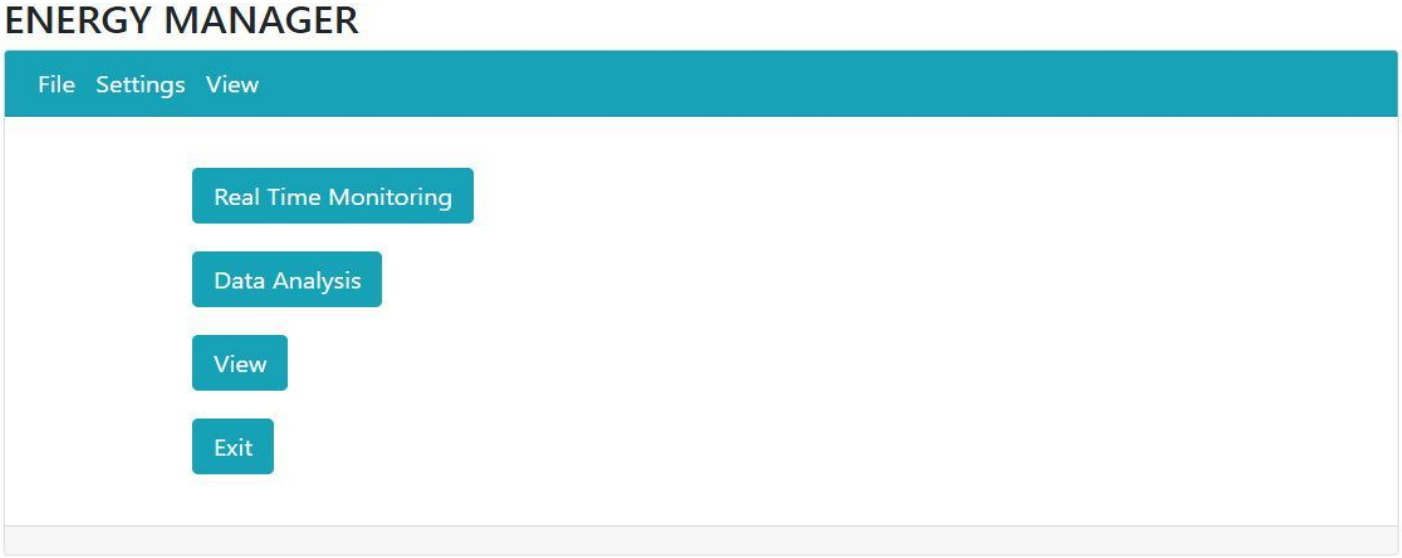
Arduino is used to get the real time values of the measured quantities from the
Python and flask is used for displaying the measured quantities in the webpage. Using this method we can use a host system and by means of wired and wireless connection we can access the host system
MySQL Phpmyadmin is a local database, which is used for data logging.
The webpage are designed with html and python and all the pages are interfaced in the flask in the python.

Following are the step-by-step procedure and view of the energy manager.

STEP 1: Only the authenticated user can access and view the energy management system.

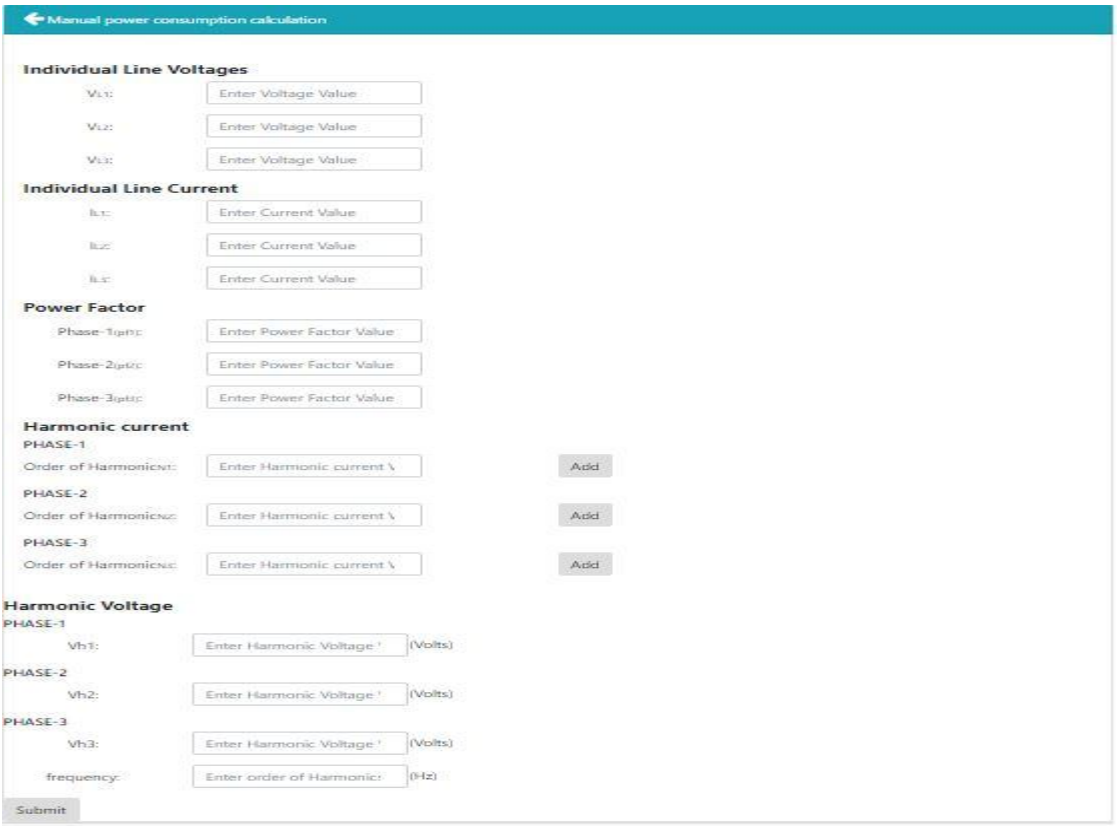


STEP 2: It consists of real time monitoring, manual data calculation data logging

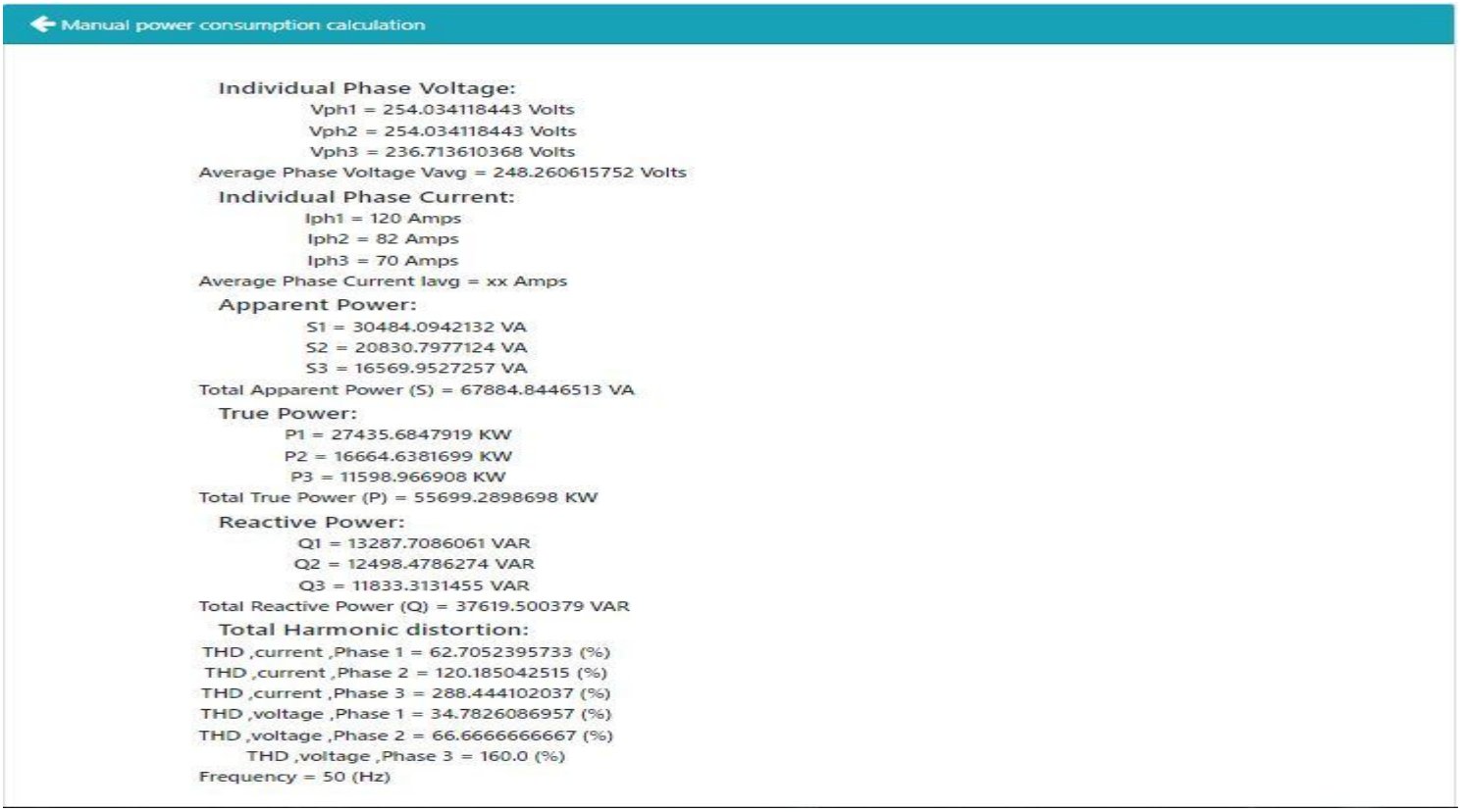


STEP 3:In the data analysis report writer is used to view the report in the script and graphical manner.

STEP 4: The manual data calculation is as follows



STEP 5: The output is displayed in the following format



STEP 6: Graphical representation

STEP 7: The values are stored in the database as following

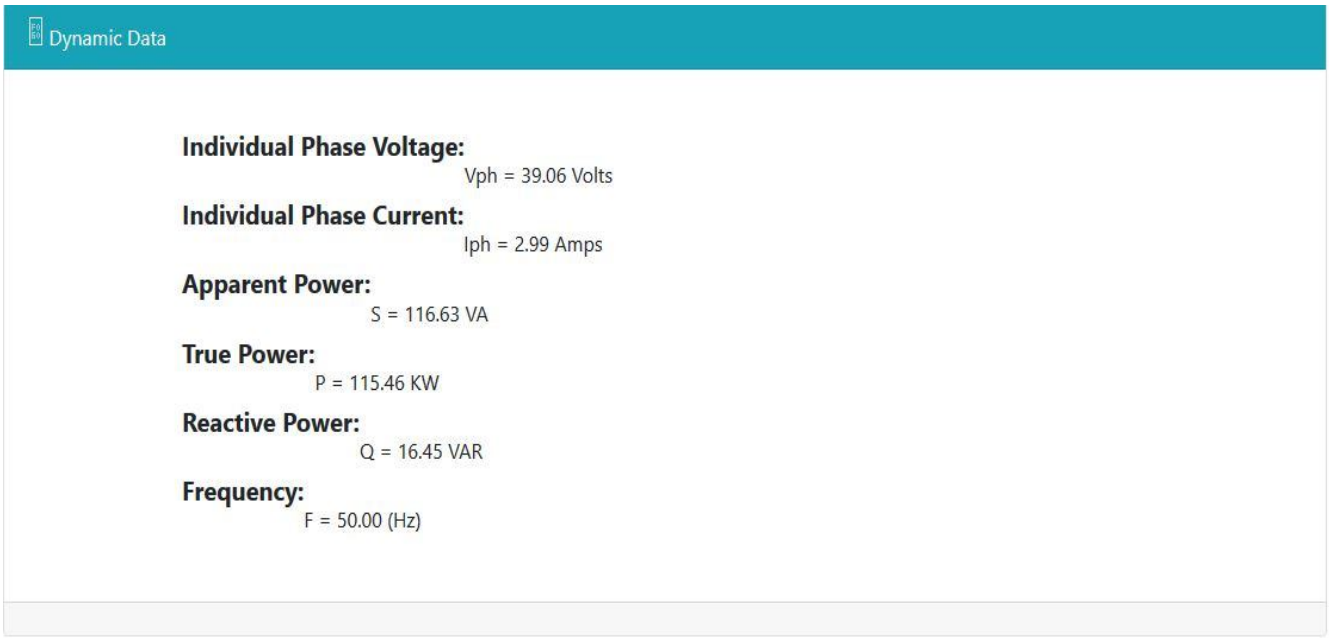
Data base

DATA BASE

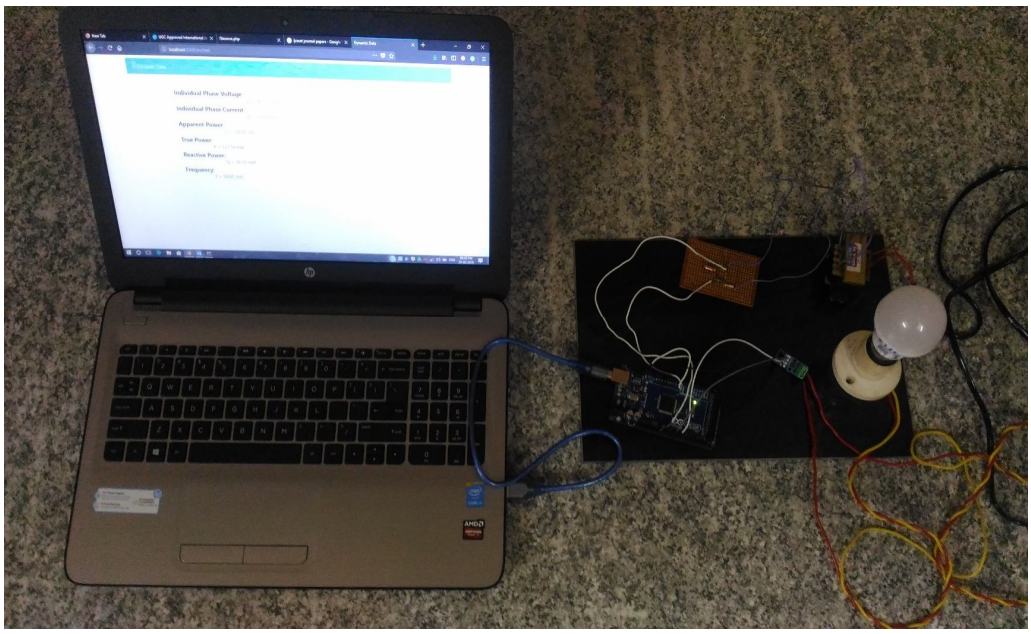
S.NO	Voltage ph1	Voltage ph2	Voltage ph3	Average Phase Voltage Vavg	Current ph1	Current ph2	Current ph3	Average Phase Current Iavg	Apparent power s1	Apparent power s2	Apparent power s3
1	43	432.786	22.7865	32	435	543	564	43.999	543	453	453
2	132.790561914	138.564064606	132.790561914	134.715062811	80	90	120	xx	10623.2449531	12470.7658145	15934.8674296
3	230.940107676	230.940107676	230.940107676	230.940107676	80	70	82	xx	18475.2086141	16165.8075373	18937.0888294
4	230.940107676	234.404209291	230.362757407	231.902358124	80	70	82	xx	18475.2086141	16408.2946504	18889.7461073
5	230.940107676	234.404209291	230.362757407	231.902358124	80	70	82	xx	18475.2086141	16408.2946504	18889.7461073
6	248.260615752	248.260615752	248.260615752	248.260615752	120	69	46	78	29791.2738902	17129.9824869	11419.9883246
7	137.986714336	19.6299091524	321.006749669	159.541124386	124	13	233	123	17110.3525777	255.188818982	74794.572673
8	132.790561914	576.195568651	50.2294734195	253.071867995	345	45	45	145	45812.7438602	25928.8005893	2260.32630388
9	248.260615752	248.260615752	242.48711306	246.336114854	120	20	1220	xx	29791.2738902	4965.21231503	295834.277933

Fig represents the stored values in the database

STEP 8: The real time data is displayed as follows



The demo experimental setup of the system is as follows



V. CONCLUSION

By using the proposed system, calculating the voltage , current , THD, Real power, Apparent power are done it is monitored by means of the energy manager. We can able to monitor the system in an single place. Fluctuation in the loads can be monitored clearly is used to maintain the depreciation factor of the system.

The system can be further improved in future as a big energy management tool by feeding the single line diagram of an industry and it can be processed.

The major achievements obtained from the system are

The graphical representation helps us to easy understanding of the data collected.

The Real Time Monitoring of data can be done by means Arduino.

The data are logged for future analzing and verification.

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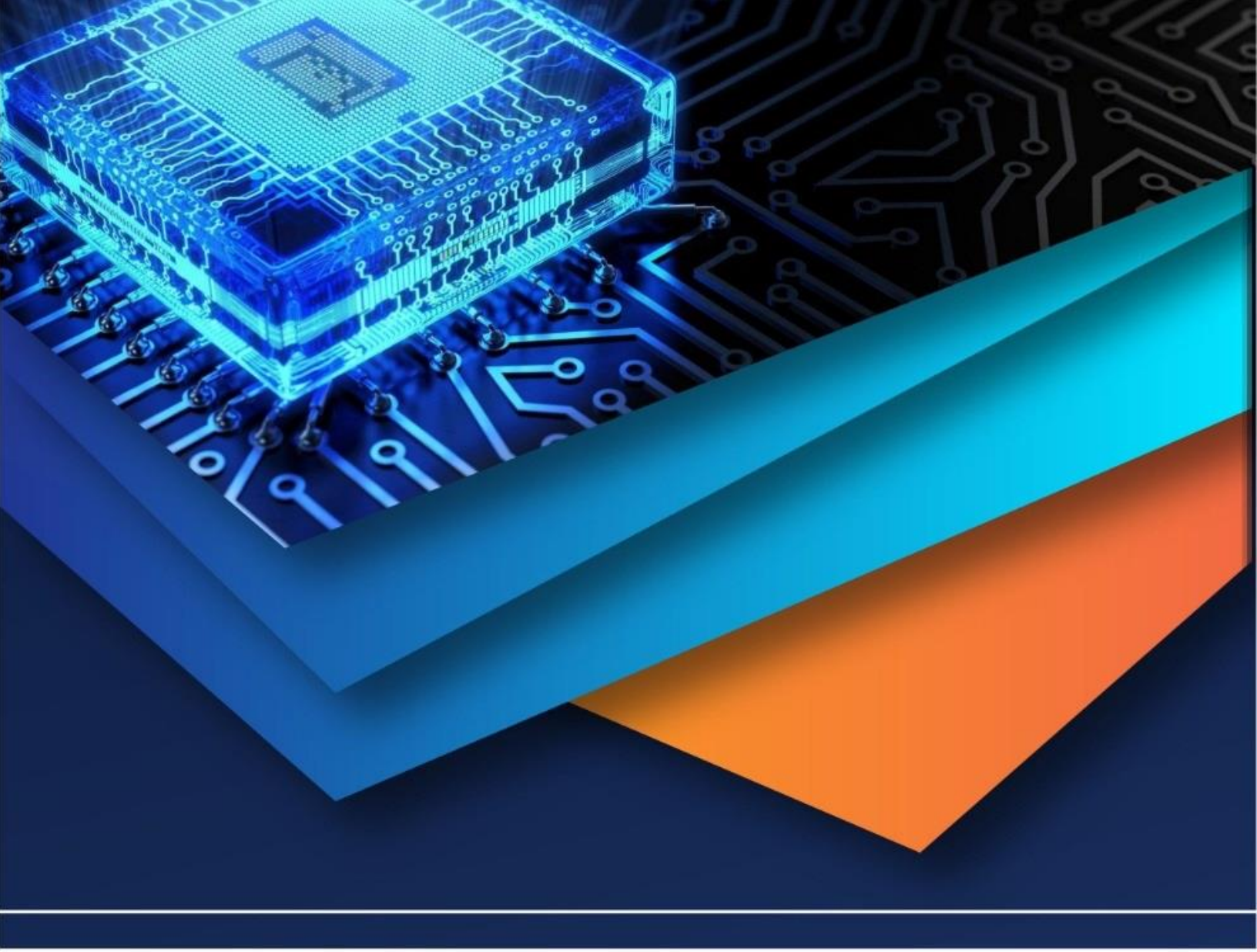

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