



ENVIRONMENT MANAGEMENT AND AUDIT

Edited by

P. SASI BHUSHANA RAO

Senior Reader, P.G. Department of Life Sciences,
S.K.C.G. College, Parlakhemundi,
Gajapati, Orissa.

P. MOHANA RAO

Reader, P.G. Department of Commerce,
S.K.C.G. College, Parlakhemundi,
Gajapati, Orissa

Foreword by

Prof. P.K. SEN-SARMA

Emeritus Scientist, Calcutta

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An Introduction to the Concept of Energy Audit

M. SELVAM AND KODEEAWARA RAMANATHAN

INTRODUCTION

Energy short falls and the resultant economic stagnation are direct challenges to our India polity. The role of energy in our economic life is very vital and the wheel of economic progress can not move without the essential input, viz., Energy. It is a well known fact that the identification of new alternative energy sources including renewable energy resources normally takes many years and such sources may not be adequate to meet the current needs of energy in India. Hence the need for energy conservation.

The efficient energy consumption/energy conservation offers a practical means of achieving our national developments/goals. Energy conservation is not an arbitrary reduction of energy consumption. Energy process has an element of avoidable and unavoidable losses and energy spent rationally. Energy organisation aims at reducing energy consumption through all possible ways like:

- elimination/reduction of wastage of energy.
- use of energy more efficiently by improved methods and process.

It is in this context that energy audit gains significance. Energy audit is an effective tool to achieve maximum energy conservation/minimum energy consumption in an industry. Energy audit is an integrated approach covering the entire energy process and it should be carried out without any intermission. Energy audit is a fundamental part of any management programme of any organisation which wishes to control its energy costs.

ENERGY AUDIT

The energy audit is key to a systematic approach for decision-making/planning in the energy management program. It results in identification of energy conservation and attempts to balance the total energy inputs with its use. The energy audit serves to identify all the energy streams in a facility/system which quantifies energy use. It is a positive approach which adds to the financial performance of a company. Financial audit is concerned with the profit, loss and income and expenditure of an organisation whereas the energy audit is about production and uses of an energy. Energy audit is a tool for analysing and controlling of any system where energy is used.

Energy audit helps in energy cost optimisation, energy pollution control, energy safety measures and suggest appropriate methods to improve the operating practices without affecting the quality of the system. It may be instrumental in coping the situations and variations in energy cost, availability and reliability of energy supply for sustainable development. It helps in taking decisions on appropriate energy mix, decisions on improved energy conservation equipments and ad-hoc technology. Energy audit techniques are better than the piecemeal solutions which incorporate measures without adopting a total system approach including gearing-up organisational structure and infrastructural requirements. It would give a positive orientation to energy cost reduction, preventive maintenance and quality control. Energy audit shows to the management the realistic scope for fuel savings and helps in allocation of energy resources. The effective energy audit helps in the following ways.

- to monitor the energy consumption.
- to measure the thermal and overall energy efficiency.

- to reduce and pinpoint the wastage,
- to workout heat balance and mass balance and time consumption.
- to reduce the overall cost and increase the profitability.
- to replace energetically inefficient equipments.
- to involve the substitution of fuels.
- to determine the effectiveness of the present energy utilisation.

Scope of Energy Audit

The scope of an energy audit varies in accordance with the facilities being audited and one extreme form of facility is a manufacturing operation where lighting, ventilation and air-conditioning are the major source of consumption of energy. The other extreme is integrated process units like refineries and petrochemical plants where cascading of energy and complex energy balances are involved. Energy audit is a pre-requisite to an energy management programme. The historic audit provides an overall picture of energy consumption and production, so that, specific energy consumption and costs could be estimated. It is possible to workout an overall index.

The different Scopes of Energy Audit are given below :

- Analysis of current energy consumption pattern and its past trends in details.
- Review of heating and lighting requirements for an industry.
- Review of existing energy recording systems of an industry.
- Review the records of preventive maintenance of an industry.
- Review of fossil fuels storage and handling adopted in an industry.
- Review the new projects with respect to energy end-uses.
- Calibration of sub-meter used in an industry.
- Comparison of standard energy consumption with actual consumption of an industry.
- Comparison of energy consumption with other locations, other firms, previous periods and budgets.
- Comparison of meter-reading against log books of an industry.

- Drawing the diagram of heat balance for the firm.
- Check the records against invoices.
- Check the capacity and level of efficiency of equipments.
- Check the working of automatic controls system.
 - Check the frequency of energy reporting system.
- Examine the level of training for energy management staff.
- Examine and monitor new energy saving techniques.
- Examine the need for energy saving techniques.
- Determine adequacy of maintenance.
- Assessment of the need for improved energy instrumentation.
- Introduction of monitoring procedures for energy use/ consumption.
- Introduction of life cycle costing for energy.
- Consider the changing MIS to include energy parameter.
- Develop energy use indices to compare performance/ productivity.
- Consider the publicity campaigns of incentives and tax-exemption for pollution free machinery.
- Replacement over-rated capacity machines etc.

The Need for Energy Audit

In India, energy audit becomes an effective tool and unavoidable for all sections in view of energy crisis and hikes in the cost of different forms of energy. The needs of energy audit are as follows:

- to understand more about the different ways of thermal energy and primary fuels used in an industry.
- to identify the thrust areas where wastage of energy can occur and where scope for improvement of energy saving exists in any area.
- to keep alive variations which occur in the energy costs availability and reliability of sustainable energy.
- to decide an appropriate energy-mix in any process/method, and,
- to identify appropriate energy conservation techniques.

Type of Energy Audit

Energy audit can be classified from different angle for different purposes. They are as follows:

- preliminary audit.
- detailed audit.
- financial energy audit.
- managerial energy audit etc.

Of all the types, the preliminary audit and detailed audit which are discussed below, are most significant and popularly used in many industries.

The preliminary energy audit is to make a quick estimate of energy requirements and energy efficiency of the process in a limited period of time. This is performed over a short span of time to focus major energy supplies and demands. It usually covers major equipments which account for nearly about 60-70% of the total energy consumed. The data needed are usually taken from production records. It is one of the initial steps taken on energy conservation programme. The frequency of preliminary audit can not be decided and pre-audit visit is also not at all required. However, a detailed questionnaire is to be compiled before the audit. It may form the basis for deciding the modalities of detailed energy audit.

The detailed energy audit shall be performed in a systematic manner for maximum energy saving. It goes beyond quantitative estimates of costs and savings. It should cover more than 90% of the energy consumed. A long term plan can be drawn upon on the basis of data generated and analysed in the detailed audit. This includes engineering recommendations and well defined projects with priorities like costs and savings, use of alternative energy etc. For energy intensive industries, the frequency of this audit may be on an annual basis whereas for other industries, it may be once in two to three years. One or two pre-audit visits are required. In order to conduct detailed audit, a detailed questionnaire should be compiled and advance notice to all departmental heads are to be issued. The detailed energy audit helps in the following ways:

- to evolve norms for energy consumption.
- to establish the baseline for measuring performance.

- to estimate energy cost as a percentage of value added cost.
- to identify the areas which hold higher potential for energy saving.
- to assess economic evaluation of different energy consumption opportunities.
- to train plant personnel in energy conservation techniques.
- to study the role of computers in a energy audit.

CONCLUSION

Energy audit is an effective energy conservation tool to define and pursue a comprehensive energy management programme in an industry. A careful audit could effectively manage the energy system at minimum energy costs for monitoring the energy consumption. It is certain that energy audit would be useful for industries in combating escalating energy costs and also reap several other benefits like improved production, better quality, higher profits, lower emission etc. The energy audit would broadly be the same in any type of industry and service. The basic formats may have to be suitably modified for different types of industries. It is an urgent need for all industries to introduce energy audit without fail and Government of India by regulation should also insist upon the same as compulsory for all industries. Further annual energy audit has to be made mandatory for all industries to conserve the precious and non-replenishable resources of our nation.

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