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Introducing the Energy and Environmental Management System

Energy and environmental management is about people and machinery performance management.

1.1 Introduction

Industrial plants use large amounts of fossil fuels and other raw materials taken from the earth’s natural resources and convert them into products and useful energy. The use and conversion of primary energy always results in waste, emissions and effluents that have an impact on all environmental media. Environmental pollution through industrial operations is a highly regulated area where operating in compliance with regulations and standards carries additional requirements and costs.

The prudent management of energy and the efficient use of natural resources are two major preconditions for environmental management. It is important to recognize from the start that impact on the environment and pollution are the consequence of energy use and the processing of material resources. If the use of energy and materials is optimized, the resulting environmental impact will be minimized! Where no energy or materials are used, there is no impact on the environment.

Efficiency is not only important as an indicator of the careful treatment of natural resources, it is also an indicator of the emissions released in order to produce a unit of production or energy. Good environmental practice is simply good management. Environmental problems are often the symptoms of inefficiency and waste of resources. Achieving best operational practices through the implementation of energy management is the first logical step to introduce systematic environmental management. When unnecessary energy consumption is eliminated and waste minimized, the impact on the environment will already be reduced to a minimum and the remaining level of environmental releases and discharges should then be subjected to appropriate disposal and abatement techniques.

Otherwise, if a company decides before considering anything else to install a flue gas treatment facility so as to reduce SO\textsubscript{2} and NO\textsubscript{x} emissions, and subsequently embarks on energy efficiency improvement projects which will result in a significant reduction of energy consumption, the company will find itself
with an oversized treatment facility that costs much more to procure and to operate than was actually required.

Energy management is a prerequisite for environmental management, but these two performance management systems are complementary to each other. The scope of energy management can be easily extended to include environmental concerns, at least with regard to monitoring of performance. When both performance areas – energy and environment – are addressed at the same time, we can refer to it as *integrated energy and environmental management*.

Improving environmental performance sometimes creates considerable cost but ensures compliance and demonstrates social responsibility. From the experience of numerous companies worldwide, improving energy performance often proves to be the most profitable investment a company can make, as we will demonstrate through selected case studies. Energy performance improvement can be a driver for the improvement of environmental performance and the financial benefits from energy savings can offset some of the costs of environmental improvements.

Energy and environmental management in industry is about controlling energy and environmental performance throughout industrial operations with the objective of achieving the company’s goals by lowering energy consumption and minimizing the impact on the environment due to the use and conversion of energy, water and any input materials. The foundations for both energy and environmental management are similar if not the same, therefore they will be elaborated upon concurrently in this chapter.

### 1.2 Definition of terms

We now explain what the term ‘Energy and Environmental Management System’ (EEMS) stands for in this book. This is particularly important because EEMS contains the words ‘system’ and ‘management’, which are so ubiquitous nowadays. However, it seems that wherever we encounter them, their meaning is different.

Some of the ambiguity is derived from the fact that Management Systems are not tangible and easily identifiable assets within a company. Some comes from the lenient use of the same terminology in different areas that come together in industrial operations. Often, we have discussions with people in industry who are striving to understand what this environmental ‘Management System’ that they have struggled so hard to develop in order to get their ISO 9000 or 14 000 certification actually is. They understand quality and environmental concerns but the ‘Management System’ part is often hard to grasp. On the other hand, various manufacturers claim that a versatile electricity meter is an ‘energy management device’, or that an automatic or computerized control system is the ‘Energy Management System’. This is not quite the case, as we will explain here.

Usually, the term ‘Environment’ stands for the surroundings of a specified system. In the context of this book, ‘Environment’ stands for a natural surroundings of a company or an organization which may be influenced or polluted by the company’s or organization’s activities. The effects of industrial activities are referred to as *environmental impacts* upon the major environmental media, which are air, water and land.

Assuming that the term ‘Energy’ stands for all forms of heat, power and utilities – electricity, fuel oil, solid fuels, gas (NG, LPG), water (chilled, hot, treated, industrial), steam, air (compressed, cold, hot) – and does not need much explanation at this point, we can focus on the ‘Management System’ part. We will start with the term ‘System’.

#### 1.2.1 System

Formally, a system can be viewed as a collection of functional components interacting in order to achieve an objective or to perform a task within defined boundaries. Every system has some inputs and outputs
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and is interfaced with its surrounding environment (see Fig. 1.1). From this viewpoint, almost anything can qualify to be called ‘a system’ – that is why the use of the term is so common.

If a system is to be controlled, the essential feature is feedback – information about output deviations from target values, brought back to the input side (see Fig. 1.1). This information must be based on measurements. Inputs can be regulated based on the feedback, in order to control the system so that satisfactory performance can be maintained.

Companies can also be viewed as man-made systems of coordinated processes and interrelated parts working in conjunction with each other, operated by people, aimed at accomplishing the core objectives of the business and a number of other goals (organizational and individual).

Such a system – a company or a business system – is always in dynamic interaction with its surroundings, determined by a constant flow of resources into the system, and flow of system outputs, intended and incidental, out into the environment.

Very broadly, the company resources fall into four categories:

1. **Natural resources**
   - Materials, energy, land...

2. **Man-made resources**
   - Technology, machines, buildings...

3. **Human resources**
   - People.

4. **Capabilities**
   - Organizational routines, procedures and **knowledge** determining a company’s ability to perform, i.e. provide services or deliver products.

To regulate such a system is clearly outside the scope of an ordinary automatic control system because increased complexity and the uncertainties caused by impacts from surrounding and human factors must be taken into account.

This problem brings us to the concept of ‘Management’.

### 1.2.2 Management

The founder of management philosophy Henry Fayol specified the main management tasks or processes that are still around today (Table 1.1).

On the operational level, management is concerned with optimizing and controlling the use of company resources in order to achieve specified objectives. The most important resources are knowledgeable,

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<tr>
<th></th>
<th>Planning</th>
<th>Deciding on how to use resources in order to achieve given targets.</th>
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<tr>
<td>2</td>
<td>Coordination</td>
<td>Communication between the company’s functional units.</td>
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<tr>
<td>3</td>
<td>Organization</td>
<td>Organizing people to get the best out of their potential.</td>
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<td>4</td>
<td>Staffing</td>
<td>Hiring, motivating and developing people as the most valuable company resource.</td>
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<tr>
<td>5</td>
<td>Controlling</td>
<td>Supervising, supporting, communicating, motivating and guiding people in order to achieve required performance.</td>
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<tr>
<td>6</td>
<td>Budgeting</td>
<td>Planning and securing the financial means for company operation.</td>
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<tr>
<td>7</td>
<td>Reporting</td>
<td>Enabling the flow of information and control of policy implementation.</td>
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experienced and resourceful people and a company’s capabilities and awareness of how to perform – the ‘know-how’!

Therefore, management process is not only task oriented but also, and even more importantly – people oriented! Effective management process must be based on data analysis and information from a business system. Management by facts is a management concept that should prevail rather then a concept of management by opinion.

The key objective of any management process is to manage the various aspects of a company’s performance. Input for a management process is information and the outputs are decisions. This concept is illustrated in Figure 1.1.

1.2.3 Performance

A critical issue for any business function or operation is its performance.

Companies perform by achieving their goals and satisfying customers. Common questions that managers are facing in their quest to improve business performance are:

- How well do we perform?
- What is the efficiency and effectiveness of our operations in meeting business objectives and satisfying customers?
- How do we compare with our competitors?
- What can we do to improve the performance of our business?
- How can we monitor progress and recognize the areas of strong or poor performance?

However, before we proceed further, let us examine what the word ‘performance’ stands for.

Performance can be defined as an ability to complete a task or operation according to a specified standard. The standards may be defined as measures, yardsticks or benchmarks for assessing the deviations of actual performance as compared to preset requirements, as a basis for managerial control.

Overall business performance depends on the effective allocation and use of resources in order to produce some level of output with the least cost and with the desired quality. Traditionally, business performance is measured by money and expressed by numerous financial ratios but the essential business performance indicator is PROFITABILITY.

![Figure 1.1](image-url)  
**Figure 1.1** Overview of Performance Management Process
More generally, performance measurement means the systematic collection of data on business activities at all levels and on all functions of a company:

- business planning;
- financial planning;
- sales/marketing planning;
- distribution requirements;
- capacity planning;
- master production schedule;
- material requirements planning;
- procurement;
- inventory management;
- bills for material management;
- manufacturing control;
- work floor scheduling;
- compliance and permits;
- product costing, etc.

Company profitability is derived from the company’s willingness and ability to improve, and from the profit-ability of employees! Therefore, people at every level must have information that will enable them to see beyond their local functions and to understand interactively how their individual actions increase or decrease profitability.

1.2.4 Information

It is essential to have appropriate information upon which management decisions are based. Managers need to know about employee performance and about how the business will perform if they control and improve operations adequately.

Information should not be confused with data. Data are often gathered in an ad hoc fashion without regard to user needs. A list of numbers does not convey much meaning without explanation. To become useful, data must be made into information by analyzing and presenting them in a form which is appropriate to a particular type of user.

Data gathering should be coordinated. Data from one source should be shared by all who are interested in that aspect of operation, instead of the same data being collected separately by multiple users. Managers should be able to delegate the evaluation of data to other employees who will decide what is important for a given purpose and who will then present this information in a way easily understandable by others.

Information management is about developing a means to collect, handle and distribute the right information to the right people. The right information is relevant, accurate, timely and presented in an appropriate form. Information technology (IT) must provide an efficient infrastructure for information management according to the performance management needs. However, making technology match business needs is not the way that IT has traditionally worked; it has usually been the other way around. Until the end of 1990s, business consumers of information technology were in a buy-it-at-all-cost mode, ending up with complex IT systems, with numerous applications not working together, or unable to share the same data. Nowadays, IT should not be regarded as something special but should simply be treated as a normal performance enhancing element of a company conforming to its actual needs. Companies need to go from using a bunch of standalone ‘islands’ of software to using applications that can work with one another. Performance enhancement is a people-driven process supported by IT!

Web-based solutions provide an IT infrastructure that helps to disseminate communication and information in a clear, consistent and intended manner to a large number of users no matter where they are.
Web services allow for the sending and receiving of data over the Internet from any application in a system and at the required time. No special hardware and no extra communication lines are required and it works at fraction of the cost of the old way. Since the content is constantly available, the audience can review it and update and interact with it when and where they want. It is an effective solution for large or distributed organizations, enabling them to monitor consistently and uniformly the performance of all business units, wherever they may be, communicate strategic messages clearly, reduce costs and support organizational learning.

1.2.5 Performance Indicators

The role of a performance indicator (PI) is to make complex systems understandable or easily comprehensible. An effective indicator or a set of indicators helps in determining the current position against established objectives.

Performance indicators quantify information on a trend or phenomenon in a manner that promotes understanding of a performance problem by both plant operators and decision makers. Performance indicators enable the measuring and tracking of progress towards goals in a comparable, consistent and easily comprehensible manner.

The process of selecting PI must necessarily start from a precise understanding of the process being addressed and of monitoring objectives. The goal of PI is to enable the monitoring and evaluation of applied energy and environmental performance improvement measures.

But information on PI alone does not solve the problem. What is required is knowledge on how to interpret PIs, and how to relate causes to consequences, and which are instances of either good or bad performance.

1.2.6 Knowledge

Knowledge is nowadays widely recognized as the only sustainable source of competitive advantage.

Like the other related concepts: truth, belief, and wisdom, there is no single definition of knowledge on which scholars agree. We may propose a definition, which says that knowledge is a developed understanding about a subject, based on facts and gained through education and experience.

The acquisition of knowledge involves complex cognitive processes: perception, learning, communication, association, emotions and reasoning. The term ‘knowledge’ is also used to describe the confident understanding of a subject, potentially with the ability to use it for a specific purpose. Knowledge is the goal of education, and the product of experience. The part of knowledge that is more easily definable involves the accumulation and assimilation of multiple pieces of information, providing a structure for it in the form of relationships between the information, and internalizing, or personalizing that knowledge by bringing it from the outside ‘in’ to the mind.

An important part of knowing is learning, i.e., the process of knowledge development and creation. Knowledge is gained through many different learning ‘modes’, and the basic division is on

- kinesthetic learning – based on hands-on work and engaging in activities.
- visual learning – based on observation and seeing what is being learned.
- auditory learning – based on listening to instructions/information.

Knowledge is the basis for management by facts as opposed to ‘management by opinion’. Facts are unknown until they are established through a deliberate process of the analysis of relevant information, which allows informed decisions to be made and significantly reduces the risk of opinionated decisions. The most powerful tool that managers can use for facts discovery – is a question! Managers have to ask themselves and their subordinates ‘Why?’ Why such an event or such data pattern appeared? What does it mean? What has caused it? Managers also have to encourage workers to ask themselves ‘Why?’
The workers should seek actively to make sense of data and information in order to develop their own understanding of underlying events in the process and combination of influencing parameters that have resulted in an observed data pattern or in an unexpected operational event.

Decisions and actions should be based on an analysis of factual and measured data and information. The analysis is based on knowledge and understanding of underlying business processes, systems and technologies. Informed management decisions, when implemented, improve business results, performance of processes and systems, communication and accountability.

1.2.7 Management System

Putting ‘management’, ‘performance’, ‘information’, ‘knowledge’ and ‘system’ together with ‘people’, we are arriving at the ‘Management System’. Every company, department or person has a system that it uses to manage events and other people even when it is a ‘no-system’ system. The purpose of a system, formal or informal, is to establish strategies that consistently enable achievement of the business objectives.

A management system is an organizational structure supported by a body of knowledge that integrates people, procedures and technology (information, communication and measuring equipment, i.e. infrastructure for data collection and processing) in order to control and optimize the use of resources and company performance (Fig. 1.2).

People play a major role in management and manufacturing processes and their own performance is critical for the company’s overall performance. Managers are people, and they manage other people – staff and workforce, that in turn operate machines and provide services.

Of course, a management system can have various objectives: to manage manufacturing, marketing, finance, quality, environment, energy, etc. A proficient management system is a tool that supports the improvement of skills, rewards correct actions, builds integrity of competent workforce and creates and captures knowledge!

1.2.8 Environmental Impacts

Environmental impacts can be defined as any change to the environment, whether adverse or beneficial, wholly or partially resulting from the activities, products or services of a company.
The environmental impacts from industrial operations can be categorized as follows:

- emissions to the atmosphere including GHG (greenhouse gases);
- discharges to water;
- solid and other wastes;
- contamination of land and underground water;
- use of water, raw materials, energy and other natural resources
- noise, odor, dust, vibration and visual impact;
- effects on specific parts of the environment and ecosystems.

This should include effects arising from normal and abnormal conditions, incidents, accidents and emergencies. Significant environmental impacts, including GHG and resources consumed, need to be listed and quantified thus forming an inventory of resources use, emissions, effluents and wastes, as a basis for environmental management.

1.2.9 Energy Performance

The *energy performance* of a technical device that converts energy from one type into another is defined as *efficiency* and is expressed by a dimensionless *output/input ratio*.

The energy performance of an activity is expressed by the ratio of energy units and the quantified results or aspects of this activity.

From a business perspective, energy is a cost item that can sometimes amount to up to 25% (or more, depending on the industry) of the overall production costs. Energy costs are usually the largest production cost where significant scope for improvement still exists. The basic bottom line equation, where energy is figured out through the costs it incurs, brings business and energy performance together:

\[
\text{Sales Revenue} - \text{Production Costs} = \text{Gross Profit}
\]

If we can reduce any of the cost items, *profit* – the key measure of overall business performance – will improve.

1.2.10 Environmental Performance

Environmental performance can be defined in a number of ways. It can be expressed by:

- quantified annual releases to the air and water;
- annual amount of waste disposed;
- amount of waste recycled;
- number of spills or accidents;
- notices of violations or fines;
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- costs of environmental compliance;
- number of environmental awards;
- participation in voluntary environmental programs, etc.

Environmental performance objectives can be just

- compliance oriented – to satisfy mandatory external regulatory requirements; but, it should also be
- improvement oriented – to better manage operational performance, rather than just measure its environmental impact, in order to assess risks and address root causes of environmental problems, and to reduce costs of environmental compliance.

1.2.11 Performance of Materials Use

One of the most neglected areas in performance management is material productivity, or performance of material use. Productivity is the most important economic indicator for understanding and predicting economic prosperity and business competitiveness. Productivity improvement increases competitive strength of companies and economies in the international trade (see Box 1.1).

Box 1.1: On Productivity

Generally, productivity is the measure of efficiency of using resources to produce goods and services for the market. It is measured by computing the ratio of output index to input index. Labor productivity denotes productive efficiency of labor, while total productivity denotes efficiency of using all factors of production, such as capital, labor, raw materials, and energy.

General factors contributing to changes in productivity are:

- technological progress;
- education and training;
- economy of scale;
- improved resource allocation;
- legal-human environment.

The internal factors affecting productivity variations are:

- output: mix, variety, quality;
- production factors:
  - technology intensity, age of plant and machinery;
  - scale of operations;
  - design for manufacturing;
  - labor skills and motivation;
  - raw materials and parts;
- capacity utilization;
- organization of functions and tasks;
- performance management practice.

The external factors include demand, relative input prices, competition rules, government ownership, unionism, laws and regulations, etc.
The common questions that arise on material productivity are:

- How much of total expenses are spent on input material?
- How efficiently are resources used?
- What is the potential for:
  - reduction of raw material losses;
  - reduction of raw material use;
  - reduction of packaging material use and waste;
  - recycling of waste.
- What are the annual costs of treatment and disposal of waste materials?

The answers to all these questions are seldom readily available. Raw materials can amount to 30%–80% of manufacturing costs, and losses of 5%–25% are not uncommon. The cost of waste is often more than four times greater than the facility realizes. Actual costs can be established only by the continuous measurement and evaluation of the performance of the use of materials.

### 1.2.12 Environmental Management

Environmental management should consider the relevant legislation, regulation and standards and should aim at achieving environmental compliance, controlling and reducing pollution and environmental impacts from resource use in industrial operations. The evolution of environmental management shifts the focus from compliance issues to a more risk-based focus on potential liabilities associated with process changes and day-to-day operations. The business value of environmental management comes from fewer impacts on the environment, reduced risk of accidents and reduced costs of compliance.

It is surprising to see how many companies, having analyzed their environmental costs, discover that these costs are at an order of magnitude higher than the company initially supposed. These costs arise from:

- capital and operational costs for pollution control equipment;
- waste disposal fees;
- environmental training;
- monitoring, record keeping and reporting, etc.

**Environmental management** establishes and implements an environmental policy, sets its goals and expectations, establishes a system for monitoring the environmental performance of industrial facilities and implements procedures for continuous environmental performance improvements and reduction of present and avoidance of future environmental compliance costs.

As this definition indicates, environmental abatement technologies and engineering solutions for assuring environmental compliance are not included within the scope of considerations in this book but useful references are provided at the end of this chapter.

### 1.2.13 Energy Management

Energy management is concerned with the efficient use of energy, water and other material resources, waste minimization in manufacturing operations and continuous improvement of performance of resources use in a company. Energy management specifically links and relates energy use to production output, aimed at achieving the required level of output with the minimum use of energy and other resources. **Energy management** implements an energy policy, sets its goals and expectations,
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establishes a system for monitoring energy performance and implements procedures for continuous energy performance improvements.

Improvement in energy performance will be reflected directly as the increase in profits of a business. A simple example illustrates its potential:

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<th>IF</th>
<th>energy costs are 20% of all production costs</th>
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<td>AND IF</td>
<td>gross profit is at 15% of all production costs</td>
</tr>
<tr>
<td>AND IF</td>
<td>10% improvement of energy performance is achieved</td>
</tr>
<tr>
<td>THEN</td>
<td>the result is 2% decrease in production costs</td>
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<tr>
<td></td>
<td>which is equivalent to 13.33% increase in profit!</td>
</tr>
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<td>(all other factors assumed to remain constant)</td>
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This profit increase will happen with no increase in sales volume, which is a more painful way of increasing profit! Worth exploring, isn’t it? Knowing that when you focus on energy performance improvement very hard, as a side benefit you will achieve performance improvements in other cost categories as well!

Energy equals cost – and energy management equals cost management. Thus, energy performance improvement means business profit improvement! That is why top managers also need to be interested and involved in an energy management program. This is emphasized here and it will be repeated later, because experience shows that top management commitment is essential for a successful energy management program. In order to make energy management sufficiently important as a topic for top managers, comprehensive arguments for energy management, as a relevant and positive contribution to overall business performance, should be used.

1.3 Energy and Environmental Management System

With energy management and environmental management defined separately, we can proceed to introducing the term ‘Energy and Environmental Management’ (EEM), and to propose a definition of ‘Energy and Environmental Management Systems’ (EEMS).

EEM is an integrated management approach concerned with the energy and environmental performance of a plant. Consequently, when we refer to ‘Energy and Environmental Management’ (EEM), it always relates to the energy and environmental performance of a process that uses energy and other resources, and the performance of people who operate the process. In fact, any energy and environmental management has to focus on people and the way in which they operate and maintain machines and processes as the key factor for optimization of energy and environmental performance. For large companies, manufacturing activities should be broken down into areas with specific process operations or tasks with recognizable inputs, activities, and outputs. Performance improvement will come as a result of implementing optimized operational procedures at the work floor level.

When manufacturing processes are complex, a high level of knowledge and adequate process information will be required for performance evaluation and management with continuous monitoring, control and follow-up information, supported by accurate measurement of data on energy, production and environmental impacts.

Therefore, applying the EEM requires a performance measurement system and involving people with advanced evaluation skills and the ability to make decisions supported by the necessary information. These key components – people, performance evaluation procedures and performance measurement and IT equipment – together with an underlying knowledge are the cornerstones of the EEMS concept (Fig. 1.3).

We can now outline the concept of the Energy and Environmental Management System (EEMS) in the way it will be elaborated upon in this book, as an energy and environmental performance improvement implementation framework that ties together:
Energy and environmental management (EEM) focuses on clearly specified performance targets and objectives related both to people’s performance and underlying process performance. An energy and environmental management system (EEMS) is a tool for achieving these targets and objectives through a system of metering, monitoring and evaluation of energy and environmental performance. Finally, we can offer the definition of Energy and Environmental Management System as:

a specialized body of knowledge with an underlying organizational and implementation structure which integrates interrelated elements, such as

- people with skills and assigned responsibilities;
- declared policies with clear objectives and targets;
- defined procedures and practices for implementation;
- established metering system for performance monitoring;
- action plan for continuous improvements;
- reporting system for checking on progress and communicating results

with the goal of achieving continuous energy and environmental performance improvements.
In their intent, the terms EEM and EEMS are similar inasmuch they both focus on continuous performance improvement, hence they will be used intermittently throughout the book. The main difference between the terms is that EEM refers mostly to a management concept, a program or an approach, while EEMS is a tool or a specific implementation project that realizes the EEM objectives.

1.4 Objectives of Energy and Environmental Management

Energy in all its forms – electricity, fuel oil, solid fuels, gas (natural, LPG), water (chilled, hot, treated, industrial), steam, air (compressed, cold, hot) – is a medium that crosses departmental and functional borders within a company, because it is used everywhere! It is used by people and by machines that are operated by people. Correspondingly, performance of energy use concerns everybody in a company. Likewise, the activities of all the people in a company result in more or less significant impacts on the environment, depending on their place of work and type of manufacturing operation.

Energy management should be concerned with both the cost effectiveness of energy distribution to and use by a manufacturing process, and with efficiency of energy transformation, generation, conversion and distribution within an existing plant. Environmental management is concerned with regulatory compliance, minimization of environmental impacts from manufacturing operations and reduction of emission, effluents and waste. Both energy and environmental management are concerned with the efficiency of raw material use and waste minimization, because any unnecessary wastage means at the same time increased energy use and increased environmental pollution.

The objective of an energy and environmental management system is continuous improvement of energy and environmental performance throughout the plant with the main goal of reducing the operational costs, minimizing waste and reducing the environmental impact of the company’s operations.

To achieve these objectives, EEM must have good technical foundation, but equally, if not more importantly, a strong managerial component! Energy is used everywhere in the company and human behavior affects energy and environmental performance, for that reason dealing with people is of key importance for long-lasting performance improvement!

1.5 Dynamics of Energy and Environmental Management

An existing facility has been designed on the basis of certain parameters which almost inevitably change by the time it is in operation. Over the course of their lifetime, the performance of the machines will deteriorate due to wear and tear or inadequate maintenance. Then there are always variations in performance because of the essentially dynamic nature of industrial operations (Fig. 1.4). The volume and type of orders are changing, production output varies, the quality of raw material differs, and people’s behavior is a source of constant uncertainty. Even the work of the most experienced and dedicated operators can fluctuate, operational problems may occur, changes in the environment affecting performance can happen.

The challenges are to operate the facility in the best possible manner against the background of a changing environment. The critical factors for success will be the availability of reliable and relevant data.

The key variable for performance assessment is production output. We cannot speak about energy and environmental performance as an absolute category without regard to the production output. Different levels of production output, or various product types, require differing amounts of energy and should result in different amounts of emission, effluents and waste.

Therefore, energy and environmental performance data will need to be gathered continually, alongside production output data for particular products and production operations. Aggregated monthly data on energy, production and environmental impacts are usually available, but this data are not sufficient for an informed performance evaluation because the impact of the human factor, i.e. how people operate the machinery, cannot be derived from such data.
An elaborate performance measurement system that will provide the necessary disaggregated daily data on important operational aspects is an essential tool for performance monitoring and evaluation, of both people and machinery at the place of work and decision making on improvement measures.

This also clearly suggests a necessity to assign responsibility for energy and environmental performance, decentralized down to the places of work where points of energy use are, and focused on people performance in each business segment that consumes energy.

Unless responsibility for energy and environmental performance is assigned explicitly to a specific person, it is illusory to expect performance to improve. This fact brings us back to people as the key factor for energy and environmental performance improvement.

1.6 Human Aspects of Energy and Environmental Management

The main objective of EEM is energy and environmental performance improvement. To achieve performance improvements, people will need to change their attitude about energy use and improve operational practices and routines. This is the truly difficult part – to change people’s behavior!
Employees must share the ownership of energy and environmental performance problems – no amount of monitoring, measurement or investment in technology can do the job without the aid and touch of a human hand. When considering energy and environmental management, most people tend to think of information first (data, monitoring, measurement, analysis and decision making), followed by procedures and equipment. Unfortunately, even with sophisticated equipment and exact information, unless people are persuaded to change their entire attitude to using energy, vast areas of day-to-day inefficiency will still remain. Machinery and processes will be operated without concern about energy efficiency, optimizers will be by-passed, meters read incorrectly, lights left on, taps left running and doors and windows left open and, as a consequence, environmental performance will deteriorate.

Information remains inert data unless it is processed and acted upon by people. Investment in machinery remains lifeless hardware unless people operate it intelligently and carefully. This is why, for an effective energy and environmental management, we have to include the third dimension – human involvement – where the main challenge is to change the people’s attitude to energy use. This is the same for any other objective of performance management. Usually, this is the most difficult task for the managers because they also need to change themselves along the way. Managers need practical guidance in order to help them steer the process of implementing EEMS from introduction to successful implementation. This is what we will offer here, using as little professional jargon and theory as possible.

In the following sections of this chapter, we will emphasize the relevant aspects of change while dealing with people when introducing the EEMS project.

1.6.1 Change

In this context, change means a qualitative new way of treating energy and environment. As such, it always means partial restructuring of established habits and routines. EEM requires new patterns of behavior to evolve – both at the level of individual actors and at the general organizational level. Accordingly, change is understood as an innovation of social, communicative and organizational features which foster taking up EEM techniques.

Implementation of EEMS can be viewed as implementing a project of change. To achieve transformation, i.e. to improve energy and environmental performance, people must be willing and capable of changes. Willingness has three dimensions:

- awareness,
- motivation; and
- skills.

Awareness means that people, from top management down to the workshops, know what energy forms are, what may be the environmental impact of their activities, what the energy costs are, and where the potential for energy savings is.

Motivation is necessary in order to trigger people to change their attitude to energy and use of materials in order to cut energy costs through more efficient and responsible operation of machines and other energy uses, providing that they have adequate skills and competencies.

These prerequisites of change – Skills-Awareness-Motivation – can be shown together in an S-A-M diagram (Fig. 1.5). If any of them is missing or is inadequately developed, a training program will need to be devised and implemented. There is one more vital ingredient for the success of change – leadership! Without leadership any change project, EEMS included, will lose its purpose and eventually fail. Leaders
at all levels of an organization must ensure that plans are put rapidly into action, rather than striving for perfection and precise analyses. Leaders should inspire and motivate people and provide them with the tools and knowledge for achieving the targeted energy and environmental performance improvement goals. In order to do that, leaders will often need to change themselves first in order to get ready and lead the staff to performance improvement.

When we are close to the indicated area in the S-A-M box (Fig. 1.5), i.e. where skills, awareness and motivation are high, with leaders at the helm of the EEMS ship, the change process will be on its way, and energy and environmental performance may start to improve. Nevertheless, there is a long way to go before arriving there.

1.6.2 Aspects of Change

Our experience has shown that there were a variety of impulses, coincidental events, personal contacts and fostering factors, which created different framework conditions for change at every company we have worked with. These factors range from the culture of the country where companies operate, organizational culture, social relationships within a company, to management and decision-making styles, level of skills and competencies and, of course, willingness and motivation for change.

At every such instance, our role has been clear: we are an external partner and external manager of change, supporting the internal stakeholders in achieving change objectives. Each group or individual stakeholder has had their own motivation and perceived difficulties and barriers for change, which need to be properly identified and understood in order to be able to move forward.

This is not to say that an external partner is a must because, surely, these are companies able to carry out the change process by themselves. However, sometimes external partners may provide the first shove for energy and environmental (EE) improvement projects, or help to legitimize and encourage the proposed EE performance improvement projects inside the company, especially in cases where key internal actors do not belong to top management.
The most important internal stakeholders are always top managers. They are the decision makers, and without their involvement and the decisions they need to make, the change process cannot even be triggered, let alone completed successfully. Their motivation comes from reduction of costs, saving money, innovation, continuous development and, of course, the improved profitability of the company. External factors such as regulatory framework, green image, social responsibility or simply orders from headquarters play a role as an initiation event, grabbing the attention of the top management for energy and environmental issues.

A critical role in the process of change is always that of the so-called ‘change manager’, i.e. the person(s) identified by others as the key promoter and supporter of change. Such a person is usually of a technical background with a good understanding of the production, energy and environmental aspects of the business and with an interest in identifying areas where the company can save time and money.

The next important role is that of ‘change agents’, persons made responsible for energy and/or environmental issues (in this context responsible for change) in each functional unit of the business. Working with energy/environment is a way for them to achieve economic benefit for the company and to gain some personal recognition.

The success of the change process depends on the dedication and commitment of internal change managers and change agents. Usually, their technical knowledge and abilities are not matched by those of decision-making powers. Sometimes, it is difficult for technical staff to gain access to decision makers. If this is the case, then external partners may be invited to provide support by reinforcing their messages and actions at the top management level.

What also proved to be important was the early achievement of some visible results, i.e. verifiable energy savings, waste or emission reductions, etc. Such a success will boost the confidence of change agents, increase their recognition by management and, usually, provide stronger support and greater good will from the management.

The performance improvements have to be well illustrated and documented in order to be understandable for the company’s non-experts and the general workforce. This helps in removing the usual barriers when addressing some aspects of change, as described in the following text.

1.6.3 Barriers to Overcome

There are many perceived barriers to improving energy and environmental performance. Some of these barriers can be attributed to:

- ignorance;
- fear of change;
- vagueness of the subject;
- desire to preserve the status quo.

The other most common barriers can be summarized as shown in Figure 1.6. There may be other barriers not addressed here, but in practice, if the reality of skills-awareness-motivation circumstances is assessed and treated adequately through a training program, with leaders taking charge, the barriers will gradually melt away.

1.6.4 Unawareness of Opportunities

Another barrier to energy and environmental management is expressed as: ‘We don’t know what we can do’. This may be true in the short term, but there is much that can be done to identify the real opportunities.
Managers have more important tasks:
- quality of products
- good market position
- reducing personnel costs

No Energy Expert Employed by Company (Small Company)

- Lack of Time

Lack of Knowledge within the Company:
- energy related
- management related

Low Energy Awareness

Low Share of Energy Costs in Total Costs

Focus on Production

Other Priorities for Investments

Figure 1.6 Some Barriers for Energy and Environmental Performance Improvement

One way is to hire an expert to identify and quantify opportunities by conducting an energy and environmental audit (see Part I Chapter 4). Although this will obviously incur some costs, it may reveal a number of opportunities for energy saving and environmental performance improvements.

Alternatively, for no cost you can ask: ‘Where, why and how energy is used?’; ‘How much could we save?’; ‘What would we need to change and save even more?’; ‘Where are the sources of environmental impacts?’; ‘Can we reduce the amount of waste that we generate?’ and so on. The answers to questions such as these are always very revealing and invariably uncover opportunities in the no-cost and low-cost categories of improvements, capable of rapid implementation.

1.6.5 De-motivating Aspects

Although the costs of resources, including energy may occupy the minds of managers, they are certainly not the main worry of employees. There are a few reasons for this:

- Most people tend to concentrate on the job at hand rather than on the means or facilities used. Energy is a particularly ‘invisible’ resource and it is taken for granted.
- Most people may occasionally think about energy and environmental issues but daily operations are repetitive, subconscious and rather boring: a monotonous routine.
- Most people do not view energy costs in the same way at the work place as they do in their own homes because the costs are not paid directly by them.
- People tend not to see direct links between their actions and environmental performance.

These factors provide real challenges for management. How do you overcome disinterest and lack of motivation and at the same time build on growing energy and environmental performance concerns?

1.6.6 Motivating People

If the above reasons can be classified as ‘demotivating’ factors, nowadays there is a relatively new ‘motivating’ factor: global climate change concern. There is an increasing general awareness of energy as a diminishing resource, costing more and more money, and greater knowledge on climate change resulting from energy generation and raw materials use.
Introducing the Energy and Environmental Management System

Motivation and thus willingness to cooperate enthusiastically with management tends to increase

- if people are given the opportunity of personal involvement in making decisions about actions that will affect them and their performance;
- if people are properly informed about the real situation, problems and reasons for decisions;
- if people are given the authority to decide on the most effective way in which to carry out their own work;
- if people are given recognition for their personal contribution;
- if people believe that their managers are genuinely interested in them as individuals;
- if people are given incentives and rewards (in addition to their regular remuneration) for exceptional efforts – not only of material but also emotional value to them;
- if people also understand the consequences of failure for them personally.

When actually implementing an EEMS project, the greatest challenges can be expected to be found in manufacturing departments where energy and environmental performance is not usually one of the standard reporting items, as opposed to utility departments where energy is the main subject of reporting.

When a proper energy and environmental performance measurement system is installed and operational, it can reveal some unflattering information about the energy and environmental performance that can make people feel defensive. Consequently, an EEMS project will likely require more changes and therefore more motivational activity in the production areas. Dealing with employees in these departments in a sensible way and having enthusiastic leadership in this location within your organization is of high importance.

This brings us back to the issue of leadership that we have already introduced earlier as the key component of successful EEMS project.

1.6.7 Providing Leadership

We all know that good management is much more than just planning and administering. It also requires leadership and effective interaction with human beings.

In order to succeed, an EEMS project must have champion(s) or leader(s) who will relentlessly pursue opportunities for energy and environmental performance improvements. These individuals must be true believers in the needs and possibilities for performance improvement and must have sufficient personal and professional authority to be respected, listened to and followed as leaders. But they must also be aware of what leadership is about as a role and what is or should be their management style in order to successfully mobilize people to follow them. Box 1.2 gives a quick overview of leaders’ roles and responsibilities.

Box 1.2: On Leadership – Leaders’ Roles and Responsibilities

<table>
<thead>
<tr>
<th>I. ROLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.1 Building and maintaining the team</td>
</tr>
<tr>
<td>People expect their leader to help them achieve their tasks and to build the synergy of teamwork.</td>
</tr>
<tr>
<td>I.2 Developing the individual</td>
</tr>
<tr>
<td>They also expect the leader to be receptive and responsive to their individual needs and help them to develop and improve themselves.</td>
</tr>
<tr>
<td>I.3 Achieving the task</td>
</tr>
<tr>
<td>The leader has clear responsibility to achieve the task with the team assigned and, if the task is not achieved, only the leader is to be blamed.</td>
</tr>
</tbody>
</table>
II. RESPONSIBILITIES

II.1 Defining the task

Leaders have to assign tasks to the people that are

- clear;
- specific;
- time-limited;
- realistic;
- capable of evaluation.

The task must convey a clear sense of direction to a person, i.e. why it is given and what is required in order to carry it out.

II.2 Planning

Planning means building a mental bridge from where we are now to where we want to be when we achieve the given task or objective. In short, planning gives the answer to the question ‘who does what, when and how?’

II.3 Briefing

A function of communicating objectives and plans to the team, usually in a face-to-face manner. The sister function of communicating is listening!! It is equally, if not more, important.

II.4 Controlling

Controlling is a function ensuring that all team efforts and energy will result in achieving the objectives.

Sometime teams are inefficient, like old boilers, but the leader needs to tune them up and get maximum efficiency out of them.

II.5 Evaluating

Whenever we review the progress or lack of it, we evaluate our people. One thing for sure: no team or person is perfect.

Therefore, evaluation must happen in an environment where:

- objectives are clear and realistic;
- there is an atmosphere of openness – two-way communication;
- there is an ability to handle failures.

II.6 Motivating

There is always a lot of talk on motivation. But firstly, leaders must be motivated themselves, then they should give clear targets to the staff, give them feedback on progress, if any, provide fair rewards, and give recognition.

People have to see leaders as an example and they need to be inspired by leaders.

II.6 Organizing

Making workable plans and structuring people to facilitate two-way communication and teamwork. It also involves a measure of control and supervision.

It requires active and continuous attention by leaders. Because people are like equipment (if we do not maintain and take care of it, equipment will soon run down). Similarly, if we do not organize, motivate and supervise team work, people will lose their sense of direction and motivation.

II.7 Providing an example

‘Leadership by example!’
Introducing the Energy and Environmental Management System

If managers want to do more than just follow the principles of motivation and really want to get the best out of people, they will have to become more aware of their management style. Managers, and particularly energy and environmental managers, need to be able to create true awareness of resource values and of the need to improve energy and environmental performance and avoid unnecessary waste. This does not just mean issuing unilateral instructions. It means interactive dialogue, i.e. two-way communication.

Two-way communication does not only:

- **Demand** ⇔ it also asks people;
- **Impose** ⇔ it also obtains agreement on targets;
- **Measure data** ⇔ it also provides feedback;
- **Order** ⇔ it also motivates by incentives.

Good leaders also know how to attract good people and how to establish strong and diverse leadership teams with clearly defined roles and commitment to common goals. They build cultures that inspire and motivate, and they provide the tools and learning to help their people succeed.

Leaders must be decisive. They must ensure that their strategies are directionally correct and put them into action promptly, rather than striving for perfection or precise analyses. They need to mobilize quickly and with flexibility in order to evolve their strategies over time.

An effective implementation of EEMS is based upon work that is performed across functional boundaries; hence it requires the creation of cross-functional teams and leaders that can enable different talents to work together. It must start at the top of the organization. Therefore, to convince the workforce of the importance of EEMS project and to provide the right leadership, the whole management structure must be involved into the project as follows:

1. **TOP MANAGEMENT TEAM:**
   - Factory Manager
   - Financial Manager
   - Human Resource Manager
   - Production Managers
   - Utility Managers
   - EEMS Manager(s)
   - A&M Coordinator

2. **OPERATION TEAM:**
   - EEMS Manager(s)
   - QA manager
   - Team Leaders – Line Managers, Supervisors (Departmental Teams)
   - Meter Readers and/or PC Operators
   - A&M Coordinator

3. **PERFORMANCE IMPROVEMENT TEAMS:**
   - Team Leaders
   - Shift Foremen
   - Machine Operators
People at every organizational level are change agents who, when properly empowered, inspired and guided, come alive with vitality, intelligence, and exceptional profitability potential that can make or break an EEMS project.

Let us consider how we can gradually move forward, starting first with top management.

### 1.6.8 Top Management’s Visible Commitment to EEM

Every change process is painful enough even if all the stakeholders are firmly on board. For a subject such as energy and environmental management, which does not immediately strike one as the highest priority, this is even more important. The first task is to make energy and environmental management important and to establish it as a topic for top management.

If the commitment of top management cannot be achieved during the project start up, the activity is destined to fail. In order to achieve top management support, suitable arguments and adequate presentation have to be prepared by internal or external key actors. The argument for EEM as a relevant and positive contribution to business performance has to combine pure economic considerations with additional benefits, focusing on the company’s multi-dimensional aspects of competitiveness, such as cost reduction, environmental compliance, improved quality, ‘green’ image, etc.

Few people would be immediately enthusiastic about any proposed change. It is particularly so when change will bring an additional responsibility, like that for energy and environmental performance. In such cases, one is likely to encounter a ‘tree-in-the-wind’ effect, as illustrated in Figure 1.7. In this metaphor, the tree is a symbol for the organizational hierarchy. When the wind of change blows, the shaking will be strongest at the top, but as we go down to the bottom of the tree, the lower branches (lower levels of the organization) are calm, protected and unaffected by the big noise up at the top.

As we have said earlier, energy is used everywhere and by everyone in a company and every individual’s behavior affects the environmental performance, so an EEMS project must involve everyone in order to give the best results. Consequently, all employees must be mobilized to assume adequate responsibility for energy and environmental performance based on their position within the organization. This can be achieved only if employees are convinced that EEMS is really the matter of high importance to the company.

That is another reason why top management’s visible commitment to EEM is important. If there is no visible commitment at the top, it is highly unlikely that there will be any thought of change at the lower levels of the company’s hierarchy.

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*Figure 1.7* A Tree in a ‘Wind of Change’
1.6.9 Decisions to be Made

Further, a very pragmatic reason for top management’s active involvement is a number of decisions that have to be made at the outset of EEMS implementation, such as:

- adopting an energy and environmental policy;
- approving an energy and environmental management action plan;
- assigning responsibilities;
- allocating a budget;
- deciding on rewards and incentives;

An energy and environmental policy should stimulate and support the introduction of energy and environmental teams and social circles and other forms of internal coordination structures such as meetings, working groups, etc. Formal responsibilities have to be supported by corresponding changes in company culture, leeway to act, management support and sufficient resources. Attempts to enforce organizational changes without hierarchical backing incorporate the risk that only superficial adaptation will take place.

New rules of conduct with regard to energy and environmental issues, responsibilities, broad involvement of staff, effective communication structures, as well as internal rewarding of suggestions schemes contribute to an institutionalization and strengthening of EEM activities within the company.

Decisions on rewards and incentives are particularly sensitive. Although it may be argued that continuous improvement of energy and environmental performance is in everyone’s job description, some additional incentives will surely help to overcome people’s natural resistance to change. Some companies have tried offering financial rewards to the people or groups that have achieved energy cost reduction but others are reluctant to offer financial incentives due to the possible abuse of the scheme or the negative effect on people who feel excluded from it. The alternatives to direct financial incentives include:

- recognition;
- certificates;
- energy/environmental personal identification, i.e. employee of the month;
- bonus for recreational activities;
- educational fund for staff’s kids;
- contribution to a charity fund of choice, etc.

Measures on rewards and incentives can be supplemented by a mix of motivational and awareness activities such as:

- energy and environmental exhibition;
- energy and environmental day;
- energy and environmental motto contest;
- case study visit.

How people are inspired, empowered and rewarded for their ability to adapt to changing conditions is the means by which objectives are achieved. Motivating and mobilizing people to become enthusiastic about an EEM program depends strongly on explicit and specific communication about the scope of change, i.e. the reasons, objectives and targets. The important thing is to keep the employees regularly informed and updated on the progress of the energy and environmental management program. Therefore, performance changes and improvements should be reported on periodically to employees. So, another part of the energy and environmental management activities must be regular communication and public relations, making people aware of what is happening, why it is happening and what they can do to help. The success of the project has to be documented and communicated in order to provide a sense of success.
to all the actors involved. Feedback of positive developments contributes to an increased motivation to continue.

*Internal communication* is another area that requires top management decisions on the ways, means and frequency of channeling information about an EEM program’s activities, objectives, targets and results; *top-down and bottom-up*. It includes issues like:

- **What needs to be communicated:**
  1. Company energy and environmental policy and action plan
  2. Monthly energy consumption charts
  3. Quantified environmental impacts, related targets and improvements
  4. Energy and environmental tips and knowledge
  5. Reward/incentives

*Possible Communication Channels:*

1. **Top – Down**
   - formal announcements
   - monthly message from management
   - internal staff meetings
   - training courses
   - notice-boards
   - newsletter, posters, stickers, leaflets
   - lunch time video show
   - energy and environmental portable library
   - internal radio.

2. **Bottom–Up**
   - employee suggestion scheme
   - weekly/monthly report
   - opportunities for performance improvements (OPI).

Organizational profitability is derived from the *profit-ability* of employees. If employees do not have the concrete means to change, align and improve their habits – the same means that are understood and utilized by management for the improvement of its own strategies – there will be breakdowns in communications.

Large companies may benefit if a dedicated person, an *A&M Coordinator*, is assigned on a permanent basis to take care of internal communication on energy and environmental awareness and performance. Performance improves and profit increases when the workforce can truly see and map the cause and effect of each individual’s action.

If the results are communicated outside the company and gain some recognition there, it will foster the motivation and provide confidence for the key actors that they are on the right track. They can also find some inspiration through external contacts and networking within energy, environment and business associations.

### 1.6.10 Visibility

Holding people accountable for specified results is a critical point on the path to success. Defining objectives, setting performance targets and measuring achievements over time are essential steps in converting performance improvement strategy from a raw concept into a detailed plan and ultimately into results. This would not happen without the persistent and visible commitment of the top management.
What does ‘visible commitment’ mean? It means that top management is directly and clearly associated with the EEMS project by doing all of the following (and possible more):

- Not only defining, but also declaring EEMS project objectives.
- Facilitating and monitoring the progress in achieving the targets.
- Providing feedback on the staff’s energy and environmental performance reports.
- Encouraging the staff to make proposals for performance improvements.
- Providing recognition for achievements.
- Having energy and environmental performance regularly on the agenda of management review meetings.

All of these measures must be carried out continuously in order to ensure the endurance of any performance improvement. How does one do that? That is what the Energy and Environmental Management System is all about, and we will explore it step by step throughout the rest of the book.

1.6.11 Working with People Towards a Successful EEMS Project

1.6.11.1 Managers

The manufacturing processes are places where additional value is created. The value creation is carried out by people grouped together according to the organizational arrangements needed for a process to work. Managers are the most important group within a company because they cement people within the groups into teams connected by common goals. The people within groups and groups among themselves establish relationships. Therefore, organizations are relational systems and can achieve high performance and continuous improvement only by empowering and motivating their people to do so.

The realization of EEMS cannot be seen as a single and purely market driven economic decision but requires the initiation and management of related social processes in the firm involving various internal and external actors. The success of companies working with EEMS is dependent on different internal factors such as company culture, technical capability or social integration of energy and environmental issues. However, since companies as social units interact with their settings, external conditions, including policy programs, directly or indirectly influence the process of implementing energy efficient (EE) and environmentally friendly technologies or establishing EE behavior.

Managers need to integrate a number of factors in order to enhance organizational ability to adopt changes and perform. Their focus must be on the common goal – performance improvement – which requires the commitment of the people and agreement upon the course of action.

Companies differ in characteristics and requirements – so there is no ‘one-size-for-all’ approach that can secure a successful EEMS project. This is especially so when it comes to people because success in working with people is highly dependent on cultural and social aspects, which are ‘soft’ issues. At the beginning of the process, the company is exposed to key events, which stimulate the key actor (change manager) to think about an EEMS project and initiate planning, decision and implementation processes. This is influenced by the existing context of personal motivation, experience, energy and environmental know-how and organizational conditions.

Companies represent social systems which are influenced by networks of internal and external inter-relations and interactions. Key actors within these networks – managers providing leadership – are instruments for stimulation, realization and diffusion of energy efficiency and environmental improvement activities. To be effective as a manager requires one to be good at managing people and relationships within and across functional groups.

The workforce is a living organism. If leadership is to effect dramatic changes in a company, the workforce needs to know how to follow and how to respond correctly to changing events. Managers inspire constancy and unity of purpose for continual improvement of organizational profitability. All
stakeholders are willing to provide or accept leadership when needed and will follow directives when goals, means and deadlines are clear, and when they feel competent and able to do so.

1.6.11.2 Employees

Employees, with their roles, interactions, skills and (de)motivational factors are key dimensions of the realization of EEMS. Employees are organized into functional units or teams but a unit is not just a mere organizational box! Units consist of people – the unit is people! Where a single individual may despair of accomplishing a seemingly complex task, units or teams nurture, support and inspire each other. The challenge for team leaders is to form a cohesive unit from people of varying capabilities, personalities and work styles. The team must understand how performance standards and targets are established. They need to accept them as a guide for a common purpose and direction.

Each team member has to be assigned to a right role based on his or her skills. If the skills are not adequate, training is required. Regular team progress meetings are essential in order to build team spirit, to develop better understanding of the tasks ahead and to get the members working together effectively toward the targets. Any initial hesitation and insecurity has to be overcome quickly and a ‘We can do it!’ attitude has to prevail. The teams may need some external support in order to reach that point and some positive reinforcement of their performance, but once they are there, we are on the right track!

In our experience, to build and achieve people’s ‘confidence’ is the key ingredient for success. When teams work in a spirit of cooperation and share confidence and mutual respect, this enables them to make decisions effectively and with a minimum of internal disagreement, which will lead them towards the achievement of the established targets. A competent and motivated workforce will be able to manage day-to-day uncertainties proficiently, always improving its ability to do so, measuring the effect of its actions by feedback in order to adjust the next action, thus improving skills and learning by doing.

1.7 Initiating Training, Awareness and Motivation Programs

It would seldom be the case that a company is in a position to embark on a major performance improvement program without a need for additional skills development. More often, an internal training program would be required in order to raise awareness, improve individual qualifications and provide the necessary skills for the workforce. Training is a process of teaching and developing skills. Training can be carried out in a formal (training courses) or informal (meetings and workshops) way for different target groups and on various subjects. An important training objective should be to develop a positive ‘it can be done’ attitude among employees. Such confidence will improve their ‘self-efficacy’, i.e. ability to adopt and implement the process of change. Self-efficacy for further action is increased by a better knowledge of the energy and environmental aspects of production and new norms and ways of treating energy and environmental issues gained during implementation.

Energy and environmental related qualification and training increases internal know-how and contributes to the higher motivation and confidence of employees. These individual training and learning processes represent a crucial element for initial success and continued action.

1.7.1 Management

No group is more important to EEM than the management team which must allocate resources and provide support to the EEM program. In addition, it often provides input and assistance with the process itself. Specific ways to work with the management team should be carefully planned and executed. One approach
is to conduct a series of preparatory and progress review workshops in order to get the program going. The ‘workshop’ is a structured meeting with clear objectives, agenda, some presentations and discussions.

An introductory workshop titled ‘Managers’ Roles and Responsibilities for EEMS’ can launch the process with the aim of clarifying roles and responsibilities, shaping critical skills and changing perception, as well as enhancing support for EEMS (Box 1.3). The objective is to have managers leave the workshop with an improved perception of the impacts of EEMS on business, the relevance of their area of responsibility and a clearer understanding of the role of EEMS. If the workshop is successful, managers will have a renewed commitment to making EEMS more effective in their departments.

Box 1.3: Management Roles and Responsibility for EEMS

**MANAGEMENT TEAM**
1. Monthly review of energy and environmental performance reports from operation team.
2. Making sure that all action plans are as scheduled.
3. Making decisions and preparing budget for all activities concerning EEMS.
   - Rewards/incentive
   - Awareness & Motivation(A&M) activities
   - EEMS Instrumentation

**OPERATION TEAM**
1. Weekly review of energy and environmental performance reports from departmental teams.
2. Providing feedback to performance improvement teams.
3. Providing technical support to performance improvement teams.

**EEMS MANAGER**
1. Organize and manage EEMS operation:
   - Meters – installation, maintenance and calibration
   - Meters – reading verification and check-ups
   - Supervising performance data key-in and processing
   - Report to management team
   - Giving feedback to operation teams on their performance directly
   - Giving technical support to operation teams, if required

**TEAM LEADERS**
1. Responsible for energy and environmental performance in their areas of work.
2. Organize A&M training for their staff.
3. Organize and motivate their staff in order to improve energy and environmental performance following general A&M training.
5. Be the leader in their area of responsibility.
6. Actively identify opportunities to reduce energy and raw materials consumption while maintaining production quality and quantity.
7. Take corrective action.

**A&M COORDINATOR**
1. Responsible for coordination and implementation of all A&M activities as approved by the management, on an on-going basis.
How many preparatory workshops will be required depends on the extent to which energy and environmental management has been developed in a company prior to the decision to embark on a major energy and environmental performance improvement program. To assess the extent of current energy and environmental management practice, a simple questionnaire may prove useful (see Toolbox III-1).

1.7.2 Technical Managers and Supervisors

As we go down the management hierarchy, training will need to be more technical and specific to the needs of the staff in order to bridge their competence gap. To be able to provide customized training such as this, a training needs assessment has to be carried out (see Toolbox III-1). A training needs assessment starts by specifying job requirements for a specific position, determining the level of responsibility and identifying the skills or knowledge requirements for that job and comparing them as against the personal experience and profile of a person. If there is a perfect match between the two, there is no need for training, but when there is a gap between the job requirements and existing qualifications, training needs will be identified. Here again, a simple questionnaire may support the training needs assessment of personnel at various positions in a company (see Toolbox III-1).

The purpose of training is to ensure that people have the appropriate knowledge and skills in order to be aware of the energy and environmental performance improvement opportunities that exist around them (Box 1.4) and to learn how to use EEMS effectively.

**Box 1.4: Example of One-Day Training Program for Technical Staff and Supervisors**

<table>
<thead>
<tr>
<th>Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To officially introduce and update the company’s energy and environmental policy</td>
</tr>
<tr>
<td>• EEMS organization chart</td>
</tr>
<tr>
<td>• To identify managers and supervisors roles and responsibilities</td>
</tr>
<tr>
<td>• To propose action plan on energy and environmental management program</td>
</tr>
</tbody>
</table>

**Suggested Duration: 09:00-16:00**

**Session Lists:**

1. Activities background
2. Review the company’s Energy and Environmental Policy
3. Energy and environmental performance improvement

   • Energy costs
   • Environmental compliance costs
   • Potential for costs savings
   • Why is it important?

4. Systematic approach for effective energy and environmental management
5. Review EEMS organization chart

   • Set schedule and activities
   • Discuss agenda of introductory workshop for all staff
   • Rewards and incentives
   • Others

7. Role and responsibilities
8. Support needed
The principal message to all staff involved in training programs should be that it is intended to make them more effective in their jobs and facilitate the execution of their duties. At the same time it will reduce the operating costs of the company and by doing so help in securing the long-term employment prospects of its entire staff.

1.7.3 Awareness and Motivation for all Employees

The most significant problem in achieving changes in the individual’s attitude towards energy and the environment is the need to change long standing, deep-seated customs and practices. In attempting to change these attitudes the aim must be to make energy efficiency and good environmental performance an integral part of the routine practices of the company by making everyone aware of the need to improve performance at their workplace.

Therefore, our experience advocates strongly the organization of awareness and motivation workshops for ALL employees in a company at the outset of implementing an energy and environmental management program. Awareness and motivation examines the ‘whats’ and ‘whys’ of an energy and environmental management program. A sample introductory course on awareness and motivation for all staff is illustrated in Box 1.5.

Box 1.5: Awareness & Motivation Introduction to All Employees

**Objectives:**
- To officially introduce and declare the company’s energy and environmental policy
- To create an understanding and awareness on opportunities for energy and environmental performance improvements

**Suggested duration:** 0.5 day

**Session Lists:**
- Explanation of the company’s Energy and Environmental Policy
- Introduction to Energy and Environmental Management
  - What is energy?
  - Where are the sources of environmental impacts from our activities?
  - What different types of energy are used in our company?
  - What are the types of environmental impacts in our company?
  - What are the costs of environmental compliance?
  - What are the costs of energy?
  - What is the potential for saving energy and reducing environmental impacts?
  - What can be saved?
  - Why save energy and protect the environment?
  - Why are our efforts important?
  - Who is responsible?
  - How can energy savings be achieved?
  - How can environmental impacts be reduced?
  - What can I do?
- Brainstorming in groups on energy saving and environmental improvement activities and support needed at groups’ own workplaces.

The course structure, as shown in Box 1.5, should serve as an example only. The duration can be shorter, and the content may be covered in more than one session. However, it is very important to customize
the courses to fit the real energy and environmental conditions at the place of work of a particular group of employees undergoing training, so that people can relate the course topics directly to the issues that they are facing in everyday operations. By doing so, they will recognize the opportunities for energy and environmental performance improvements at their place of work.

1.8 Bibliography