

# Energy management in a Business context

January 2017

Etienne Bayenet  
12 rue Geischleid  
L-9184 Schrodweiler  
<http://bayenet.jimdo.com>

# Why an energy management ?

Because :

- energy costs can't be planned.
- energy is needed everywhere.
- energy is difficult to save, many small steps are needed. You can't improvise.
- energy efficiency points out a long term strategy of the company.
- global increase of consumption increases unit costs of energy.
- energy use changes the climate.

# Who should manage energy ?

- Most concepts can be applied for any type of consumable element (water, paper, pens, production material...) which production requires energy. Any new machine or appliance means future consumption.
- Energy is used by all the systems in the company. Maintenance team takes care of it.

**Energy management could be done by procurement or by maintenance. Usually, it is not an autonomous activity**

**Everybody is responsible for its processes and energy use. Energy manager can only suggest objectives and help to reach them.**

# General concepts

- Analysis of the situation
  - Follow up of consumption, detect high energy activities, detect strategical activities
- Define an action plan
  - List actions and look for subsidies
  - Reduce energy needs (optimisation and reduction of waste)
  - Sensitisation of the employees
- Check results
  - KPI
  - Continuous improvement
  - Look for new technologies, new ideas...

# Analysis of current situation

## Objectives :

- Define the needs of the company, check which elements are strategical and what is needed to keep them working. One issue is life span of systems.
- Find out what are the high consuming elements (which means with high saving potential).

1 Watt 24h/24 costs around 1 Euro per year in Luxembourg

- Check the reason of peak loads during the days, electricity peaks have a direct impact on the invoice and on the network.
- Find all quick savings, event if the impact is limited.
- Have a reference basis (indicators) to be able to check the results of the energy management.

# Why an energy audit ?

An energy audit can have 3 different aims :

- To have an external view on the situation, and get recommendations on possible evolutions or subsidies.
- To confirm the need of a project, internally or for subsidies.
- To certify a level of quality, for example during a responsibilities transfer

It is important to know what is searched before the audit starts.

# Consulting or sub-contracting ?

Consulting allows to transfer out of the company a temporary extra load of work where time or competences are missing. Consultancy should allow to bring back the task inside the company.

Definition of an energy policy, including analysis of the current situation and the definition of an action plan can be an important workload where an external specialist could have a high added value.

If it is clear from the beginning that energy management should be externalised, sub-contracting has to be considered. The difficulties of sub-contracting for energy management are :

- feed-back of the users is very important to find optimal configurations.
- we need a global optimum configuration, not just on a specific system.

# Consumption analysis

Measuring equipment is usually expensive. It should be used mainly if there is a business need (cost calculation) or a technical need (leaks/waste detection).

For electrical systems, measurements can be done with mobile systems that are only installed for a short time. This should be enough to detect the systems with the higher energy consumption.

Variation of global consumption depending on activities, weather... will provide many informations. Can be compared :

- the difference between day and night consumption.
- the difference between working and non working days.
- the difference between the different days.
- the difference between sunny or cloudy days, cold and warm days...

The new generation of metering instruments should allow a real time follow up of consumption which would make analysis much easier.



# Action plan : 3 orientations

Three main orientations will allow the realisation of the action plan

- Maintenance.
- Energy related investments. Usually it is replacement of obsolete systems or installation of auto-production systems.
- Production investments allowing new developments for the company.

Each orientation has its own logic and actors, but the objective is the same, to reduce the energy risk by reducing the costs or diversifying energy origin.

The action plan has to define responsibilities, budgets and delays.

# Maintenances

The main tasks of maintenance in order to improve energy efficiency are :

- An optimisation of the configuration of the systems to be as close as possible of real needs
- Replace defective systems by new ones more efficient or better adapted.
  - Replacements usually also helps in maintenance management (less intervention) or bring extra comfort (less noise, more light... )
  - In some case, technological evolution has been so important that systems could be replaced before being defective. This concerns for example LED lightning or electrical motors.

A small specific budget for energy optimisation could be a great help and challenge. It would allow many small improvements and tests.

# Maintenance : examples

- LED lightnings reduce electricity use and suppresses the need to change regularly light bulbs (remark: LED doesn't support too much heat). It is often possible to replace 2 standard bulbs by one LED system because you don't need redundancy (safety reasons) anymore.
- Reducing water temperature in the radiators reduces losses in transport and reduce waste if windows are left open. In some case, it can improve the efficiency of the heater. Be careful, sanitary water has to be warm enough to avoid bacteriological invasion.
- Allowing users to start systems (ventilation, heater, AC...) when needed (always for a limited time) makes it possible to reduce standard working time.
- Infrared heating in strategical places (usually the reception desk) can avoid to over heat the whole building.

# Maintenances: what's the optimum?

- Power and efficiency are opposite, both together is not possible. Having power as close as possible of the needs gives the best efficiency. Oversized equipment, too high power available... mean oversized costs and consumption.
- Optimised systems are more sensitive to disruptions. Breakdown scenarios have to be kept in mind.
- Optimisation means going to the limits. All laws and regulations have to be respected, users feed-back is very important.
- Global optimum is the objective. If a locally installed less efficient system brings big savings in other systems, it's a good thing to do. Better configuration can be done later.

# Maintenance: systems management

- There are two types of technical systems, sometimes together in one machine.
  - some systems are more efficient when running lower than nominal power (heat pump...). In such a configuration, you have to be as close as possible of the needs.
  - other systems are optimised for nominal power or output (some motors, production chain, wood stove...). Needs have to be collected and produced at once, some storage can be useful.
- Generally speaking, systems are designed to run, not to start and stop.

# Maintenance: reducing waste

- Suppressing waste doesn't reduce production and comfort. A follow up is needed for:
  - leaks and other losses
  - unused services (closed valve under pressure, working times of all systems including printers, obsolete system that nobody turned off...).
  - redundancy : it is often needed for security reason, but is it better to have both feeds working together or to alternate ?
  - too strict parameters that start unneeded systems (for example to start AC at the end of the day).
- Creativity and curiosity for new solutions is needed. Complicated solutions should be avoided, real need and profitability should always be kept in mind.
- There is a lot of technological evolution. Sometimes (mainly for lightnings), waiting a few months could bring the solution.

# Maintenance: other ideas

- Needs are not the same all year long. Do we need to heat the buildings in the morning during the summer ?
- Cost efficiency is a priority, it's not a good idea for example to transfer energy costs to water costs for cooling.
- Sometimes, needs require non expected solutions, for example extra insulation when optimising the heating system, or a better partition of cool and warm air flows when improving air conditioning.
- Investments require energy, non profitable investment could be an energy waste.
- An increase of business related consumption is a good news, only waste has to be suppressed.

# Energy investment

Energy investment is often a major maintenance that require another decision and financial process.

This description applies for things like major building repairs, infrastructure renewal or changes in production systems.

In this cases, it is not the energy saving that will justify the investment, but the need to keep the business going.

Investments in electricity production, storage or management systems could have a better ROI than expected if it allows a reduction of the peak loads.



# Energy investment: when ?

Since there are many subsidies/incentives (including reduced interest rates) related to energy investments, and that not replacing old system can disrupt business processes, it is important to act in time.

- Emergency action may not respect subsidies regulations, could disrupt business continuity and could increase costs.
- Too early action anticipate costs and could be done just before new regulations or the availability of more efficient technology

From my experience, lifespan of the systems should be respected. Availability of spare parts and breakdowns are good indicators.

# Production investment

In the productive investment, the objective is to develop the business. Energy consumption is seen as a needed cost and is often not an important criterion. It shouldn't be neglected because :

- When new equipment is installed, it is difficult to explain that it should directly be improved.
- Investments are done for a long time. Bad choices have long term impacts.

Maintenance can improve parameters, but changing elements would require many discussions.

# Sensitisation of the employees

- Behaviours have a huge impact on energy consumption. Good ways to work have to be shown and explained.
- Each building, each process have specific optimum that sometimes may seem crazy. Users have to be informed.
- Hierarchy has to play the game otherwise sensitisation can't work.
- Each time that there is a technical solution at a reasonable cost to save energy, it should be used. Here is one of the places to use the energy efficiency budget of the maintenance team.

# Control and follow up

Energy control implies few points and actions :

- compare the initial energy analysis and check the evolution of the indicators. Anomalies have to be analysed, they could point out technical problems.
- check if new technologies could bring new savings.
- check life span of systems and plan improvements.
- make sure that the new systems are energy efficient.
- define new actions

# Conclusion

The process might seem complicated, the energy manager has to make it flexible and to adapt it to the business.

- Some savings will be so obvious that they will be done directly without any question.
- Other savings will be planned and budgeted but never done because of technical or psychological constraints.
- Some actions will be waiting until an opportunity will make them possible or needed.

The process is always the same : analysis, decision, planning, realisation. A long term view allows the energy manager to use any opportunity for energy improvement.

Thank you for your comments and questions, sorry if the English is not always the best.

Thanks to the <http://forum.arctic-sea-ice.net/index.php> for the nice comments.

Best regards.

Etienne Bayenet