

## Energy Management System - EMS

Central Scientific Instruments Organisation (CSIO), with the head quarters at Chandigarh is a premier national laboratory dedicated to research, design and development of scientific and industrial instruments. During 1990s, CSIO Chennai Centre is identified for working in the area of Energy Management Instrumentation. CSIO Chennai Centre successfully completed projects funded by Ministry of Power, DST and international funding agency IGEEP-GTZ, Germany. CSIO Chennai Centre also provides Energy Audits, calibration services etc to the regional industries. CSIO Chennai Centre developed Energy management system based on LonWorks Technology incorporating the embedded networking protocols and state-of-art instrumentation.

Energy conservation is one area of present national focus due to limited energy resources, acute power shortage and the ever-widening demand supply gap. Studies conducted by various national and international agencies indicate that in industries, energy savings of 5% to 10% can be obtained by simple monitoring and an additional 10% to 15% can be achieved by monitoring and control. As most of the industries feel the pinch of increasing in energy costs day by day, they are looking for conservation and better utilisation of energy. An effective, reliable, and robust energy monitoring system is pre-requisite for achieving sustained energy efficiency. This provides quantifiable scientific base for continuous monitoring aids in evolving a goal and ultimately facilitates achievement of lower levels of energy consumption by means of automatic control with interlocking facilities. Central Scientific Instruments Organisation unit at Chennai, under the sponsorships of Department of Science & Technology (DST), Ministry of Power (MoP) and Indo-German Energy Program (IGEP) developed different technologies to tap these energy saving potentials in industries.

The Energy Management System (EMS) as shown in figure acquires data from different energy consuming areas in various sections of the plant and logs the information and generates reports. This information can be used for taking actions leading to improvement in energy efficiency. Based on 'on-line' measured data and the manual data (fed from production such as raw material, finished product etc ( The system has a provision for manual entry if there is no on line physical parameter available ) a shift wise or daily basis, the specific energy consumption figures are calculated and displayed.

The EMS measures and displays the following over-all figures on a continuous basis:

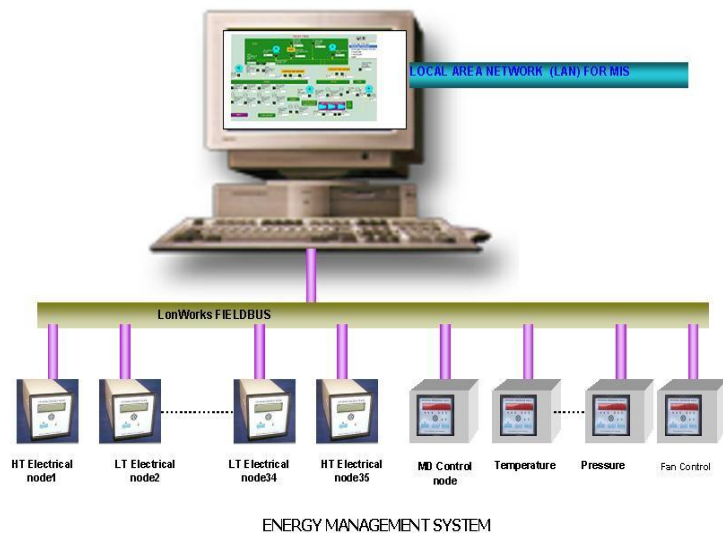
Over-all electrical energy consumption

Purchased - units  
Generated - units  
Fuel consumption

Any physical parameters like Temperature, pressure, steam flow, Compressed air flow etc.,

Steam Consumption - tons / h

The EMS system calculates the Specific energy consumption (SEC) Maximum demand and generates control signals for taking appropriate actions



EMS facilitates achieving substantial improvement in energy efficiency by measures like

- **Better utilisation of energy in industry**
- Energy conservation
- Provide smooth operation
- Ensure safety for both operating personnel and environment

## TECHNOLOGY DEVELOPMENT

LonWorks field bus technology has been adopted for energy monitoring and control. Network nodes have been developed for providing comprehensive electrical energy measurements as well as physical parameter measurements. Each energy node provides comprehensive electrical measurements like single phase as well as three phase voltages, currents, power factors, real, reactive and apparent powers, real, reactive and apparent energies, frequency, demand etc. Physical node provides to take inputs from 8-channel for monitoring compressor pressures and air temperatures and generate on/off control signals. Twisted pair communication has been used to cover the entire distance. LabView software has been adopted for creating real-time monitor screens and for generating reports of energy consumption by utilities like Air Preheater shop, Fan shop, Service plants, Fan testing station, Engineering and Administrative buildings in an engineering industry. The configuration of the system i.e. no of nodes in the system can be added or replaced for further expansion as per the user requirement.

The EMS system installed at BHEL consists of the following:

- Energy nodes for measuring electrical energy on HT side/ LT side
- Physical node for measuring physical parameters taking the signals from physical transmitters
- Control node for controlling the valves actuators etc. by means of on/off or 4-20 MA signals
- Display node is for displaying the parameters in the network at any given place
- PC with PCLTA card acts as system server

## FEEDBACK FROM THE INDUSTRY ABOUT ENERGY MANGEMENT SYSTEM (EMS):

**Feedback from MPL :** EMS has empowered the management with information on power consumption of utility systems of various process units, which was not available earlier in consolidated form. It helped to point out the excess use of energy than the normal for taking corrective actions immediately. It helped to prevent the misuse of energy as watchdog. Over a period of three years the company has reduced its daily electrical consumption from 44,000 units to 39,000 units with a clear daily saving of 5000 units resulting in an annual energy cost reduction to the tune of Rs.75.00 lakhs. It has reduced its SEC from 955 units/ton to 738 units/ton and is maintaining the same at par with global standards.

**Feedback from BHEL:** BHEL recovered the cost of the system within six months. With the help of EMS and energy audits by CSIO, BHEL could reduce its Specific Energy Consumption (SEC) from 305 KWh / Ton during 2001-02 to 177 KWh / Ton during 2004 –05 and its present SEC is 135 KWh / Ton. BHEL utilized EMS thoroughly for PF control, Demand Control and the controls associated with Compressor cooling water temperature. BHEL enhanced the capacity utilization of the electrical systems with the help of EMS. BHEL is now going ahead with the expansion of EMS from section level measurements to bay level monitoring by introducing additional 75 nodes.

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