

Design & Implementation of Analysis System for Industrial Energy Meter Loop Using MODBUS Protocol

Pallavi D. Mendhe¹, M. M. Pathan²

¹Department of VLSI Engineering, G. H. Raisoni College of Engineering, Nagpur, India

²Professor, Department of Electronics Engineering, G. H. Raisoni College of Engineering, Nagpur, India

Abstract: Industrial automation is most demanding and upcoming fields from many years. Every industries need a lot of power supply and consume great energy at multiple level of production. Government of India issued new compliance of energy audit for big industries have multiple levels of energy meters and power distribution. With the help of traditional energy meters and power distribution. With the help of serial communication with energy meter user can get the details but this is easy if there are few meters. If user wants to communicate with multiple meters over single communication host and over single communication line then it became major issue. MODBUS protocol is special design and for same purpose, it has a facility to communicate with multiple devices supporting this protocol over single communication line by giving identification number to every node or device. The proposed system is to design and developed a MODBUS protocol based communication tool for performance analysis of industrial energy meter.

Keywords: Modbus Protocol, Energy Meters, RS485 to RS232 converter.

1. Introduction

The energy audit in a constructing is a feasibility study. For it not only serves to identify energy use among the various services and to identify opportunities for energy conservation, but it is also a crucial first step in establishing an energy management program. The audit will produce the data on which such a program is based. The study should reveal to the owner, manager, or management team of the industry the options available for reducing energy waste, the costs involved, and the benefits achievable from implementing those energy-conserving opportunities (ECOs).

The energy control application is a scientific on-going strategy for controlling a building's energy intake pattern. it's far to lessen waste of energy and money to the minimum permitted by means of the climate the industry is positioned, its capabilities, occupancy schedules, and different elements. It establishes and keeps an efficient stability between a constructing's annual practical power necessities and its annual real strength intake.

Monitoring of electrical parameters is a key detail in any strength method. Implementation of monitoring gadget is step one of this kind of approach as it makes an evaluation of the real situation possible, before dedication of the most relevant answers. Because of monitoring it's far viable to quantify the energy performance development movements.

2. Energy Parameters

As far as energy performance is involved, measurement of electrical energy is of path primary. energetic electricity (in kWh or MWh) is usually the main thing of the electricity invoice. For an correct assessment, size of energetic power is usually recommended at specific locations within the installation, ideally at each workshop level. The size duration must be confined, one week being a reasonable

compromise a good way to evaluate durations with comparable pastime tiers.

Any determined increase of power intake ought to be carefully analyzed, if it isn't the result of a planned boom of hobby level. The best situation should be a regular and extended lower of electricity consumption. size of the deliver voltage is likewise very valuable in terms of energy efficiency. 3 distinctive factors must be analyzed:

Amplitude: For an highest quality operation, the supply voltage have to be maintained in a range of \pm five% around the value declared by the utility. decrease value manner that some gadget like automobiles perform in deteriorated conditions. better cost approach extended energy losses in transformers, motors, lighting equipment. Voltage fluctuations are answerable for mild flicker and motor vibrations, even supposing the voltage amplitude remains inside the contractual limits. Voltage lags and interruptions are the maximum essential phenomena in terms of power nice.

Current and power absorbed: correct measurement and dating can help find the foundation of the disturbance, and in all likelihood facilitate negotiations with the software. cutting-edge and energy absorbed At exclusive points in the set up supply the image of the immediately pastime stage. Observation of large fluctuations of contemporary or electricity can direct movements for you to optimize system and clean power usage. Continuously high values of cutting-edge imply that overload tripping is probably and coffee values means that device can be over-rated or unsuited. **Power Factor :** A bad energy element, say, lower than zero.9, approach that the supply modern is un-necessarily high, for a given power transmitted to the masses, and situation to a unique fee via the utility. electricity issue Correction equipment must be applied.

Harmonic distortion: high harmonic voltage distortion, say, better than 6 to eight%, may be the cause of disturbances and elevated strength losses. This observation must trigger

the implementation of harmonic mitigation device. For large interconnected networks, the power frequency is maintained by using the Utilities within strict limits round 50 or 60Hz. there is nothing to be completed at the Distribution degree. The handiest motion to be taken in case of dimension displaying out-of-variety frequency should be to put together for interruption or black- out.

Voltage unbalance element: is some other parameter that is normally monitored and displayed with out being virtually beneath manipulate. Fortunately, this is usually not an problem in maximum.

3. Analysis

A. Improved Reliability

Smart Grid facilitates utilities lessen their operational fees, boom worker protection, offer higher client satisfaction and decrease capital prices. It gives utilities with accelerated information and intelligence allowing them a higher manipulates and knowledge. Smart grid can improves forecasting of load [1], hence permitting accurate prediction of while the brand new capital investments are required. For clients smart Grid guarantees progressed services and reduced additional fees due to power interruptions [2].

B. Improved Efficiency

It helps to reduce line losses during transmission and distribution and thus decrease the inefficient generation for meeting peak load demands.

C. Smart Meter

The time period smart Meter frequently refers to an electrical meter, but it also imply a device measuring herbal fuel or water consumption. A smart meter is a device that monitor and facts intake of electrical strength and communicates that facts to the software for billing. clever meters permit two-way conversation among the meter and the controller (principal gadget). in contrast to domestic electricity meters, clever meters can gather information remotely for reporting. Such a sophisticated metering infrastructure differs from conventional automatic meter studying in that it permits two-way communications with the meter. traditional meters like electromechanical and static meters maintains a report of best overall strength intake, but no longer 3 the information related to time of consumption. alternatively, clever meters keep the tune of time-based totally intake and others parameter like strength, modern-day, voltage and frequency version.

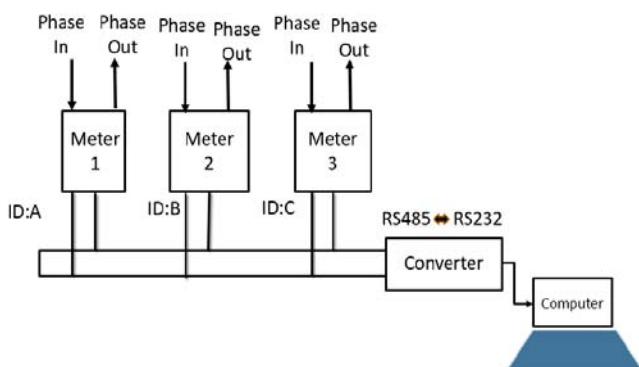


Figure: Block diagram of energy analysis system

4. Conclusion

In this paper, an extensive literature and field study has been carried out, resulting in a zero human intervention remote energy and current monitoring system. The system comprises of low cost high performance micro controller and related sensors. Multiplexing meter with single controller make system cost efficient. Server is integrated with Web-page which helps to access server data anywhere in the campus with particular IP address. Graphical Representation of power consumption, line current, line voltage, frequency variation of Power Transformer is presented for easy understanding of large quantities of data and the relationships between parameters.

5. Future Scope

The present work is capable of monitoring a single meter and the work can be extended for monitoring of multiple meters. The webpage can also be modified to display data from multiple meters. The webpage is coded in basic HTML and the platform can be changed to enhance user experience and robustness. Project work can be push up to next level by clustering more for excessing data of all the energy meters. For billing purpose we can converts data into excel sheet converter to reduce man hours.

References

- [1] Tao Hong, Jason Wilson and Jingrui Xie, "Long Term Probabilistic forecasting with Hourly Information," *IEEE Transactions on Smart Grid*, 2013.
- [2] P. Subban and K.O. Awodele "Reliability Impact of Different Smart Grid Techniques on a Power Distribution System," presented at *IEEE PES Conference On Innovative Smart Grid Technologies Latin America (ISGT LA)*, 2013.
- [3] Jizhen Liu, Tianshu Bi, Yuguang Niu and Zengping Wang "The Utilization of Large- Scale Renewable Powers with High Security and Efficiency in Smart Grid," in *Power and Energy Society General Meeting, IEEE*, 2012.
- [4] Yifan Li et al. "An energy efficient solution: Integrating Plug-In Hybrid Electric Vehicle in smart grid with renewable energy," in *IEEE Conference on Computer Communications Workshops*, 2012.
- [5] Shengnan Shao et al. "Impact of TOU Rates on Distribution Load Shapes in a Smart Grid with PHEV Penetration" in *Transmission and Distribution Conference and Exposition, IEEE PES*, 2010.
- [6] V.C. Gungor, D. Sahin, T. Kocak, and S. Ergut, "Smart Grid Communication and Networking", Turk Telecom, Rep. 11316-01, Apr 2011.
- [7] Gungor, V.C.; Sahin, D.; Kocak, T.; Ergut, S.; Buccella, C.; Cecati, C.; Hancke, G.P "Smart Grid Technologies: Communication Technologies and Standards" in *Industrial Informatics. IEEE PES*, 2011