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ENERGY MANAGEMENT

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Abstract - Energy Management is defined as method of achieving quality product at least energy cost without affecting environment. It may be done by 1] Eliminating unnecessary energy use, 2] Improving the efficiency of needed energy use, 3] Buying energy at lower net prices, 4] Adjusting operations to allow purchasing energy at lower prices. It needs Metering our energy consumption and collecting the data, finding opportunities to save energy, and estimating how much energy each opportunity may save, taking action for saving, tracking the variation in consumption of energy & lastly analyzing the data for real saving if any etc.

I. INTRODUCTION

Energy Management is defined as method of achieving quality product at least energy cost without affecting environment. The steps taken are as follows

Year 1970- Started Thinking Year1980-Seriously Thinking
Year 1992- Energy Policy Act-1992-Federal USA.
Year 2001-India Energy Conservation ACT 2001

"Energy Management" Means Lowering Cost By: 1] Eliminating unnecessary energy use, 2] Improving the efficiency of needed energy use, 3] Buying energy at lower net prices, 4] Adjusting operations to allow purchasing energy at lower prices.

Step in Energy Management are as follows

1) Identify all opportunities, 2] Prioritize actions rationally, 3]Accomplish activities successfully, 4] Maintain activities.

"Energy management" is a term that has a number of meanings, but we are mainly concerned with the one that relates to saving energy in businesses, public-sector/government organizations, and homes:

II-THE MEANING OF ENERGY-SAVING

When it comes to energy saving, energy management is the process of monitoring, controlling, and conserving energy in a building or organization.

Typically this involves the following steps:

1]Metering our energy consumption and collecting the data.

2] Finding opportunities to save energy, and estimating how much energy each opportunity could save. We would typically analyze our meter data to find and quantify routine energy waste, and we might also investigate the energy savings that we could make by replacing equipment (e.g. lighting) or by upgrading your building's insulation.

3] Taking action to target the opportunities to save energy (i.e. tackling the routine waste and replacing or upgrading the inefficient equipment). Typically we would start with the best opportunities first.

4] Tracking our progress by analyzing our meter data to see how well our energy-saving efforts have worked. The same cycle is repeated from Step 2.

To confuse matters, many people use "energy management" to refer specifically to those energy-saving efforts that focus on making better use of existing buildings and equipment. Strictly speaking, this limits things to the behavioural aspects of energy saving (i.e. encouraging people to use less energy by raising energy awareness), although the use of cheap control equipment such as timer switches is often included in the definition as well.

It is something that energy suppliers (or utility companies) do to ensure that their power stations and renewable energy sources generate enough energy to meet demand (the amount of energy that their customers need).

It is used to refer to techniques for managing and controlling one's own levels of personal energy. We are far from qualified to say anything more about this!

It also has relevance in aviation – it is a skill that aircraft pilots learn in some shape or form. We know nothing about aircraft energy management, but we can at least manage a picture of a man on a plane...

Anyway, from now on we will pay no more attention to these other definitions - all further references to "energy management" will be to the energy-saving sort described above.

III - SCOPE OF THE WORK

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The energy management has got unlimited scope in the world. In this paper , we have taken mainly the energy management at Homes, Offices, Business houses etc in current situation only

IV- OBJECTIVES OF THE STUDY

To observe the nature of energy consumption at present
To collect the data of actual consumption by metering
Finding out the sectors consuming high energy & those which are consuming more than the rated capacity.
Finding out the perfect need & making people aware about proper use of energy,
Try to find out of mere wastages of energy if any
Analyse the data properly & suggest the best feasible way out on the area of problem
Find out the financial estimate & time required for necessary changes required if any.
Prepare draft plan &For the same without affecting normal routine as far as possible
Implement the plans step by step & keep consisting monitoring on the work.

V- HISTORICAL BACKGROUND

Home Energy Management

Energy management has been popular in larger buildings for a long time, it has only recently started catching on in homes. Most homeowners are not even aware of the term, and take more of a haphazard, flying-blind approach to reducing their energy consumption.

But the monitoring and results-driven approach used by professional energy managers is just as effective in the home as it is in larger buildings.

Why is it important?

Energy management is the key to saving energy in your organization. Much of the importance of energy saving stems from the global need to save energy - this global need affects energy prices, emissions targets, and legislation, all of which lead to several compelling reasons why you should save energy at your organization specifically.

The global need to save energy

Globally we need to save energy in order to:

1] Reduce the damage to Earth - We are doing to our planet, Earth. As a human race we would probably find things rather difficult without the Earth, so it makes good sense to try to make it last.

2] Reduce our dependence on the fossil fuels, They are becoming scare commodity now.

Energy management is the means to controlling and reducing your organization's energy consumption. It is important because it enables you to:

Reduce costs – this is becoming increasingly important as energy costs rise.

Reduce carbon emissions and the environmental damage that they cause - as well as the cost-related implications of carbon taxes and the like, your organization may be keen to reduce its carbon footprint to promote a green, sustainable image. Not least because promoting such an image is often good for the bottom line.

Reduce risk – the more energy you consume, the greater the risk that energy price increases or supply shortages could seriously affect your profitability, or even make it impossible for your business/organization to continue. With energy management you can reduce this risk by reducing your demand for energy and by controlling it so as to make it more predictable.

On top of these reasons, it's quite likely that you have some rather aggressive energy-consumption-reduction targets that you are supposed to be meeting at some worrying point in the near future... Your understanding of effective energy management will hopefully be the secret weapon that will enable you to meet those aggressive targets.

Bette r Ways to Manage Energy Consumption-

1. Metering your energy consumption and collecting the data

The old approach to energy-data collection is to manually read meters once a week or once a month. This is quite a chore, and weekly or monthly data is not nearly as good the data that comes easily and automatically from the modern approach...

The modern approach to energy-data collection is to fit interval-metering systems that automatically measure and record energy consumption at short, regular intervals such as every 15-minutes or half hour.

Detailed interval energy consumption data makes it possible to see patterns of energy waste that it would be impossible to see otherwise. For example, there's simply no way that weekly or monthly meter readings can show you how much energy you're using at different times of the day, or on different days of the week. And seeing these patterns makes it much easier to find the routine waste in your building.

2. Finding and quantifying opportunities to save energy

The detailed meter data that you are collecting will be invaluable for helping you to find and quantify energy-saving opportunities. We've written an article that explains more about how to analyze your meter data to find energy waste.

The easiest and most cost-effective energy-saving opportunities typically require little or no capital investment.

For example, an unbelievable number of buildings have advanced control systems that could, and should, be controlling HVAC [Heating, Ventilation & Air Conditioning] well, but, unbeknown to the facilities-management staff, are faulty or misconfigured, and consequently committing such sins as heating or cooling an empty building every night and every weekend.

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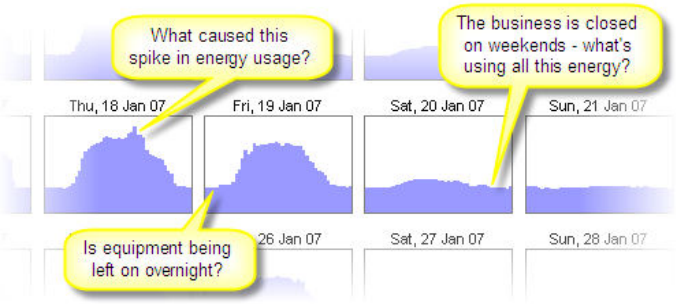
One of the simplest ways to save a significant amount of energy is to encourage staff to switch equipment off at the end of each working day.

Looking at detailed interval energy data is the ideal way to find routine energy waste. One can check whether staff and timers are switching things off without having to patrol the building day and night. With a little detective work, you can usually figure out who or what is causing the energy wastage that you will inevitably find.



Detailed energy data is the key to finding the easiest energy savings

By using detailed interval data, it is usually pretty easy to make reasonable estimates of how much energy is being wasted at different times. For example, if we have identified that a lot of energy is being wasted by equipment left on over the weekends, we can:

A] Use interval data to calculate how much energy (in kWh) is being used each weekend.

B] Estimate the proportion of that energy that is being wasted (by equipment that should be switched off).

C] Using the figures from a and b, calculate an estimate of the total kWh that are wasted each weekend.

Alternatively, if we have no idea of the proportion of energy that is being wasted by equipment left on unnecessarily, we may could:

A] Walk the building one evening to ensure that everything that should be switched off is switched off.

B] Look back at the data for that evening to see how many kW were being used after you switched everything off.

C] Subtract the target kW figure (B) from the typical kW figure for weekends to estimate the potential savings in kW (power).

D] Multiply the kW savings by the number of hours over the weekend to get the total potential kWh energy savings for a weekend.

Also, most buildings have open to them a variety of equipment- or building-fabric-related energy-saving opportunities, most of which require a more significant capital investment. You are probably aware of many of these, such as upgrading insulation or replacing lighting equipment, but good places to look for ideas include the Carbon Trust and Energy Star websites.

Although your detailed meter data would not necessarily help you to find these equipment- or building-fabric-related opportunites (e.g. it won't tell you that a more efficient type of lighting equipment exists), it will be useful for helping you to quantify the potential savings that each opportunity could bring. It is much more reliable to base your savings estimates on real metered data than on rules of thumb alone. And it's critically important to quantify the expected savings for any opportunity that you are considering investing a lot of time or money into – it's the only way you can figure out how to hone in on the biggest, easiest energy savings first. Targeting the opportunities to save energy Just finding the opportunities to save energy won't help you to save energy. We have to take action to target them. For those energy-saving opportunities that require to motivate the people in the building. It can be hard work, but, if we can get the people on our side, we can make some seriously big energy savings without investing anything other than time. As for those energy-saving opportunities that require us to upgrade equipment or insulation: assuming we have identified them, there is little more to be said. Just keep your fingers crossed that we make our anticipated savings, and be thankful that we don't work for the sort of organization that won't invest in anything with a payback period over 6 months.

VI- DATA COLLECTION

Tracking your progress at saving energy

Once we have taken action to save energy, it's important that we find out how effective our actions have been:

Energy savings that come from behavioral changes (e.g. getting people to switch off their computers before going home) need ongoing attention to ensure that they remain effective and achieve their maximum potential.

If we have invested money into new equipment, we will probably want to prove that we have achieved the energy savings which was predicted.

If we have corrected faulty timers or control-equipment settings, 2we will need to keep checking back to ensure that everything's still working as it should be. Simple things like a power cut can easily cause timers to revert back to factory settings - if we are not keeping an eye on our energy-consumption patterns we can easily miss such problems.

If we have been given energy-saving targets from above, we will need to provide evidence that we are meeting them, or at least making progress towards that goal.

Occasionally we might need to prove that progress isn't being made (e.g. if we are at your wits' end trying to convince the decision makers to invest some money into your energy-management drive).

Managing your energy consumption effectively is an ongoing process

At the very least we should keep analyzing our energy data regularly to check that things aren't getting worse. It's pretty

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normal for unwatched buildings to become less efficient with time/ It's to be expected that equipment will break down or lose efficiency, and that people will forget the good habits we worked hard to encourage in the past.

We should take a quick look at our energy data once a week, or even just once a month, to ensure that nothing has gone horribly wrong. It's a real shame when easy-to-fix faults such as misconfigured timers remain unnoticed for months on end, leaving a huge energy bill that could have easily been avoided. Ideally we will achieve much better results if we make it part of our regular routine.

Energy management includes planning and operation of energy production and energy consumption units. Objectives are resource conservation, climate protection and cost savings, while the users have permanent access to the energy they need. It is connected closely to environmental management, production management, logistics and other established business functions. The VDI-Guideline 4602 released a definition which includes the economic dimension: "Energy management is the proactive, organized and systematic coordination of procurement, conversion, distribution and use of energy to meet the requirements, taking into account environmental & economic objectives".

Organizational Integration It is important to integrate the energy management in the organizational structure, so that the energy management can be implemented. Responsibilities and the interaction of the decision makers should be regularized. The delegation of functions and competencies extend from the top management to the executive worker. Furthermore, a comprehensive coordination can ensure the fulfilment of the tasks.

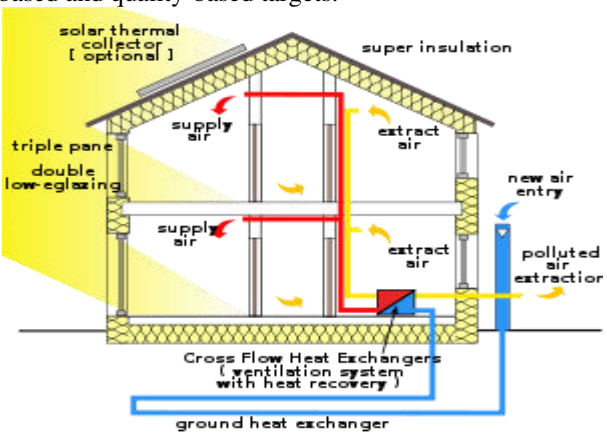
It is advisable to establish a separate organizational unit "energy management" in large or energy-intensive companies. This unit supports the senior management and keeps track. It depends on the basic form of the organizational structure, where this unit is connected. In case of a functional organization the unit is located directly between the first (CEO) and the second hierarchical level (corporate functions such as production, procurement, marketing). In a divisional organization, there should be a central and several sector-specific energy management units. So the diverse needs of the individual sectors and the coordination between the branches and the head office can be fulfilled. In a matrix organization the energy management can be included as a matrix function and thus approach most functions directly.

Energy management in operational functions

Facility management

Facility management is an important part of energy management, because a huge proportion (average 25 per cent) of complete operating costs are energy costs. According to the International Facility Management Association (IFMA), facility management is "a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, processes and technology."

Especially the availability and service life of the equipment and the ease of use should remain the same. In this topic the facility manager has to deal with economic, ecological, risk-based and quality-based targets.



The most important key figure in this context is kilowatt-hours per square meter per year (kWh/m²a). Based on this key figure properties can be classified according to their energy consumption.

Europe: In Germany a low-energy house can have a maximum energy consumption of 70 kWh/m²a.

In comparison, the Passive house (Passivhaus in German) ultra-low-energy standard, currently undergoing adoption in some other European countries, has a maximum space heating requirement of 15 kWh/m²a. A Passive House is a very well-insulated and virtually air-tight building. It does not require a conventional heating system. It is heated by solar gain and internal gains from people. Energy losses are minimized.

There are also buildings that produce more energy (for example by solar water heating or photovoltaic systems) over the course of a year than it imports from external sources. These buildings are called energy-plus-houses.

Logistics

Carriage of goods

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The logistics causes more than 14% percent of CO2 emissions worldwide. For this reason the term Green Logistics is becoming increasingly important.

Possible courses of action in terms of green logistics are

Shift to ecofriendly transport carrier such as railroad and waterway

Route and load optimization

Formation of corporate networks, which are connected by logistics service

Optimizing physical logistics processes by providing a sophisticated IT support

Besides transportation of goods, the transport of persons should be an important part of the logistic strategy of organizations. In case of business trips it is important to attract attention to the choice and the proportionality of the means of transport. It should be balanced whether a physical presence is mandatory or a telephone or video conference is just as useful. Home Office is another possibility in which the company can protect the environment indirectly.[9]

Energy procurement

Procurement is the acquisition of goods or services. Energy prices fluctuate constantly, which can significantly affect the energy bill of organizations. Therefore poor energy procurement decisions can be expensive. Organizations can control and reduce energy costs by taking a proactive and efficient approach to buying energy. Even a change of the energy source can be a profitable and eco-friendly alternative.[10]

Production

Production is the act of creating output, a good or service which has value and contributes to the utility of individuals. This central process may differ depending on the industry. Industrial companies have facilities that require a lot of energy. Service companies, in turn, do not need many materials; their energy-related focus is mainly facility management or Green IT. Therefore the energy-related focus has to be identified first, then evaluated and optimized.

Production planning and control

Usually, production is the area with the largest energy consumption within an organization. Therefore also the production planning and control becomes very important. It deals with the operational, temporal, quantitative and spatial planning, control and management of all processes that are necessary in the production of goods and commodities. The "production planner" should plan the production processes so that they operate on an energy efficient way. For example, strong power consumer can be moved into the night time. Peaks should be avoided for the benefit of a unified load profile.

The impending changes in the structure of energy production require an increasing demand for storage capacity. The Production planning and control has to deal with the problem of limited storability of energy. In principle there is the possibility to store energy electrically, mechanically or chemically. Another trend-setting technology is lithium-based electrochemical storage, which can be used in electric vehicles or as an option to control the power grid. The German Federal Ministry of Economics and Technology realized the significance of this topic and established an initiative with the aim to promote technological breakthroughs and support the rapid introduction of new energy storage.[12]

Maintenance

Maintenance is the combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function.[13] Detailed maintenance is essential to support the energy management. Hereby power losses and cost increases can be avoided.[14]

Examples of how it is possible to save energy and costs with the help of maintenance:

- Defrost the fridges
- Check the barometer of cars and trucks
- Insulation of hot systems
- Improve leaks in building envelopes

VII- CONCLUSSIONS

Potential energy strategies

- Passive Strategy: There is no systematic planning. The issue of energy and environmental management is not perceived as an independent field of action. The organization only deals with the most essential subjects.
- Strategy of short-term profit maximization: The management is concentrating exclusively on measures that have a relatively short payback period and a high return. Measures with low profitability are not considered.
- Strategy of long-term profit maximization: This strategy includes that you have a high knowledge of the energy price and technology development. The relevant measures (for example, heat exchangers or power stations) can have durations of several decades. Moreover, these measures can help to improve the image and increase the motivation of the employees.
- Realization of all financially attractive energy measures: This strategy has the goal to implement all measures that have a positive return on investment.
- Maximum strategy: For the climate protection one is willing to change even the object of the company.

In reality, you usually find hybrid forms of different strategies.

Energy strategies of companies

Many companies are trying to promote its image and time protect the climate through a proactive and public energy

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strategy. General Motors (GM) strategy is based on continuous improvement. Furthermore they have six principles: e.g. restoring and preserving the environment, reducing waste and pollutants, educating the public about environmental conservation, collaboration for the development of environmental laws and regulations.

Nokia created its first climate strategy in 2006. The strategy tries to evaluate the energy consumption and greenhouse gas emissions of products and operations and sets reduction targets accordingly. Furthermore, their environmental efforts is based on four key issues: substance management, energy efficiency, recycling, promoting environmental sustainability.

The energy strategy of Volkswagen (VW) is based on environmentally friendly products and a resource-efficient production according to the "Group Strategy 2018". Almost all locations the of the Group are certified to the international standard ISO 14001 for environmental management systems.

When looking at the energy strategies of companies it is important to you have the topic green washing in mind. This is a form of propaganda in which green strategies are used to promote the opinion that an organization's aims are environmentally friendly.

Energy strategies of politics

Even many countries formulate energy strategies. The Swiss Federal Council decided in May 2011 to resign nuclear energy medium-dated. The nuclear power plants will be shut down at the end of life and will not be replaced. In Compensation they put the focus on energy efficiency, renewable energies, fossil energy sources and the development of water power.

The European Union has clear instructions for its members. The "20-20-20-targets" include, that the Member States have to reduce greenhouse gas emissions by 20% below 1990 levels, increase energy efficiency by 20% and achieve a 20% share of renewable energy in total energy consumption by 2020.

Ethical and normative basis of the energy strategies

The basis of every energy strategy is the corporate culture and the related ethical standards applying in the company.[29] Ethics, in the sense of business ethics, examines ethical principles and moral or ethical issues that arise in a business environment. Ethical standards can appear in company guidelines, energy and environmental policies or other documents.

The most relevant ethical ideas for the energy management are:

- Utilitarianism: This form of ethics has the maxim that the one acts are good or right, whose consequences are optimal for the welfare of all those affected by the action (principle of maximum happiness). In terms of energy management, the existence of external costs should be considered. They do not directly affect those who profit from the economic activity but non-participants like future generations. This error in the market mechanism can be solved by the internalization of external costs.
- Argumentation Ethics: This fundamental ethical idea says that everyone who is affected by the decision, must be involved in decision making. This is done in a fair dialogue, the result is completely uncertain.
-