

Energy Conservation Management and Energy Audit in Small Scale Industries

C.P. KHATTER
DR. B. L. SETHI

Introduction

Energy is a pivotal prerequisite of developed economy and social structures. One of the major problems concerning its supply is the depleting nature of the extraction of fossil resources, combined with the need for transition to renewable energy supplies. The last depends on a number of scientific and technological break through. Meanwhile, energy conservation promises to fill the gap between supply and demand. Several measures for conservation of energy are very important for consideration.

The conservation of energy, therefore, is using less more wisely than before. Saving a watt is nearly always cheaper than increasing the supply by a watt. The energy industry is one of the most capital intensive. Efficient utilization of energy resource is not only conservational it also saves capital investment. Thus conservation is really the cheapest of energy 'resources' at least until its potential is exhausted.

The concept of conservation is dynamic, ever changing. In the past it was less costly to wasteful than to use it efficiently, but as the price of fuel has risen, the cost of waste has become prohibitive.

Shri Suresh Prabhu, Ex. Union Minister for Power explained in detail in an article "Quality Power" – A blue print for power, published in a monthly journal of Tool and Gauge Manufacturers Association [January 2003 issue]. It states that power sector development envisages the following six levels of intervention strategy:

C.P. KHATTER is with Central Institute of Hand Tools, Jalandhar.

DR. B.L. SETHI is with Department of Mechanical Engineering, Thapar Institute of Engineering & Technology, Patiala

- [1] **National Level:**
Covering policy and legal framework.
- [2] **State Level:**
Covering tariff fixation, unbundling, and subsidies.
- [3] **State Electricity Boards:**
State Electricity Board [SEB] covering restructuring, accounting and management information system.
- [4] **Distribution Circle Level:**
Covering outage reduction, reliability and accountability.
- [5] **Feeder Level:**
Covering reliability, voltage stabilization, metering, high tension/ low tension [HT/LT] ration correction.
- [6] **Consumer Level:**
Covering metering, billing and consumer satisfaction

The blueprint outlines individual strategies for each specific problem issue for solution.

The above surely indicate the concern on the National level and clear vision on the Energy Conservation. In the blue print all the aspects at various levels have clearly defined and action plans have been made with the consent of Plans have been made with the consent of Planning Commission and other agencies involved.

At the international level, United Nations Industrial Development Organisation [UNIDO] has taken up the subject on very high priority. Dr. Pradeep Monga, Ph D, Senior Technical Advisor, Industrial Energy Efficiency Branch Program Development and Technical Cooperation Division, United Nations Industrial

Development Organisation, Austria as Senior Technical Advisor have been assigned the task at international level. Shri P. P. Malhotra, Industrial Advisor office of Development Commissioner [Small Scale Industries] New Delhi is an executive officer for energy conservation in small scale Industries at national level.

Energy Conservation Act 2001 has been passed to take care of the Energy Conservation at various levels. Rules are under finalization to give effect to Energy Conservation Act. A detailed Action Plan on Demand Side Management is being prepared. Benchmarks for important cost segments of various power projects have been identified based on manual on International Good Practices. This would enable the utilities to explore for cost reduction and also ensure a certain degree of transparency. The objective is to reduce the cost of power delivered so as to make it affordable for the consumers.

Project Promoting Energy Efficiency In Hand Tools Small Scale Sector In India

Office of Development Commissioner [SSI], Ministry of Small Scale Industries under the Program of Energy Conservation have undertaken a Project on Promoting Energy Efficiency in Hand Tool Small Scale Sector India.

The project aims at strengthening the competitiveness of energy intensive and export oriented Forging/ Hand Tool SSI Sector in India through adoption and promotion of energy efficient and clean technologies, strengthening policy institutional structure and supporting capacity building and developing an international marketing strategy for export promotion to enhance export share of SSI units. The Hand Tool SSI clusters based at Jalandhar [Punjab] and Nagaur [Rajasthan] have been identified as the key clusters and the experiences would be disseminated to Hand Tool SSI cluster at Tumkur [Karnataka] and other places in the country.

UNIDO and Development Commissioner [SSI] are the key partners for implementation of the program. SIDBI and Indian Hand Tool Manufacturers Associations would be the co-operating partners. The other agencies like CIHT Jalandhar, HTDDTC Nagaur [Rajasthan], Bureau of Energy Efficiency, NPC, and TERI etc would also be networked for implementing the Project.

The project Cost
US \$ 7,50,000
DC [SSI]
US \$ 3,00,000 [40%]
UNIDO US
\$ 3,00,000 [40%]
SIDBI and industry Association US
\$ 1,50,000 [20%]

The project duration is 3 years from the date of commencement.

Industry Associations have committed their contribution of US \$ 75,000 in the project.

Government of India has approved the above project.

Energy conservation in small-scale industries

Following main fields are covered in SSI Units:

- Oil Fired furnaces
- Electric heated furnaces
- Coal fired Furnaces
- Boilers
- Electric motors
- Compressors
- Pumps, fans and variable speed drives
- Refrigeration and air conditioning systems, etc.

Government Aid Is Also Available for:

- Change in technology for energy conservation
- Change in manufacturing/ machining technologies for energy conservation
- Energy conservation with Intentions for export
- For creating representative industries for energy conservation

The energy audit serves in identifying all the energy streams in a facility system to quantify energy use in discreet functions. Energy Audit has a positive approach aimed at continuous improvement in energy utilization in contrast to financial audit, which stresses to maintain regularity. Energy audit provides answers to the questions – what to do, where to do, where to start, at what costs and for what benefits.

Energy audit helps in energy cost optimization, pollution control, improving safety aspects and suggests methods to improve the operation and maintenance practices of the system. It may be instrumental in coping with variations in energy cost, availability and reliability of energy supply, decision on appropriate energy mix, decision on improved energy conservation equipment/ instruments & technologies. This technique is better than the piecemeal incorporation of measures without adopting total system approach, including gearing up organizational structure and infrastructure requirements.

The Inter Ministerial Working Group [IMWG] in its report have identified a saving potential of 15-20% on an average in various types of industries. This is a Energy Conservation Act 2001 has been passed to take care of the Energy Conservation at various levels. Rules are under finalization to give effect to Energy Conservation Act. A detailed Action Plan on Demand Side Management is being prepared. Benchmarks for important cost segments of various power projects have been identified based on manual on International Good Practices. This would enable the utilities to explore for cost reduction and also ensure a certain degree of transparency. The objective is to reduce the cost of power delivered so as to make it a affordable for the consumers.

Project Promoting Energy Efficiency on Hand Tools Small Scale Sector in India

Office of Development Commissioner [SSI], Ministry of Small Scale Industries under the Program of Energy Conservation have undertaken a Project on Promoting Energy Efficiency in Hand Tool Small Scale Sector in India.

The project aims at strengthening the competitiveness of energy intensive and export oriented Forging/ Hand Tool SSI Sector in India through adoption and promotion of energy efficient and clean technologies, strengthening policy institutional structure and supporting capacity building and developing an international marketing strategy for export promotion to enhance export share of SSI units. The Hand Tool SSI clusters based at Jalandhar [Punjab] and Nagaur [Rajasthan] have been identified as the key clusters and the experiences would be disseminated to Hand Tool SSI cluster at Tumkur [Karnataka] and other places in the country.

UNIDO and Development Commissioner [SSI] are the key partners for implementation of the program. SIDBI and Indian Hand Tool Manufacturers Associations would be the co-operating partners. The other agencies like CIHT Jalandhar, HTDDTC Nagaur [Rajasthan], Bureau of Energy Efficiency, NPC, and TERI etc would also be networked for implementing the Project.

The project Cost
US \$ 7,50,000
DC [SSI]
US \$ 3,00,000 [40%]
UNIDO US
\$ 3,00,000 [40%]
SIDBI Industry Association US
\$ 1,50,000 [20%]

The project duration is 3 years from the date of commencement.

Industry Associations have committed their contribution of US \$ 75,000 in the project.

Energy conservation in small-scale industries

Following main fields are covered in SSI Units:

- Oil Fired furnaces
- Electric heated furnaces
- Coal fired Furnaces
- Boilers
- Electric motors
- Compressors
- Pumps, fans and variable speed drives
- Refrigeration and air conditioning systems, etc.

Government Aid is also available for:

- Change in technology for energy conservation
- Change in manufacturing/ machining technologies for energy conservation
- Energy conservation with Intentions for export
- For creating representative industries for energy conservation

The energy audit serves in identifying all the energy streams in a facility system to quantify energy use in discreet functions. Energy Audit has a positive approach aimed at continuous improvement in energy utilization in contrast to financial audit, which stresses to maintain regularity. Energy audit provides answers to the questions –what to do, where to do, where to start, at what costs and for what benefits.

Energy audit helps in energy cost optimization, pollution control, improving safety aspects and suggests methods to improve the operation and maintenance practices of the system. It may be instrumental in coping with variations in energy cost, availability and reliability of energy supply, decision on appropriate energy mix, decision on improved energy conservation equipment/ instruments & technologies. This technique is better than the piecemeal incorporation of measures without adopting a total system approach, including gearing up organizational structure and infrastructure requirements.

The Inter Ministerial Working Group [IMWG] in its report have identified a saving potential of 15-20% on an average in various types of industries. This is a substantial amount of savings. However, for conducting energy audits, certain sophisticated equipment/ instruments are required to get an accurate picture of the saving potential. These standard equipment / instruments being costly poses a deterrent for the industries/ Energy Auditors to purchase and conduct Quality Energy Audit.

Various groups/ Committees have underlined the imperative need for upgrading the capabilities of Energy Auditors/ Industries in our country. Keeping this and above facts in view, it is proposed to provide financial assistance for purchase of equipment/ instruments required for conducting energy audits so that energy auditing may be efficiently and accurately carried out. This would also help industries in knowing the actual quantum of energy, which is being wasted.

The small industries covering a wide spectrum of industries in small, tiny and cottage sector occupy an important position in planned development of Indian Economy and has grown to be the most vital sector of our nation. The liberalized policy of the Government has thrown this industrial sector to the large and giant multinational companies, also posing certain challenges as well as bringing opportunities to the small-scale sector. Because of the creditable contribution of the SSI sector towards economic progress of the country, Government of India is committed to promotion, financing and development of this sector and also coordinating functions of all institutions engaged in similar activities.

Scope of Work in Energy Audit

Study of Specific Energy Consumption Pattern

- [1] This involved collection and computation of data/information on the energy consumption pattern and production in Central Institute of Hand Tools.
- [2] **Study of Reheating Furnaces**
Performance of the Reheating Furnaces were studied and specific recommendations for energy efficiency improvements have been suggested, wherever practically feasible/ appropriate.
- [3] **Study of Air Compressors**
Performance of the Air Compressors and allied systems were studied to assess their operational performance. The collected information in the form of measurements was analyzed to evaluate the Specific power consumption [kw/cfm] for the Air compressors.
- [4] **Study of Motive Load**
Measurements using appropriate instrumentation support to access the loading, power factor and efficiency of motors/pumps/fans above 10 HP were made to identify specific energy savings proposals, where practically feasible/ appropriate.
- [5] **Study of the Lighting System**
Performance of the lighting installations were studied and specific recommendations for improvements in lighting have been suggested, wherever practically feasible/ appropriate.
- [6] **Study of DG Set**
Performance of the DG Sets was studied to assess their operational performance. The collected information in the form of measurements was analyzed to evaluate the Specific Electricity Generation Ratio [KWh/ Lit] for the DG sets.

Methodology

Methodology adopted for achieving the desired objectives assessment of the current operational status and energy savings include the following:

- Discussions with the concerned officials for identification of major areas of focus and other related systems;
- A team of engineers visited the plant and had discussions with the concerned officials/ supervisors to collect data/ information on the operations and Load Distribution in the plant. The data was analyzed to arrive at a base line energy consumption pattern.
- Measurements and monitoring with the help of appropriate instruments including continuous and / or time lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- Computation and in-depth analysis of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.

Reference Book:

Power and Energy for Sustainable Growth
Proceedings All India Seminar,
February 20-21, 2003