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Smart IOT Technology for Machine Condition Monitoring

Elango S , Durgaganeshmoorthi P , Jeeva E , Jeeva N.R , Jeganprakash N

Email: elanmeae@gmail.com

[1]Asst. Prof., Department of EEE, Nandha Engineering College, Erode, India
[2]UG scholar, Department of EEE, Nandha Engineering College, Erode, India

I. ABSTRACT

This paper aims to describe the role of advanced sensing systems in the electric grid for machines in an Industry. In detail, the project, development, and experimental validation of a power consumed by a machine is described in the following. This paper provides an outline of the potentialities of the sensing systems and IoT to monitor efficiently the energy flow among nodes of an electric network. Information concerning the power consumption and power quality could allow the power grid to route efficiently the energy by means of more suitable decision criteria. The new scenario has changed the way to exchange energy in the machines. The explosive growth of the requirement of the communication for information between machines raised concerns, such as, the optimization of the human environment, the management of urban security, the improvement of living quality, and the effective management of production, the "Internet of Things" (loT) is in great demand. Our government has a high regard to the research and development of loT, as we are moving towards the "Internet of Things", millions of devices will be interconnected, providing and consuming information available on the network and cooperate. International Telecommunication Union (lTV) put forward "Internet of Things" in the report in 2005, but there is still not a generally accepted concept.

II. INTRODUCTION

Power supply: a group of circuits that convert the ***standard ac voltage*** (120 V, 60 Hz) provided by the wall outlet to ***constant dc voltage***

Transformer : a device that step up or step down the ***ac voltage*** provided by the wall outlet to a desired amplitude through the *action* of a *magnetic field*

Rectifier: a diode circuits that converts the ***ac input voltage*** to a ***pulsating dc voltage***

The pulsating dc voltage is **only suitable** to be used as a battery charger, but **not good enough** to be used as a dc power supply in a radio, stereo system, computer and so on.

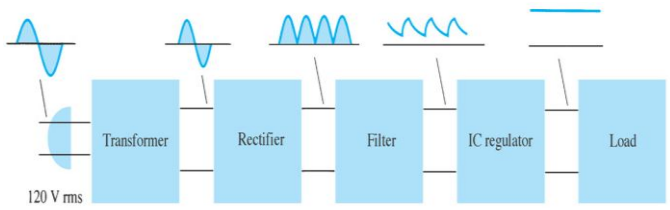
There are two basic types of rectifier circuits:

1. Half-wave rectifier
2. Full-wave rectifier - Center-tapped & Bridge full-wave rectifier

In summary, a full-wave rectified signal has **less ripple** than a half-wave rectified signal and is thus better to apply to a filter.

Filter: a circuit used to reduce the fluctuation in the rectified output voltage or ripple. This provides a ***steadier*** dc voltage.

Regulator: a circuit used to produces a ***constant*** dc output voltage by reducing the ripple to negligible amount. One part of power supply.



ARDUINO

The Arduino microcontroller is an easy to use yet powerful single board computer. It has gained considerable traction in the hobby and professional market.The Arduino is open-source.

Which means hardware is reasonably priced and development software is free. A microcontroller board, contains on-board power supply, USB port to communicate with PC, and an Atmel microcontroller chip. It simplify the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation.It is an open source hardware, any one can get the details of its design and modify it or make his own one himself.

Digital or Analog

All physical quantities are analog.Analog means that the quantity can take any value between its minimum value and maximum value.Digital means that the quantity can take specific levels of values with specific offset between each other.

Ex: 1- Digital:

English alpha consists of 26 letter, there is no letter between *A* and *B.*

- *Square waves are Digital.*

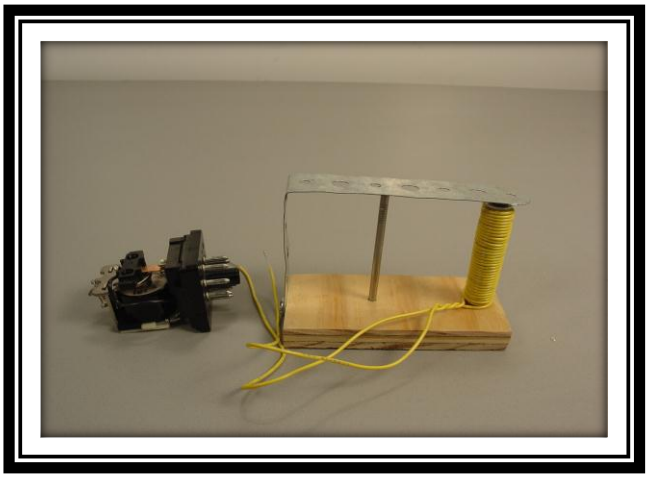
Ex.: 2- Analog:

Temperature, can take any value[-1,12.8,25.002,… etc.].

- Sine waves are analog.

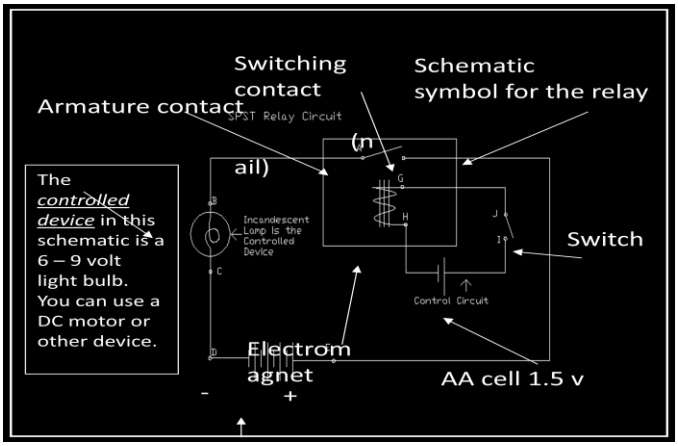
RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. The first relays were used in long distance telegraph circuits.



Basic design and operation

When voltage is supplied to the primary circuit, current flows through the coil winding to ground. Whilst doing so, a magnetic field develops around the primary coil. As the magnetic field builds, it pulls together the switch contact in the secondary circuit, thus supplying current to the component being operated. When the relay is switched off the magnetic field is removed and the sprung plate returns the switch to the open circuit position, thus switching off the power.

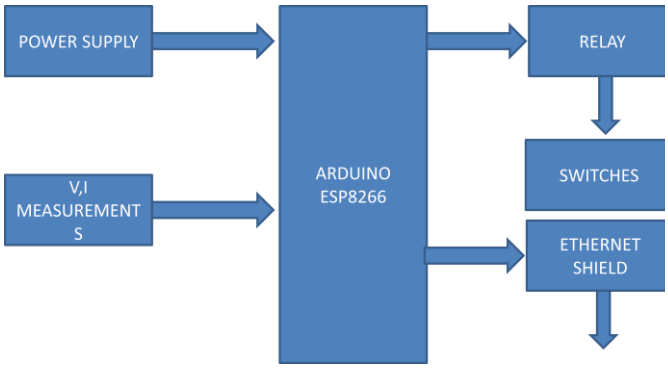


III. IOT TECHNOLOGY FOR MACHINE MONITORING

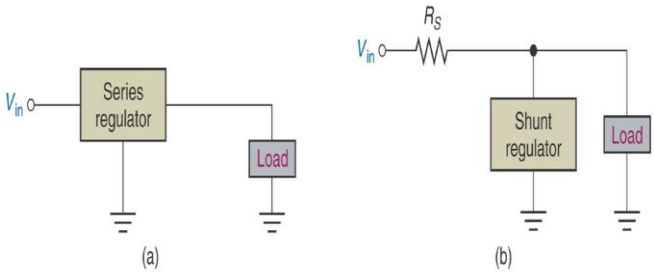
A. EXISTING SYSTEM

The general way of machine monitoring in the present days deals with a lot of manual interfaces.The user has to continuously monitor the voltage or power measurements

I. Block Diagram



the load and the shunt regulator is connected in parallel with the load.



B. PROPOSED SYSTEM

IOT deals with real-time optimization of production and supply chain networks in a manufacturing industry by networking machines and associated sensors, actuators and control systems together. In case of process industries, it automates the process controls, service information systems and operator tools using digital controllers in order to achieve enhanced productivity and safe distribution system

The tasks of Industrial Internet of Things (IIOT) are

- Real-time monitoring and control of processes
- Deploying smart machines, smart sensors, and smart controllers with proprietary communication and internet technologies
- Maximize safety, security and reliability through high precision automation and control

From **design** to **maintenance**, we **improve sustainability & efficiency** of your operations

1) Types of Regulators

Fundamental classes of voltage regulators are linear regulators and switching regulators.Two basic types of linear regulator are the series regulator and the shunt regulator . The series regulator is connected in series with

II. Two types of regulators

- **I**C voltage regulators
- Fixed voltage regulators

➢ IC VOLTAGE REGULATORS

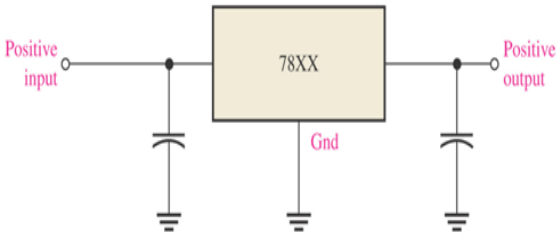
Regulation circuits in integrated circuit form are widely used.Their operation is no different but they are treated as a single device with associated components.These are generally three terminal devices that provide a positive or negative output.Some types have variable voltage outputs.A typical 7800 series voltage regulator is used for positive voltages.The 7900 series are negative voltage regulators.These voltage regulators when used with heatsinks can safely produce current values of 1A and greater.The capacitors act as line filtration. Several types of both linear (series and shunt) and switching regulators are available in integrated circuit (IC) form.
Single IC regulators contain the circuitry for:

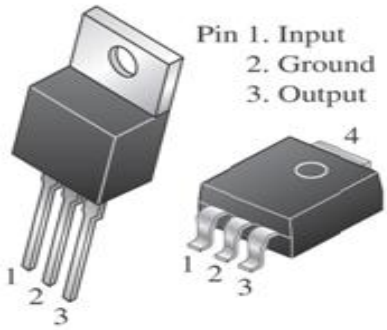
1. reference source
2. comparator amplifier
3. control device
4. overload protection

Generally, the linear regulators are three-terminal devices that provides either positive or negative output voltages that can be either fixed or adjustable

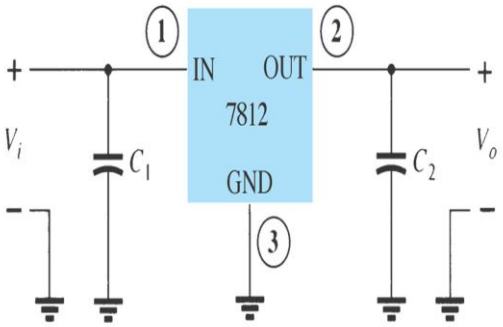
➢ Fixed voltage regulators

The fixed voltage regulator has an unregulated dc input voltage V_i applied to one input terminal, a regulated output dc voltage V_o from a second terminal, and the third terminal connected to ground.Fixed-Positive Voltage Regulator.The series 78XX regulators are the three-terminal devices that provide a fixed positive output voltage.





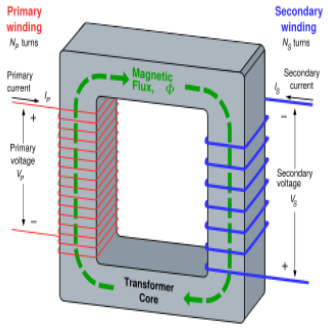
An unregulated input voltage V_i is filtered by a capacitor C_1 and connected to the IC's IN terminal.The IC's OUT terminal provides a regulated +12 V, which is filtered by capacitor C_2.The third IC terminal is connected to ground (GND)



IV. ELEMENTS OF BLOCK DIAGRAM

A. Transform

Centre tapped transformer.19-0-19 v at the output.
Rating of 1A current.It is centre tapped to have both -ve and +ve half cycle of AC waveform to contribute to direct current.Transforming energy using mutual induction.TTL logic circuitry can not work on voltage of 220v so we are stepping down it to 9v



B. Voltage Regulation

Two basic categories of voltage regulation are:

- line regulation
- load regulation

The purpose of **line regulation** is to maintain a nearly constant output voltage when the **input voltage** varies.
The purpose of **load regulation** is to maintain a nearly constant output voltage when the **load** varies

C. Line Regulation

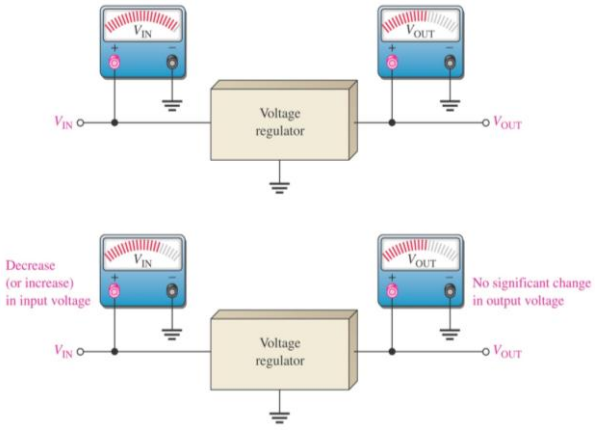
Line regulation can be defined as the percentage change in the output voltage for a given change in the input voltage.

$$Line\ regulation = \left(\frac{\Delta V_{OUT}}{\Delta V_{IN}}\right) \times 100\%$$

Δ means "a change in"

Line regulation can be calculated using the following formula:

$$Line\,regulation = \frac{(\Delta V_{OUT} / V_{OUT}) \times 100\%}{\Delta V_{IN}}$$



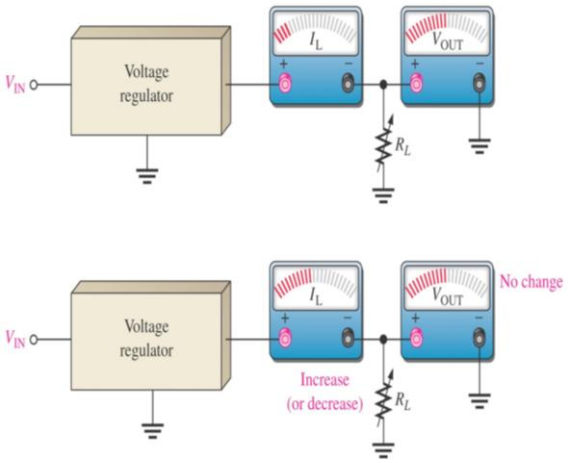
D. Load Regulation

Load regulation can be defined as the percentage change in the output voltage from no-load (NL) to full-load (FL).

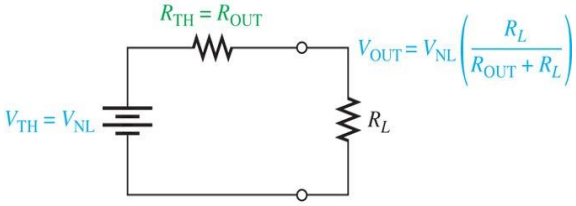
$$Load\ regulation = \left(\frac{V_{NL} - V_{FL}}{V_{FL}} \right) \times 100\%$$

- Where:

V_{NL} = the no-load output voltage
V_{FL} = the full-load output voltage



Sometimes power supply manufacturers specify the equivalent output resistance (R_{out}) instead of its load regulation.



R_{FL} equal the smallest-rated load resistance, then V_{FL}:

$$V_{FL} = V_{NL}\left(\frac{R_{FL}}{R_{OUT} - R_{FL}} \right)$$

V. GENERAL APPLICATION

1. Networking service: goods identification, communication and positioning
2. Informational service: information collection, storage and query
3. Operation service: Remote configuration, monitoring, operations and control
4. Security service: user management, access control, event alarm, intrusion detection, attack prevention
5. Management service: Fault diagnosis, performance optimization, system upgrades, billing management services

VI. CONCLUSION

This paper focuses on researching on the architecture and key technology of Internet of Things. Moreover, the applications of Internet of Things are interpreted in this paper. Especially, the application of loT in Industrial machine monitoring is emphasized.

VII. REFERENCE

- W.K. Edwards, "Discovery systems in ubiquitous computing", IEEE Pervasive Computing, 2006,pp. 7077.
- E. Fleisch, and F. Mattem, Das Internet der Dinge, Springer, 1 edition, July 2005.
- F. Jammes, and H. Smit, "Service-oriented paradigms in industrial automation", IEEE Transactions on Industrial Informatics, Feb. 2005, pp. 62-70.
- S. Karnouskos, O. Baecker, L.M.S. de Souza, and P. Spiess. "Integration of soa-ready networked embedded devices in enterprise systems via a cross-layered web service infrastructure", In Proc. of the 12th International Conference on Emerging Technologies & Factory Automation (ETFA), 25-28 Sept. 2007, pp. 293-300.
- Huang Xuyong, "Basic Research of Wireless Sensor Networks and Applications in Power System", Huazhong University of Science & Technology, Wuhan, 2008.
- Zhou Wentian, and Cheng Yongmei, "Application of Wireless Sensor Networks in the Power System", Power Electronics, Feb. 2010, pp. 70-71