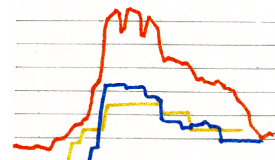




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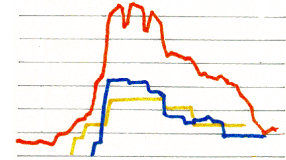
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## 1 Introduction

The use of energy in its various forms (motive power, heat, refrigeration, compressed air...) is an important factor in the production process.

The influence of energy costs on product price varies greatly between different areas of industry.

In exactly the same way as for other production costs, energy costs must be recorded and evaluated at all management levels in order to identify the efficiency of its use.

Alongside the operational and cost issues, there are also other important wider aspects that warrant attention.

The finite nature of energy reserves and the effect of energy consumption on the environment are factors that are increasing in significance.

Energy is a scarce commodity. In spite of technological advances that improve equipment efficiency, every organisation is wise to create conditions that lead to energy being used at its optimum efficiency.

It must be clearly understood that energy consumption always has an impact on the environment and the burning of fossil fuels releases additional CO<sub>2</sub>.

Because a growing proportion of energy must be imported, the efficient use of energy is an important competitive and national economic issue.

## 2 ENERGY MANAGEMENT

Energy Management is an activity within a business that co-ordinates the introduction and operation of a system that records energy consumption in a defined process and also monitors whether this energy is being used efficiently. This occurs through the following four steps:

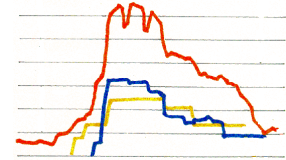
- Definition of the business's energy goals.
- Development of an energy management strategy
- Motivation of staff with regard to energy issues
- Formulation of a detailed Energy Strategy



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The ENERGY MANAGER (EM) is the person responsible for energy management within an organisation. This position is ideally a key position at senior management level. By doing this communication channels to the company's senior management are kept short.

Further key functions of the ENERGY MANAGER are:

- Dialogue with the organisation's senior executives in order to incorporate the company goals defined by energy management into quality control management.
- To ensure the organisation complies with changes to energy regulation and legislation.
- To construct an information system so that all the relevant departmental managers are informed at regular intervals regarding the annual goals for energy management as well as the current status of their area of responsibility. The purpose of this is to strengthen co-operation and a feeling of joint responsibility between participants in achieving those goals.
- Regular investigation of energy consumption using checklists.
- Organisation of an Energy Management Working Group made up of participants from within company senior management and production management.

Even though the main duty of the energy manager (EM) is to organise energy consumption as efficiently as possible, economic aspects must also be taken into account.

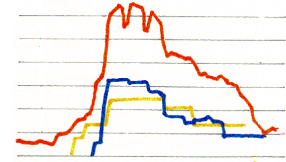
Because of the varying energy costs associated with different consuming units and the discrepancy between quantities of energy and services ordered and actually consumed, advice from the EM regarding energy purchasing is essential to ensure that the company obtains the most advantageous supply agreements.

The EM must be well informed with regard to grant programmes offered by the EU, central, and local government and advise the company's senior management with regard to investment measures. The EM should also advise on issues such as Climate Change Levy (CCL) exemption and Enhanced Capital Allowances (ECA's) and the assistance available from Action Energy.



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## 3 General conditions and influencing parameters

### 3.1.1 Legal conditions

Due to the importance of energy consumption to the national economy, governments have created frameworks to encourage rational energy utilisation.

The following issues should be noted:

- Energy Efficiency Initiatives
- Energy tariffs
- Emission laws
- General supply conditions
- Laws for the energy industry
- Standards and guidelines
- CO<sub>2</sub> - trading

The IPPC (Integrated Pollution Prevention and Control) regulations are of particular importance.

Climate Change Levy exemption agreements commit sections of industry towards demonstrable energy and CO<sub>2</sub> savings.

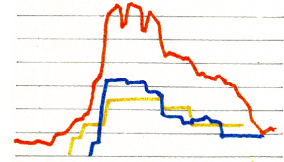
Influencing factors

- Energy costs
- Environmental costs for energy consumers such as emission taxes, etc
- Climatic conditions
- Product sales prices



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## 4 ORGANISATION

Organisation of the energy management system is based on the following tools:

- Data collection and recording;
- Energy cost recording;
- Data evaluation;
- Energy audits;
- Measurements;
- Monitoring.

### 4.1 Data collection and recording

Data collection does not only cover the periodic recording of varying energy consumption by units, but also the collection of production data during the measurement period.

Energy consumption within a business can easily be determined from the energy accounts. However, these do not help in the allocation of consumption to individual consuming units. Within a company there are typically areas, productive and non-productive, in which energy is consumed. In the case of good energy management, energy use surveying takes place upon the basis of logically separated functional areas.

In order to optimise data collection, the use of a checklist is recommended.

For estimating the effectiveness of energy management, energy flow diagrams that allocate energy purchases to individual consuming units have proven to be of value.

### 4.2 Energy cost logging

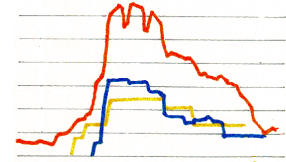
When energy cost logging is discussed, it means a data processing system which almost entirely automatically calculates energy consumption, or the proportion consumed for a production process in a relevant physical unit such as kilojoules (kJ=1000 joules), or a specific value established for the energy consumption per production unit. This is undertaken in order to be able to compare these with average values (benchmarking). The Microsoft EXCEL spreadsheets provide an example of one possible format for demonstrating how data should be organised so that the desired outcomes can be achieved.



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### 4.3 Data analysis

A basic prerequisite for analysis is the setting of so-called monitoring targets e.g. the values being sought after. The measured actual values are then compared with previously determined targets.

Following a critical examination of the accuracy of the values, which includes both measurements as well as calculations, results are compared with expected values and any deviation is assessed.

As a next step, a detailed analysis is required so that the potential for improvements can be determined.

This analysis should demonstrate the effects of improvement measures in a spreadsheet within which the calculations and, where measured values are not available, well-based estimates are supplied. Results can be compared with the set targets.

### 4.4 Energy audits

The energy consuming equipment in a company, particularly in energy intensive industries, and the equipment for converting and distributing energy such as boilers, distribution feeds for compressed air and steam etc., need regular maintenance which is carried out by trained maintenance staff. In addition, the energy efficiency of the plant must be checked regularly.

Energy Audits or specialised studies may be carried out by external consultants. Although the methods required are not particularly complex, the EM often has insufficient time or does not have the necessary instrumentation:

- By using infrared cameras, weak spots in heat insulation and heat transfer bridges can easily be detected.
- Companies specialising in steam systems can check the functioning of condensate drain-off lines and identify steam leaks.
- Burner settings should be regularly adjusted in order to maintain optimal efficiency and to minimise environmental pollution.
- The integrity of compressed air networks can be checked using various methods.

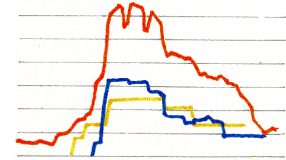
All these activities must be prepared for in advance with the production manager and carried out methodically. From these activities, the audit reports are gathered together and analysed in detail. If anomalies appear, the team determines who must remedy what and by when. The task of the EM is to regularly meet with the team and to monitor or adapt the progress of the measures being implemented.



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### 4.5 Measures

For any weak points found as a result of data raising and data analysis, potential measures to overcome them must be demonstrated.

Varying measures can be ranked according to their costs, the time requirements necessary for integration into the existing structure, cost effectiveness, and logical sequencing of the measures.

#### 4.5.1 Immediate measures

Immediate measures pay for themselves very quickly and can be carried out using the resources on hand.

#### 4.5.2 Mid and long-term measures

These measures are only possible at a considerable investment cost and with advance planning. With regard to the planning of mid and long-term measures to overcome weak points, the sequencing of measures must be carefully looked at.

A plan for the execution and integration of these measures must be worked out.

#### 4.5.3 Integration plan

The main requirement of a plan for integrating a measure is to provide a quick overview of the measure and to assist in making decisions simpler for all those participating in the decision making process - such as company management, financial management, production management

### 4.6 Monitoring

After a measure has been implemented, its success must be measured, compared with the planned outcomes, and regularly checked. In this way manufacturer's specifications for the installed unit are also checked. If the savings being achieved are below the expected values that were planned for, the reasons for the shortfall need to be investigated.