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Monitoring of Electrical Appliances using Utility Meter

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***Abstract*—** *Most of people are unaware of the cost of energy consumed by various appliances. Electricity usage has increased exponentially over the past two decades. Due to this level of usage, the increase in the electricity bill is inevitable. Many units of power are being wasted due to negligent usage in residential parts of India every year. Most of this wastage can be ceased by improper monitoring of usage. This project aims to design a circuit which helps the consumer in taking care of the electrical energy consumption and the extra charges incurred due to minor changes in slab categories, even though these changes are small they affect the consumer's bill severely. To make the consumer aware and to control the excess power consumption, this paper introduces, a "Monitoring of Electrical Appliances". This system will intimate the consumer about his /her usage rate. For Example we set some rated value which value depends upon load once the maximum threshold value is reached, power is cut off with a prior notification to the consumer. It not only benefits the consumer, it also benefits the government as it is capable of reducing the power consumption and subsequently can reduce the unusual power usage.*

***Keywords*—** *Electrical Appliance monitoring, alert a consumer.*

I. INTRODUCTION

The modern world owes a lot of its growth and development to its energy sources, which controls everything that happens within the world. Everything from education to economics is mostly dependent on energy. The proper operation of every home in our country depends on energy. Though the importance of energy is well know, the consumption has not decreased in any way. The energy losses are predominant in our households. The energy consumption in India has been increasing drastically over the years. As per NMEEE document 2009, from annual consumption of 19200Kwh in 2005, only from residential and commercial buildings, it is predicted to reach 89823Kwh in 2030. Out of all utilized power in 2017-2018, residential and domestic utilization contributes to 48.40%. Energy utilization is constantly increasing due to rise in demand caused by technological advances, modernization, economic development and high population.

The power utilization rate increments by 7 % each financial year.

But still India is in the nascent stage of energy conservation point of view in any of the sectors.

The utility meter has been designed with the motive of measuring the power consumed by the electrical appliances in real time and communicating the results through a communication device. This paper addresses the issues of consumer and focuses on the conservation of domestic energy consumption.

The article proposes the advance features and applications of a utility meter system which can be used in the minimization of energy wastage in household appliances. The utility meter also reduces the chance of damage to appliances due to pre-existing faults.

II. OVERVIEW OF THE SYSTEM

Multiple previously done surveys helped in developing the utility meter system. The system consists of CT sensor, signal conditioning circuits, arduino, keyboard interfacing, LCD and communication device. The information exchanging tool is ideally a mobile phone.

The current transformer-CT is directly connected in series with corresponding appliance line of the house for measure current.

III. PROPOSED ARCHITECTURE

Our system is connected to closed power line of the house. Then current sensor read the current taken by connected load and compare it with rated value and then display required command like "power consumption is normal" or if the CT read a current that exceed rated value then display like "power consumption is exceeds rated value" it alert a customer like appliance face little difficulty so necessity to conduct maintenance work on that load or need replacement to reduce a power consumption.

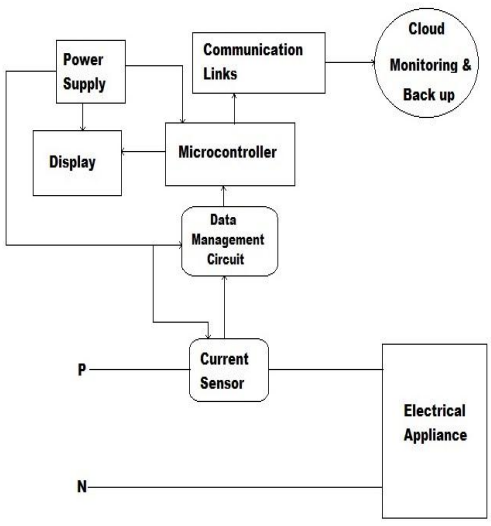

Figure 1. Block diagram of proposed system

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IV. METHODOLOGY

By this approach the user can monitor the load and if the loads need service or replacement that also intimated to user. The utility meter finds the power consumption of connected load and compares it with the rated power consumption and informs if the power consumption of the connected appliance exceeds the rated value.

The utility meter does not require any infrastructural change in the present wiring system. The CT sensor measures the current and compares it with the rated value which is pre-set in the Arduino through program and the value is displayed via the LCD display.

TABLE 1. Rated current value of household appliances

s.no	Electrical load	Rated power consumption value(watts)/day	Threshold current value(amps)
1	Laptop	50-100	1.5- 2.6
2	Iron box	800-1200	4.347-17.391
3	Fridge	100-200	1.2- 2
4	Heater	4000	17.391

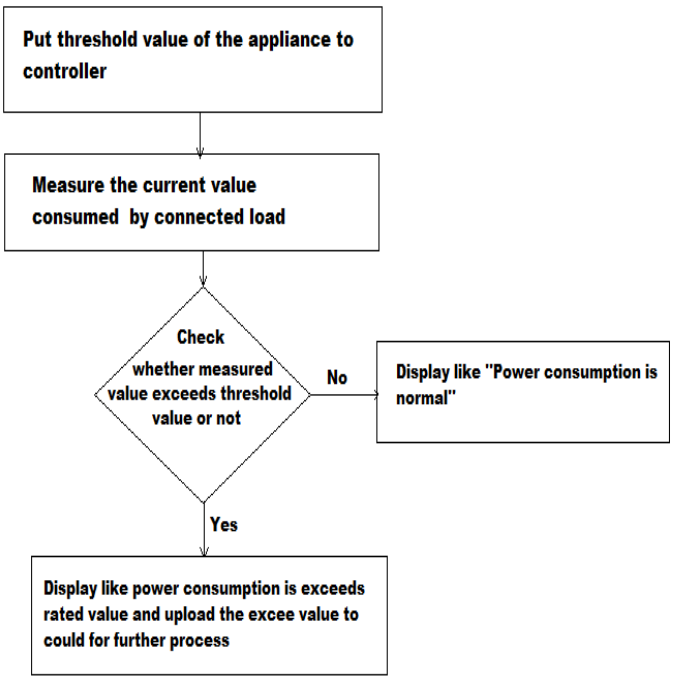

Figure 2. Flowchart of proposed system

V. RESULTS AND HARDWARE

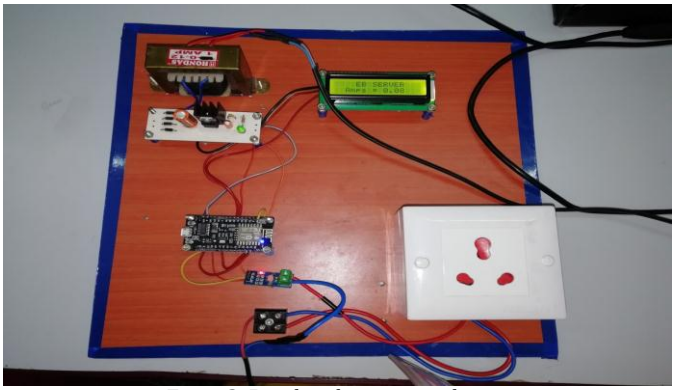

Figure 3. Developed experimental setup

This system process is depends on ohms law. That mean power taken by any appliance is depends on load. The different type of load has different current rating. So depends on current reading the power is calculated because we already known the supply voltage.

VI. CONCLUSION

The above proposed idea has the potential to reduce about 40 % of power consumption in households per month. The basic utility meter has been working in a 230v power supply in household appliances and gives an accurate value with no change required in the infrastructure of the present wiring system.

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