Microcontroller Based Demand Meter

Ms. Kishori Rewatkar[1], Prof. Shashikant Kewte[2]
[1, 2] Dept Of Electrical Engineering
[1, 2] Tulsiramji Gaikwad Patil College of Engg., Nagpur University, Nagpur, Maharashtra, India

Abstract- *Load managing is the only focal point of Demand Side Management programs in Indian Efficacies. "Load Peeling" is the most important implement for load management across the efficacy in all situations in India. In view of the fact that power managing is necessary to describe the quantity of enthusiastic energy in a precise period of time, consumption of Demand Meters is necessary. It is probable to compute the consumed power by using microcontroller based Demand Meter. With the help of this Demand Meter, consumer not to worry about their electricity bill. Demand Meter is design to calculate power from line current and voltage for resistive and inductive only. With the use of this Demand Meter loads does not go beyond limited one.*

Keywords- PIC Microcontroller, C.T, P.T, LCD, ULN2003.

I. INTRODUCTION

In current time a lot of efforts have been prepared to devise the power meter with instantaneous billing method but plough now the premeditated power meters are not professional and do not offer alternative. At the present time the facts of Electricity customers are ever-increasing in grand degree. It is tough to grip and sustain the power because of rising desires. While millions of power manufacturing customers twirl on/off different electric equipments it originates amend in the demand for power. In efficacy gridiron, the power utilization & construction must be stable at all times; any momentous disproportion can origin Grid volatility or painstaking power fluctuations, foremost to power failure in the organism. The connection between electricity users and suppliers in the electricity market has been generally based on that whenever and whatever loads are essential by users, they are anticipated to be met by suppliers at the anticipated time with the best quality. The above electricity ingestion increase in the domestic sector and industrial sectors is prominent to the overloading electricity demands. Yet, to meet the current nonstop rising electricity demands, there should be a continually growing electricity supply; this would prime to assist the standing network with more electricity generators and improve transmission and distribution organization. More evident bad impressions could occur excluding increase in power generating cost, enlarged electricity charges, do a deal quality e.g. voltage variations, technical and economic shortages and even unwanted environmental influences e.g. greenhouse gas emissions. Technical and economic problems are existing mainly in congestions at crest demands related with compromises in quality and high-priced power.

So, it is required to manage maximum demand. Thus, sufficient amount assets are compulsory to gather the load in the scheme at some point in instance; steadiness among load and production is capable to achieve whichever by escalating the production otherwise by diminishing demand. The power invention conception was primarily stands on demand font: as there is a demand for further power, Efficacy Company would merely enlarge it's engender competence to gather the obligatory demand. Highest Demand is venerable in kilowatts for every hour, which is quantity of entire electricity worn for a phase of instance.

The broad-spectrum motion of this paper is to administer and be in command of the highest power demand in sort as well being capable of squeeze the monthly electricity bill. By use of this meter, the customer does not have to distress that their electricity bill will broaden thus embrace to shell out a bunch of currency on bills. Maximum power demand meter can improvement every customer chiefly industrialized workings. The information that been apply to fabricate the meter can profit the civilization. Assemblage language will be use to devise a program for specific function which are to scrutinize and scheming the power demand. With this controller, the serious and unnecessary load during ridge or off- ridge phase can be prohibited.

II. METHODOLOGY

Maximum Demand is considered in kilowatts for every hour, which is a capacity of totality electrical energy use for a phase of instance. Assume a 1000 watt load use for one hour devour one kilowatt for every hour (kWh). There are two essence used to illustrate the manner the maximum demand workings which are the whole instance of quantity and the intervallic instance for integration. Suppose 8 hours is the whole instance of quantity and that whole instance of quantity has been separated into 1 hour intermission. That creates 8 × 1/8= 1 hour intermission. In earlier times, at some stage in every 1 hour, the hardware procedures the highest power utilization and report it. Every instance this is calculated, for

every intermission of 1 hour subsequently, the highest power utilization rate is evidence awaiting the 8 hours are over and done. After that the highest rate of all these phases is verified and exhibit. The detach inventory for 1 hour's intermission is zeroed and the progression recur. At the last part of the 8 hours, the maximum demand catalog is examine and to be paid then the verification is zeroed to begin a new 8 hours billing interlude.

ELECTRICAL LOAD MANAGEMENT

Requisite for Electrical Load Management in a complete degree viewpoint, the expansion in the power use and distinctions of end use sections in instance of consumption has provoked discrepancy in capability to look out of demand. Since border spreading out is pricey and just somewhat a while panorama, better load supervision at user end decreases top requirements on the efficacy establishment and healthier use of energy plant restrictions. State Electricity Boards utilize power function constitution to contact end user in better load supervision through processes similar to instance of consumption levies, chastisement on outshine endorsed most tremendous awareness, night-time levy dispensations.

MAXIMUM DEMAND CONTROL

Rearrangement of huge electric loads and apparatus procedures, in poles apart transfer can be deliberate and employed to decrease the synchronized maximum demand. For this intention, a process flow graph and a progression graph are arranged.

It is probable to shrink the maximum demand by construction up luggage compartment capability of commodities/ resources, Water, freezing water/boiling water, by means of energy during off peak interlude. Shedding of unnecessary loads when the maximum demand is liable to accomplish predetermined edge.

III. BLOCK DIAGRAM.

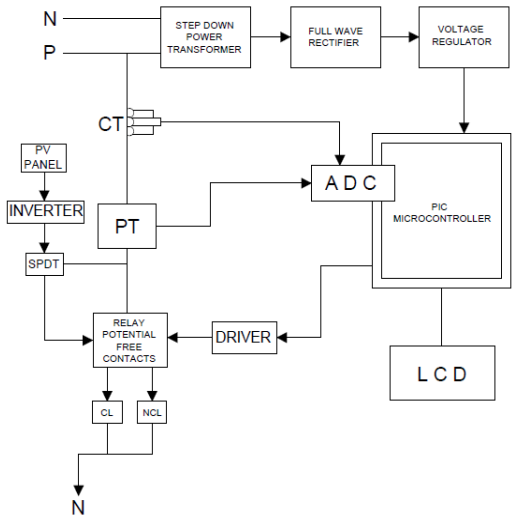

Fig No.1 Block Diagram

1. **Power Transformer** is worn to tread downward 220V AC to 12V AC.
2. **Full Wave Rectifier** is worn to exchange AC voltage to animated DC voltage. It use two diodes.
3. **Voltage Regulator** (IC 7805) is worn to offer even 5V DC irrespective of voltage oscillation stuck between 6V DC to 28V DC.
4. **ADC** converter is an electronic apparatus which converts a key in analog voltage or current to a digital integer relative to the extent of voltage and current. Commonly the digital yield is the two's accompaniment binary digit which is comparative to the key in.
5. **Driver:** Exterior apparatus similar to High - power relays want >100mA and must more voltages. Thus to organize such devices, a transistor stand driver track is used to magnify current to obligatory stage. Seeing as the voltage and current leg are in large anthology then the transistor have power over related to a high current transform forbidden by the trifling current digital logic sign.
6. **LCD (**Liquid Crystal Display) computer screen is an electronic exhibit element and locate large variety of functions.
7. A **PIC microcontroller** used to implement the numeral functions over and above the pins achieves a variety of occupations such as ADC, Comparator and Timers. It has 28 pins out of that 25 pins are serviceable as digital input or output.
8. **CT** offers a independent assessment of voltage to the flow of current.

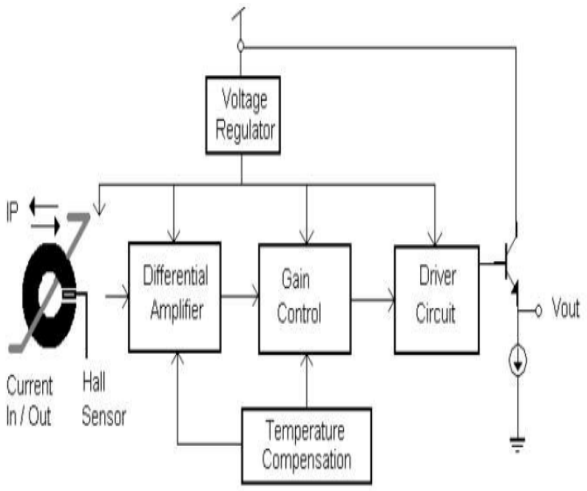

Fig No. 2 Current Transformer

9. **PT** offers an independent charge of voltage to the surge of voltage by 100% electrical severance stuck between high voltage and low voltage face.

IV. CIRCUIT DIAGRAM

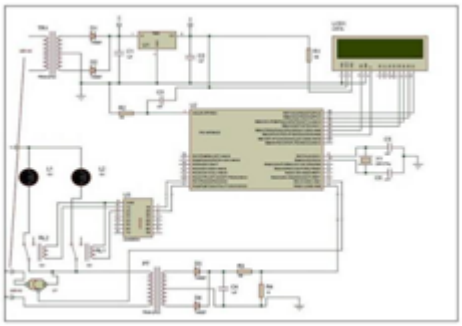

Fig No.3 Circuit Diagram of Demand Meter

220V AC voltage is converting with the help of energy transformer to 12V AC. Because of the control circuit necessitate DC voltage, thus a rectifier and filter circuit is used to convert a 12V AC to pure 12V DC with diode D1 & D2 with capacitor C1. Since the obtainable DC voltage is of 12V and control circuit necessitates stable 5V for its procedure, in order that controller IC 7805 is worn which offers a stable 5V DC output. To guard an entire circuit aligned with a limited reset owing to loading on 5V DC bus, a capacitor C2 is worn as a storage space capacitor. Microcontroller achieves a variety of purpose so it necessitates clock pulse. A crystal oscillator is worn for the production of clock pulse with suppressor capacitor. Capacitor C3 and C4 sustain the turn ON and turn OFF time of the clock pulses. Because of lot of compost data will survive in the interior a RAM memory later than toggle off the power supply, microcontroller necessitates to retune. Or else it perturbs the accomplishment start point of microcontroller after toggle on the power. So that microcontroller needs a retune pulsate at its reset pin. Reset pin called a High to Low transitory of pulse. To generate this pulse capacitor C3 and resistor r2 are associated in discriminate manner. First of all a capacitor is entirely emancipation so a low resistive lane is form to flow a 5V during capacitor is charged and figure high impedance status between 5V & reset pin. Therefore rearrange pin voltage falls to 0V.

The same as the microcontroller workings on stable 5V in order that it offers highest 5V and maximum of 20mA in its output docks. Whereas the relay in the circuit workings on 12V to toggle ON/OFF the loads. Therefore it is compulsory to enlarge the 5V signals emerge from microcontroller to a 12V to coerce 12V relay. Thus a driver IC ULN2003 is worn. CT & PT are used to determine the voltage and current athwart the load. Thus the force has been considered. The output of CT and PT are the analog signal which is not calculated by microcontroller. To exchange these analog signals to digital signals, ADC is worn which is previously established in the microcontroller. LCD presents all the parameter akin to voltage, current, power, time on the display.

V. EQUATIONS

Resistive and Inductive loads are chief loads in Industries.. In pure resistive load voltage, current and resistance are linearly related which is,

$V = IR$
& $P = VI$

Induction furnaces, ballast type lighting, AC motors and transformers are Inductive loads. So it requires two types of powers like active and reactive power. The sum of these two active and reactive powers is total power consumed by the load i.e.,

Total Power(S) = Real Power (P) + Reactive Power (Q)

VI. POWER LOAD MANAGEMENT

The user does not have to worry that their electricity bill will increase thus have to charge a lot on money bills by using the meter. There is no necessity of manual edge as the complete system is fully automatic and meter reading also correctly calculated in this system, which disables the traditional manual meter reading. Demand meter is used for measuring and calculating energy. The results of this assessment specify that this meter is a genuine approach of the

power measurement. It has high degree of accurateness. So that with the help of this meter the industrialist can overcome their electricity bill.

Getting high electricity demands for limited hours a day is one of the most substantial problems at the national and international level. The purpose for electricity demand crests consist of the instantaneous high consumption of electricity. Technical and economic complications are existing mainly in congestions at highest demands related with compromises in quality and high-priced power. The connection between electricity users and suppliers in the electricity market has been generally based on that whenever and whatever loads are essential by users, they are anticipated to be met by suppliers at the anticipated time with the best quality. The above electricity ingestion increase in the domestic sector and industrial sectors is prominent to the overloading electricity demands. Yet, to meet the current nonstop rising electricity demands, there should be a continually growing electricity supply; this would prime to assist the standing network with more electricity generators and improve transmission and distribution organization. More evident bad impressions could occur excluding increase in power generating cost, enlarged electricity charges, do a deal quality e.g. voltage variations, technical and economic shortages and even unwanted environmental influences e.g. greenhouse gas emissions. Technical and economic problems are existing mainly in congestions at crest demands related with compromises in quality and high-priced power.

VII. ACKNOWLEDGEMENT

With this Demand Meter, the crime of thieving force might be suggested to an end. This suggested work will facilitate us in safeguard force so that our nation state will be enhanced. This delve into work can make an unnecessary change in reckoning of electricity bill and can offer the assistances to the supervision by tumbling the man force and time utilization. Load management is one of the foremost tasks that allocate Industrialist to make up-to-date judgment a propos their force utilization and chains the power purveyor diminish the crest load demand and restyle the load contour.

VIII. CONCLUSION

This research work can compose an excessive change in result of electricity bill and can offer the assistances to the supervision by tumbling the man power and time utilization. Load management is one of the foremost occupations that allows Industrialist to make up-to-date verdict regarding their power utilization and chains the power suppliers condense the crest load demand and change the format of the load profile.

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