

THE EXISTENCE OF ENERGY MANAGERS IN AN INDUSTRY - A NEED OF THE TIME IN THE ENERGY STARVED ENVIRONMENT

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ABSTRACT

It all starts or fails with energy managers! No energy manager in a firm means no voice to invest in energy efficiency. No voice implies no annual budget for energy conservation measures. Having no annual budget means no energy efficiency measures are implemented. No implementation results in less profit and no energy cost reduction. It is expected from an energy manager to follow a sequential and iterative procedure and suggest design improvements in existing energy systems. In line with the Government's effort to be more energy efficient as indicated within the Strategic Plans of Saudi Arabia, the Energy Efficiency (EE) programmes would focus especially in the industrial and commercial sectors. With the proposed introduction of Efficient Management of Electrical Energy Regulation, amendments to the Uniform Building By-laws, labelling of electrical appliances and the use of high-efficient motors, the focus on energy efficiency within the commercial and industrial sector would be further enhanced. These developments coupled with the recent increase in energy cost worldwide spells a real need to develop local experts with the required knowledge and experience in energy efficiency. As energy and environmental problems intensify, there is urgent demand nationwide for energy managers who can set up and implement real practical solutions. It is not just concerned with saving energy, but also with increasing productivity, improving standards of living and saving money. This paper discusses various aspects of certification of energy managers process in terms of academic requirements for the certification as well as the accreditation requirements needed from training institutes. Various technical aspects of the process have been discussed keeping in view of labour market requirements and perspective.

Keywords: energy managers, energy efficiency, certification methods , high efficient motors

INTRODUCTION

It all starts or fails with energy managers ! No energy manager in a firm means no voice to invest in energy

efficiency. No voice implies no annual budget for energy conservation measures. Having no annual budget means no energy efficiency measures are implemented. No implementation results in less profit and no energy cost reduction. It is expected from an energy manger to follow a sequential and iterative procedure and suggest design improvements in existing energy systems. The optimization procedure is outlined in Figure 1 [1].

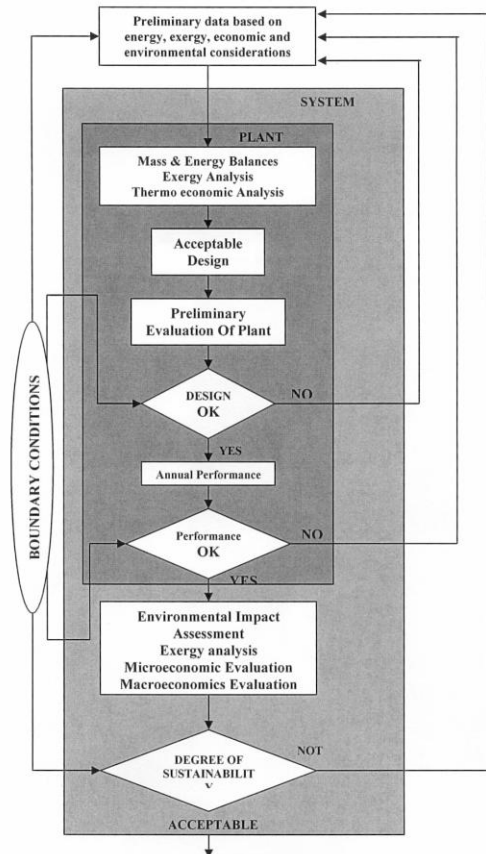


Figure 1. Optimisation of performance evaluation (adopted from Giannantonio et al. 2005)

The procedure extends iterative thermoeconomic design procedures suggested in the past by means of the addition of economic and environmental evaluations. Starting from a tentative preliminary design, the procedure organizes in series the information deriving from the three kinds of analysis (energetic, exergetic and thermoeconomic) that focus on the energy process itself in order to get from each of them indications for design improvement. After these process-scale analyses are performed yielding some viable alternative options, the design is judged through larger scale assessments based on environmental impact, exergy accounting, and micro/macroeconomic evaluations. According to this judgment, the energy manager can gain confidence on design performance and can suggest design parameters or structural modifications for energy conservation [2].

At each step of the procedure a set of suitable performance indicators, referring to either plant or single components, is defined to help the energy manager to understand the physical processes involved in the system and/or in its components compare component and/or system performances. Energy Management is all about how to make the best use of our present and future energy sources. It address critical economic and environmental problems due to energy use by considering the technical, economical, environmental and social factors that affect the usage and demand for energy. However, the Energy Manager as it stands presently is expected to be familiar with the following broader areas of energy and thermoeconomic analysis, energy auditing and planning and environmental evaluation. It is expected from an energy manager to follow a sequential and iterative procedure and not only suggest design improvements in existing energy systems but also to get the buy-in of top management to implement these improvements. As such an Energy Manager must be able to cut across all divisions / sections / disciplines within the organization to be able to formalize optimal energy programmes. Any Energy Manager Training course should be holistic in nature, i.e. cover all aspects of the aforementioned areas in energy use within an organization, this again should address whether it is for the commercial or the industrial sector [3].

As it is the intent to set a comprehensive programme in Energy Efficiency for the commercial and industrial sector, the introduction of any workable programme that brings the optimum results within the Malaysian contexts should be well thought out and opinions weighted before initiating the programme rather than working on the idea of implementing first and adjusting as we go along. This may in fact be counter productive in so far as to start with the right foot and steer an energy efficient culture within the commercial and industrial sector.

THRUST OF ENERGY EFFICIENCY IN MALAYSIAN MARKET

As part of the Malaysia - Danish Environmental Cooperation (REEE component) SCI Output 9, a survey of the present market for energy managers had been undertaken. The

sample consisted of 16 written questionnaire and 25 face-to-face interviews. The survey has come up with the following guidelines:

- Almost all companies participating in the survey are focusing on how to increase the energy efficiency in the company and reduce the energy costs.
- Most companies do not have a designated position in charge of energy matters within the company; however it is usually assigned to an existing position as a joint function or part function of other designated jobs viz. Technical Services Manager, Electrical Manager, Production Manager.
- All companies are aware of the initiative of the new guidelines requiring companies consuming total electrical energy equal to or exceeding more than 6 million KWh per year requires a registered energy manager.
- All companies are aware of the need for further education/training in the fields of energy efficiency for its personnel involved in energy matters and are sending existing staff for specific training and upgrading.

ENERGY COMMISSION REQUIREMENTS FOR CERTIFICATION AS ENERGY AUDITOR/MANAGERS

A review was carried out to compare the requirement of the Energy Conservation body syllabus and guidelines issued, with some of the training institutions involved in the certification of energy managers. These institutions in principle conform to all the sub-topics required by the Energy Conservation Body for the requirements of the legal, regulatory and environmental aspect of energy management. However, the training institutes needs to establish the minimum learning objective, minimum duration and methods of assessment for each of the objectives. The learning objectives should cumulate to an overall learning objective for the energy manager, which should have its main focus on his/her ability to gain better control and structure of the company's energy use by assessing current use/operating practices, and by taking the necessary steps to incorporate energy efficiency into the corporate culture. It is to be stated that there is a difference between an energy auditor and an energy manager. Energy auditing can be stated as more of a science while management is more of an art that requires different skills as compared to an auditor. As they are two distinct fields of specialization, it would be prudent to specifically look at the time allocation versus the require learning objective of each subsection and if there is a need to separate the training to focus on energy auditing and energy management [4]. There are three conditions set by the EC for entry qualifications of candidates for the energy manager's course. They are following:

- Posses a certificate or diploma or a degree or any other qualification recognized by the government in any engineering discipline; or having and certificate of competency of Electrical Engineer or Service engineer or Electrical Supervisor or High voltage Chargeman.

- Working in an operational, maintenance or supervision of any engineering environment or building maintenance for a minimum period of three year
- Not less than 25 years of age.

A suggested entry and certification methodology is shown in Figure 2.

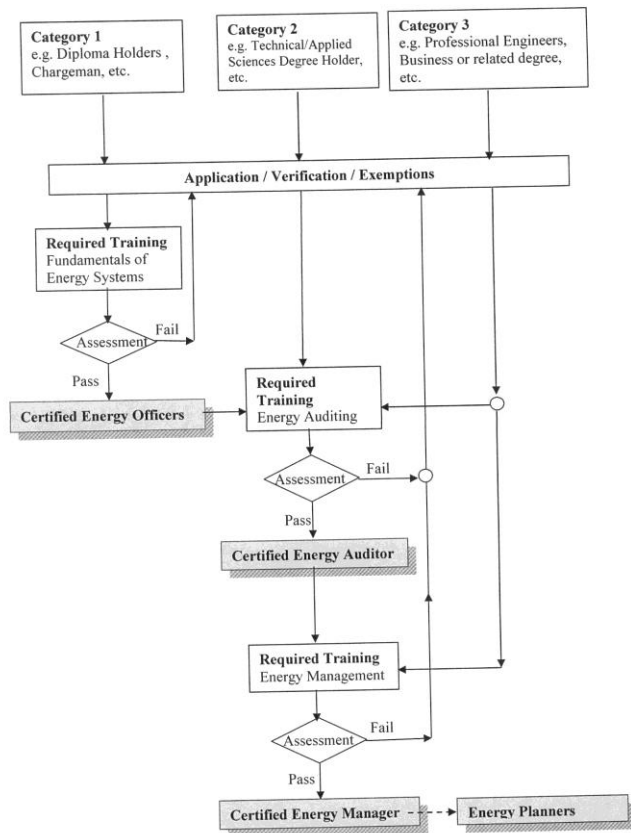


Figure 2: Entry and Certification methodology for Energy Officers/Auditors/Energy Managers

Here arbitrary terms of Energy Officer, Auditors and Managers are used simply in view of categorizing the entry and certification levels. Further requirement in number of years experience could be set against each category / qualifications or in fact exemptions could be given to certain candidates.

The syllabus for the Auditors should include class room teaching and practicals (hands-on). The suggested syllabus guidelines for the Auditors should cover the areas like energy audit, energy data collection and reporting methodology. After the classroom session the candidates must be exposed to actual supervised (by the trainers) audits at specified plants or at institution having such facilities prior to carrying out audit projects of their own. These hands-on supervised audits sessions should include the usage of all different measurement and monitoring equipment learnt during the classroom sessions.

As for the energy managers, the course should focus on the management aspect of energy within an organization and should include the following areas:-

- Sustainable Energy Management
- Energy Management Policy
- Legislation
- Audit Process, Target & Plan
- Project Management & Control
- Energy Business Practice & Financing
- Application of Information Technology for Energy Efficiency
- Case studies - integrated energy and resource usage and cost reduction projects.

After the formal class room teaching, the candidates for Energy Managers should return to their place of employment where they must implement their energy efficiency project based upon information obtained during classroom instruction. Following the selection of an approved energy efficiency project, with the support from training institute, the candidates gather project baseline data, implement the project and then measure and verify project energy savings and financial analysis.

CERTIFICATION CATEGORIES FOR ENERGY OFFICERS / AUDITORS / MANAGERS

The certification for the energy officers/auditors/energy managers is aimed to raise the professional standards of those engaged in energy efficiency. It is also required to improve the practice of energy efficiency by encouraging energy professionals in a continuing program of professional development. It is also needed to identify people with acceptable knowledge on the principles and practices of energy efficiency related disciplines and laws governing and affecting energy efficiency through completing an examination and fulfilling prescribed standards of performance and conduct [5]. These categories should include all relevant competencies certificates issued according to the following acts,

- The Factories and Machinery Act
- Occupational Safety and Health Act
- The Electricity Supply Act
- Energy Commission Act, and
- Any other relevant Act

Energy officers / auditors/ managers can fall under the following prerequisite:

Energy Officer - A two-year Technical / Vocational Diploma with fixed number of years of experience in energy efficiency. The number of years experience could be varied according to different designation / qualifications. These candidates should go for the certification as Energy Officers. With this certification they could be authorized to assist the energy auditor / managers in carrying out energy auditing/management task. To ensure a career path, they should

be allowed to continue with the knowledge and skill levels up to that of an Energy Manager (refer to Fig.2).

Energy Auditor - An engineering \ technical \ applied sciences degree holder with minimal experience in energy efficiency. These candidates are to be assessed for the certification as Certified Energy Auditors (CEA). These CAE's should be recognised as the persons that are authorized to carry out "official" audits and issue certified energy audit reports for an organisation. They could either be internal members of the organization or external auditors hired by an organization to produce the certified energy audit.

Energy Manager – An engineering, business, or related degree with more than 10 years of experience, Professional Engineers, First / Second Engineers (Factories and Machinery Act), Competent Electrical Service Engineer, Competent Electrical Engineer (Electricity Supply Act) or other equivalent qualifications deemed acceptable. People in this category are not required to be CEA, however may choose to become Energy Auditors thus requiring them to undergo the same training and assessment as the energy auditors (refer to Fig.2). It is suggested that the syllabus be modular in nature such that those who had chosen the path through the CEA route should be exempted from the "Audit Process, Target & Plan" module in the Energy Manager Programme.

An energy manager occupies an important position and is a focal point of all the activities pertaining to energy management in the organization. The energy manager provides leadership in the development of policy on Energy Management Action Plan and plays a key role in the formulation of corporate energy policy. Energy managers also perform the activities related with Energy Management, Project Management, Personnel Management and Financial Management at the plant level. He also prepares the information to be submitted to the Designated Agency with regard to the energy consumed and action taken on the recommendation of the Certified Energy Auditor.

ASSESSMENT OF COMPETENCIES OF CANDIDATE

Competency is the ability to apply skills and knowledge to the job in order to achieve the required outcomes in the workplace. Competency standards define the outcomes required, provide benchmarks which allow the assessment of competency and provide a means of recognition of competency wherever or however it is gained [6].

An examination for the candidates after the training programme gives the certification agency assurance that the person being certified can perform the tasks and skills as needed by the respective qualifications. The public and other industrial users of energy efficiency services have a right to expect that those operating within the industry are competent in the area of service they offer. It is especially true, if it is the intent to allow the Certified Auditors / Managers to act as consultants to the commercial and industrial sector [7]. The

competency of the candidates can be accessed by any of the two bodies:

- i. Independent Agency - could be the competency issuing agency like the Energy Commission (EC) or by an authorized independent association (e.g. Malaysian Energy Professionals Association)
- ii. Training Institutes

If the candidates are to be accessed by the independent agency then it is suggested it be comprised of two sections. Firstly a written comprehensive examination is to be conducted by the independent agency. The examination paper is to be prepared by the designated examiners set by the independent agency. A standard format of the exam needs to be adhered such that it is uniform for all the different training institutions. The written examination as for the Energy Officers amounts to 100 % while for the Auditors and Managers carries 60 % (higher percentage than the project work) of the assessment marks. Secondly, the Auditors and Managers who have passed the written examination should be asked to present their project work / working paper. The examination panel is to be set by independent agency. The candidates should be asked to present their work in 20 minutes followed by a 10 minutes question – answer session. This examination covers 40% of the assessment marks.

This method of examination may be tailored such that a candidate can choose to sit for the common examination without having to go through the training phase; if at all this is to be encouraged. Those who have secured 70% aggregate marks should be declared to have passed the Energy Officers / Auditors/ Managers Certification Programme. As for the Energy Managers it could be envisaged that a short interview by the panel to assess the energy managerial skill of the candidate may be required.

If the assessment is to be done by a private training institute then it is suggested that the assessment of the candidates should be done in a slightly different manner. Firstly, a comprehensive examination is to be conducted by the training institute. The examination paper is to be first submitted to an authorized independent body. The authorized independent body will send the paper to designated external examiners for verification / modification. This is for the purpose of standardizing the level of difficulty amongst the different institutions. The examination is to be supervised by a designate from an authorized independent body or by the staff members of the training institute. The written examination carries 60 % (higher percentage than the project work) of the assessment marks for the auditor / managers programme. As for the Energy Officers examination the whole exercise can be conducted by the training institute. Secondly, those that have passed the written examination should be asked to present their project work. There should be one external examiner designated by the authorized independent body to supervise the presentation examination. The external examiner will also grade the candidates. The candidates should be asked to present their

work in 20 minutes followed by a 10 minutes question – answer session. This examination covers 40% marks.

Those who have secured 70% aggregate marks or a pass for both the examinations should be declared to have passed the Energy Officers / Auditors course. However, for the Energy Managers certification a final interview could be conducted by designated external examiners. However, all three categories must apply to the competency issuing agency to be registered before they are recognized as Certified Energy Officers / Auditors / Managers.

To sustain a continuous need to produce people needed for the evaluation and certification process, it is envisaged that after 1-2 years on job experience as a Certified Energy Auditors / Managers these Energy Auditors / Managers can choose to undergo an independent evaluation program. The evaluation should be based on following:

- Recalling technical knowledge gained during certification process
- Performance indicators achieved during the job
- Published reports, project reports, etc. on energy efficiency
- Ability to handle unforeseen energy auditing/ management scenarios

ACCREDITATION OF PRIVATE TRAINING INSTITUTES

The Accreditation Procedures for Private Training Institutes must be an integral part of the certification process for the Energy Officer/Auditor/Manager. Accreditation of professional programmes is to ensure consistent standards of quality by these the private training institutions. Successful candidates from accredited programmes have a distinct advantage if they decide in due course to seek professional recognition – and many employers will take this into account when recruiting these energy professionals. Increasingly, however, the advantages of independent professional accreditation are being recognised internationally and regionally. These accords are assuming growing importance with employers as the globalisation of products and services demands greater confidence in the skills and professionalism of the energy managers involved [8]. Towards this end it is advisable the Energy Commission liaises with regional bodies on the issue of Energy Managers certification.

The Energy Manger program should be designed to prepare individuals with knowledge and skills required for the task of energy conservation, analysis and management. In general the program should satisfy following:

- Curriculum shall have sufficient prerequisites to ensure that graduates have a predictable level of expertise;
- Facilities shall be sufficient and safe for the training;
- The organization has appropriate financial resources and that administrative and management procedures and policies are in practice; and

- Written policies shall ensure the competence, impartiality, and integrity of the program.

Any Training Institute wishing to gain accreditation for an ‘Energy Officers / Auditor / Manager’ programme should approach the Designated Agency (EC) in Malaysia. The Training Institutions will have to fill in all items in the application and study the certification scheme, fundamental concept, certification requirement and criteria for certification. Some of the required document could include,

- Official Applications Forms for Energy Auditor/ Manger Certification Program
- A summary of program offerings, including objectives (learning outcomes), descriptions, and agendas,
- A summary of the credentials and experience of the teaching staff,
- A description of the relevant facilities, resources, and equipment available for
- Instructional programming and for conducting skills evaluations
- A historic record of the development and presentation of the course offering

A suggested flow from application to accreditation is as shown in Figure 3.

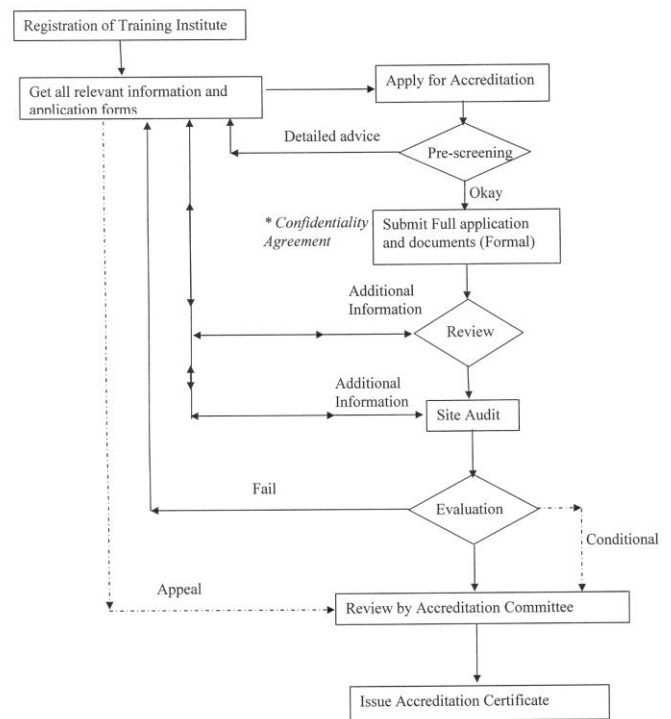


Figure 3: Process Flow of Accreditation Methodology

The Designated Agency (EC) should perform a pre-screening, should the pre-screen be not satisfactory, applicants will receive detailed recommendations for improvement. Once

all documentation are in order the formal application and other related documents will be submitted to the Designated Agency (EC) for formal review.

The Designated Agency will appoint independent accreditation auditors for the site visit and audit. The auditor will evaluate the Training Institute based upon the criteria and existing evidence and documentation. The auditor may seek additional information prior to or during the visit, but every effort will be made to align requirements with those that a training institute would normally have to meet for internal management and quality assurance. The panel will expect to meet the teaching staff and students, and to visit library, laboratory and other resources. Examination papers and evidence of marking strategies should be provided. The internal QA system will be reviewed. If the evaluation result is satisfactory, the auditor will submit the audit report and evaluation result to the Designated Agency or further review. However, if the evaluation is not satisfactory, the auditor will provide recommendations for improvement and make appointment for the subsequent audit.

Confidential agreement should be made between the applicant and Designated Agency to ensure all the applicant's documentation submitted and information gathered during site visit and audit are treated as confidential only for the purpose of organizational accreditation [9]. The Designated Agency Committee will review the audit report and, unless obvious omissions are notices, give its final approval of accreditation or choose to give a conditional accreditation. A certificate will be issued to the successful applicant. A list of the accredited organizations should be publicized on the Designated Agency web site and newsletter. Successful applicants should have the right to display the logo of the Designated Agency on their published materials.

Accreditation usually carries validity duration for a 3-year period. The Designated Agency should reserves the right to clarify or verify any aspect of the accreditation. It reserves the right to withdraw accreditation at any time, upon establishment of evidence that accreditation criteria are not being met. Renewal of the accreditation will be subject to submission of relevant documentation and site audits. On-the-spot audits might be conducted to verify the accuracy of the information provided in the application form, where deemed necessary.

Accreditation brings with it a serious responsibility and requires that those involved – in accreditation, certification, and those accredited and certified – meet the highest standards of ethics as well as the standards for technical knowledge and skills. Without ethical guidelines, and the commensurate sanctions for failing to meet those standards, any credential awarded would be suspect in the market [10].

All the accredited institutes should follow a code of ethics. Having received accreditation from the Designated Agency (EC), the common codes that should be followed by institutes are as follows:

- The institute should agree to adhere to the standards of professionalism and conduct as advised by the Designated Agency from time to time.
- Avoid all conflicts of interest, both in fact and in appearance;
- Maintain all confidential and proprietary information in the strictest confidence;
- Commit to bringing professionalism, accountability, and integrity to this work;
- Practice and maintain professional competencies according to the educational standards advised by Designated Agency;
- Immediately report any and all incompetent, unethical, and/or unprofessional conduct by associates or candidates to the Designated Agency
- Not make any statement or take any action that could bring the accrediting body, the process, the industry, or the credential into disrepute.

CONCLUSIONS

Despite the widespread recognition among the energy users of realizing greater efficiencies in energy use, technical and non-technical barriers continue to inhibit them from harnessing the huge potential that is prevalent. Although, there have been oases of excellence with some progressive organisations reporting significant achievements in energy efficiency, opposing factors, such as limited research and development funding due to budgetary constraints, emphasis on short-term rather than long-term goals and managerial obsession with the bottom line has hindered the acceptance.

Policy makers and authorities must continuously encourage and facilitate efficient use of energy in all economic sectors, as the Saudi economy grows at a rate leading to large-scale industrialization. While at present, voluntary efforts are being encouraged by the government, the long term effective solution would be the use of legislation to improve end use energy efficiency in all sectors of the economy. To ensure the effectiveness of any energy efficiency legislation that would come into effect, the legislation should cover all areas of energy use, categorically both the electrical and thermal energy use. The support systems to ensure proper execution and monitoring of this legislation should be viewed with equal importance. The primary focus should be to uniquely structure an approach that integrates the requirements of the legislation and a recognized certification / accreditation process that promotes the growth of an energy efficient culture within the industrial and commercial sectors.

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