ENERGY, ENVIRONMENT AND PROFITS

MAKING A CORPORATE COMMITMENT

Energy Efficiency Office
DEPARTMENT OF THE ENVIRONMENT
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I am pleased to be able to say that more than 1250 organisations have now signed up to the Making a Corporate Commitment campaign, which seeks board level commitment to energy efficiency.

To help promote the campaign and the overall case for energy efficiency, my Department recently organised a series of roadshows, ‘Energy Efficiency: the Environmental Solution’ throughout the UK. At each of these roadshows a case study was presented by a leading industrialist whose organisation had addressed energy and environmental issues successfully and who had achieved permanent results.

There are many lessons that we can all learn from these case studies. One is that they confirm that it really is possible for everyone to save a fifth or more of their energy consumption.

Two key factors also emerge in this booklet. First, additional profits can be created by improving energy use; and second, saving energy has a significant impact on the environment, since improved energy efficiency is one of the quickest and most cost-effective responses to the threat of global warming.

This booklet is intended as a guide for all organisations who wish to improve their energy management. The case studies cover all types of energy use whether in a single-site organisation or in a large, multi-site conglomerate. I believe there are lessons here for everybody.

The booklet is just one of several ways in which we are continuing to support and develop the Making a Corporate Commitment campaign. I am relying on you, the energy user, to fulfill your commitment, and in that process add to your profits and improve our environment.

I wish you every success.

Michael Howard

The Rt. Hon Michael Howard Q.C. MP
Secretary of State for the Environment
Energy Efficiency: The Environmental Solution
INTRODUCTION

This booklet has been written by Directors for Directors, as a guide towards achieving sound and lasting commercial and environmental benefits through improved energy efficiency. It contains six case studies:

Weetabix

Weetabix sets out many of the myths regarding energy efficiency, and shows how they may be overcome, irrespective of whether or not they are real. Weetabix's processes, on one site, are not particularly energy intensive but a relatively simple approach, involving the application of known technology, is a key part of the company's policy of being in business for wealth creation on a long term basis.

Northumbrian Water LTD

Northumbrian Water has nearly 800 operational sites and a relatively insignificant energy expenditure. Nevertheless the commercial case for managing energy efficiently has been recognised. It has been integrated into the business on an equal basis with other issues. Again, simplicity and the application of known technology are the keys to the huge overall reduction that has been made.

Manchester Airport

Manchester Airport is a fascinating approach. Here is a single-site organisation, undergoing massive development. Energy is addressed through the company's pursuit of excellence programme because it is commercially and environmentally attractive. Energy use is treated more as a management than technical issue reinforced through business centre accounting into which energy fits superbly.

IBM

IBM is another non-energy intensive organisation whose large size and multiplicity of sites gives the company a large energy bill in total. A site-by-site approach to improved energy management, backed up by corporate commitment at the centre, has provided the company with a steady and increasing stream of additional revenue. Simple issues are addressed first, and savings from these help fund higher technology applications later. Targets for energy reduction have been set for many years. The current figure is 4% each year on a recurring basis.

Arjo Wiggins

Arjo Wiggins, an established paper maker, has never pursued energy efficiency in isolation to other business priorities, even though its processes are energy intensive. Energy management has been treated simply and integrated into the business. Formal monitoring is routine and action is taken on its findings. Investment in technology is only introduced whenever investment is taking place for other purposes. It may seem surprising but this commercially orientated approach has resulted in energy usage some 30% below the industry average.

British Sugar

British Sugar is a huge complex multi-site organisation in which energy is a major cost. Managing this cost is a line management responsibility, involving constant attention at each factory with inter-factory comparisons taking place continually. This results in the best factories continuing to improve and others moving closer to the best. A wide span of technology is involved from co-generation of steam and electricity through to the recovery of low grade heat. Considerable cost savings have been achieved.
I believe there is something for every organisation to learn from these case studies. They show that good energy management is relatively straightforward and that a commitment to it is invariably rewarding, irrespective of size, energy intensity or number of sites involved. Energy is cash and cash needs safeguarding and managing. Energy is also a major factor in the environmental issues facing business today.

Overall the case studies in this booklet concentrate upon the principles behind managing energy effectively. There are many ways to reap the benefits of improved energy management and ideally the chosen approach will be compatible with each organisation’s individual philosophy, culture and management style. In that way the probability of real lasting success becomes large indeed.

To help you take the next step, you may care to seek answers to the following few questions.

**HOW DO ENERGY COSTS AFFECT YOUR PROFITABILITY?**
How do they compare with other controllable costs?
What would be the impact of a 10% energy saving on profits?

**HOW COMPREHENSIVE IS YOUR CORPORATE ENERGY POLICY?**
Does it establish standards of performance and your potential for savings?
Does it require an annual Action Plan and regular progress reports?
When was your policy last reviewed?

**HOW IS YOUR ENERGY MANAGEMENT STRUCTURED?**
Which Board member is responsible for energy management?
Is ownership for energy formally allocated?
Do you assess performance against targets?

**WHAT RESOURCES HAVE YOU ALLOCATED?**
What have you done to raise awareness among all your staff?
What return on investment do you demand?
Do you invest a specific proportion of your energy costs in improved energy efficiency every year?

Answers to these few questions, in the light of the information set out in the case studies, should provide you with an indication of:

- your organisation’s current level of energy efficiency;
- the actions you should be contemplating;
- how your energy policy might best be developed and formalised; and
- the additional cash and profit you could generate.

I join the Secretary of State in wishing you every success with your own campaign.

Michael Roberts
President, Institute of Energy,
1992-93
"The company is in business to create wealth and make money. The Weetabix approach to achievement is summed up in these four words: commitment, structure, metering, communication."

David Edgar, O.B.E. - Operations Manager

HIGHLIGHTS

- Simplicity is always maintained.
- Known technology is applied.
- There is no formal Energy Manager; energy efficiency is a line responsibility, and every manager shares in that.
- Attention to energy efficiency is not a one-off crisis issue but a permanent way of life, taking its place alongside other equally important business issues such as quality, profitability, productivity, health and safety.

THE COMPANY

Weetabix Limited is a leading British breakfast cereal manufacturer employing just over 1500 people in the UK. Its energy spend of £2 million each year is not large, in relation to its turnover, but energy efficiency has been firmly on the boardroom agenda since the mid-1970s. As a result, Weetabix has made substantial savings, worth over £0.5 million each year, and a major contribution to helping the environment.
ATTITUDES

In successfully addressing energy efficiency, Weetabix has concentrated on eliminating popular misconceptions. These misconceptions include:

- Exclusivity to large companies. A myth. While the UK's 200 largest companies account for 60% of the industrial energy requirement, energy efficiency reduces costs and increases profits for all and does not distinguish between size of organisation.

- Need for additional staff. Another myth. Weetabix does not have an Energy Manager. The Buyer negotiates energy purchases, production management is responsible for the efficient running of the plant, and company accountants produce supportive facts, figures and indices of performance for output, costs and their composition. All of this is co-ordinated by the Operations Manager.

- Need for expertise in-house. In practice there is an abundance of external expertise available. Besides Government-sponsored initiatives, including the Energy Efficiency Office, its technical agents, and Regional Energy Efficiency Officers, all of the fuel supply companies provide technical support facilities. In the majority of cases all this information and expertise is freely available.

- Need for investment capital. A common myth which Weetabix has dispelled. By first addressing basic housekeeping issues, and then low-cost issues, equivalent to minor maintenance items, the entire Weetabix energy programme has been self-financed out of savings. Today about 10% of savings are deliberately and regularly ploughed back; the remaining 90% is pure profit.

- Lack of employee interest. Experience has shown this to be a supervisory/management excuse rather than a fact. Employees are aware that an efficiently managed and cost-conscious company has a much greater chance of survival. Energy efficiency contributes to long-term security, so Weetabix employees are encouraged to take an interest in the subject and do.

APPROACH TO ACHIEVEMENT

By overcoming common misconceptions, Weetabix has created a positive attitude and approach to energy efficiency which can be summed up in four words: commitment, structure, metering, and communication.

Commitment begins at the top. Not only has the company joined the Government's Making a Corporate Commitment campaign, but the Chairman has included energy in his letters to employees and takes an active interest in the energy budget and subsequent performance.
A Steering Committee, chaired by the Operations Manager, with representatives from all energy-using departments has been set up. Besides improving communications the Committee provides an excellent way of involving users and building a team.

Metering has been progressively extended so that all significant consumers are measured. Information received helps managers to improve and maintain energy utilisation.

Information is the key to good communication which can motivate staff to strive to do better. Energy communications, therefore, are deliberately extended with results and achievements published regularly, complementing a more general educative company booklet, produced to help promote employee awareness of company energy issues.

RESULTS

Overall, Weetabix has saved more than 20% of its energy expenditure worth over £500,000 every year, all achieved for minimal expenditure utilising a small proportion of savings. But much more importantly, because of its simplicity, this straightforward approach has become a routine way of life at Weetabix, thereby helping to ensure its continuity.

The simplicity of measures introduced can be easily illustrated.

- Old-fashioned and easily adjustable thermostats, often installed in impractical positions, have been replaced with modern, electronic, pre-set and tamper-proof equivalents, linked to a defined time span.
- Seven day time switches have been introduced, to replace 24-hour equivalents, which guarantees the office heating is off at weekends.
- Automatic doors have been introduced on main traffic ways.
- Dock shelters have been introduced for vehicle loading and unloading.
- When equipment has to be replaced, modern and energy efficient varieties are chosen.
- Defective insulation on steam pipes has been replaced.
- Modern high efficiency lighting has been introduced. In some areas this has increased lighting levels and halved electrical consumption.

All of these measures are fundamentally simple, readily available, and highly cost-effective. Their introduction has been painless and they assume no greater or less importance than other business priorities such as quality, safety, productivity, and loss prevention.

THE FUTURE

Weetabix has a very sound base from which further energy benefits should naturally evolve. The latest electronic energy management systems are being introduced, not in isolation to save energy, but more as a deliberate and structured aim to constantly improve the management of processes and their related costs.

Good energy management will be maintained in the future. It has become part of the normal management style which promotes team effort, but with every manager being responsible for his particular contribution and knowing what that contribution needs to be.

Weetabix could argue that good energy management has developed with good management, or that good management has led to good energy management. Which comes first is irrelevant, but the results are both outstanding and permanent; providing an excellent base for continuing progression into the future.
NORTHUMBRIAN WATER LIMITED

MEETING THE CHALLENGE OF 800 SITES

"There is a very good commercial case for energy efficiency. The measures we are taking are not only reducing our total power bill, but are also contributing to a cleaner, better environment."

Robert Smith - Managing Director

HIGHLIGHTS

- Despite the relative insignificance of energy costs, commercial advantages have been achieved from energy and environmental opportunities.
- Energy management has been integrated into the business on an equal footing with other business issues.
- New investments have been made, involving the latest available technology.
- Outside expertise has been employed to help guarantee success.

THE COMPANY

Northumbrian Water Limited, a member company of the Northumbrian Water Group, is responsible for water and sewage services in the North East of England. Facilities range from Kielder Water, the largest man-made lake in Northern Europe used for water supply, recreation and electricity generation, through to a multitude of small sites from which even the smallest and remotest locations are served.

In all, Northumbrian Water owns more than 800 sites, and their combined energy costs amount to nearly £6 million a year. An insignificant cost when compared to total turnover of about £200 million.

APPROACH

Some years ago, Northumbrian Water recognised the significant savings that could be secured from improved energy efficiency. The company developed a simple approach, using known technology, replicating wherever practical, with the back-up and support of an external contract energy management organisation. In 1990 this approach was formalised, structured and accelerated, to build on the success of their early initiatives.

A board member took on responsibility for energy management, a professional energy manager was recruited, and an energy policy and strategy developed, consistent with the company's environmental aims, and all as an integral part of the company's overall business plan.

At an early stage the company analysed its energy consumption across all sites using a general, computerised monitoring package. In addition to establishing the energy database and management information system, tariff savings were identified, producing an early initial bonus which allowed the company to establish a cost target reduction of 20%, to be achieved within five years.

Formal objectives followed:

- to reduce energy costs
• to improve environmental conditions
• to reduce harmful emissions to the atmosphere.

These objectives were supported by a three-stage methodology:
• Firstly to reduce energy costs through tariff management
• Secondly to improve energy efficiency
• Thirdly to develop renewable power generation.

ENERGY COSTS

All electrical tariffs were analysed and each location was switched to the optimum for that situation. Tenders were invited for supply contracts to all sites with a maximum demand in excess of 1MW and this action alone saved £170,000 per annum and cost nothing to implement. Effectively pure additional profit.

Close examination of these new electrical cost structures and their traditional operating patterns also enabled the company to maximise operations outside peak hours. Again this reduced costs without incurring other penalties. From this early stage the energy programme achieved a positive cash flow.

ENERGY EFFICIENCY

Pumping water accounts for 80% of electricity use, heating and lighting the remainder. Again the company's approach was straightforward and logical. The efficiency of all large pumps was measured and existing control arrangements adjusted to ensure that the most efficient operated as lead pumps. This now occurs on a continuing basis to help ensure that, as a pump's efficiency drops, it is overhauled. Indirectly, this procedure has also optimised pump overhaul costs, vis-a-vis, operating costs.

For heating and lighting, modern controls have been introduced. In larger buildings readily available energy management systems have been installed plus electronic controls to assist in the management of building energy services, often from a central location, with local override as necessary.

It was in the multitude of smaller buildings however, where the company believed there was bigger saving potential. Many of these are not permanently manned, hence lighting, and heat in particular, could be wasted. Both are now controlled effectively with the aid of movement detectors and thermostats. Comfort heating is provided whilst occupied and frost protection when unoccupied.
RENEWABLE POWER GENERATION

Some of the renewable power generation opportunities that Northumbrian Water have taken advantage of are unique to the Water Industry, others are of more widespread application, at least to large organisations.

Water from Kielder Water is released via two turbines. These and other smaller units generate nearly 20% of the company’s total electrical requirement. In one remote location, wind power is the sole energy source for a telemetry station. This is more cost-effective than laying cables over long distances for the small consumption involved.

More recently, and both to reduce costs and environmental emissions, the company decided to use the methane gas produced as part of its sewage treatment processes at seven of the larger treatment plants. This gas is now recovered and used in combined heat and power units for the production of hot water and electricity producing a threefold benefit. Methane which is environmentally unfriendly is no longer released into the environment, natural gas is no longer required for producing hot water, and electricity is generated for own use, with the surplus being sold to the National Grid.

As Northumbrian Water did not want to use their own in-house expertise to design, install and commission their combined heat and power units they approached a Contract Energy Management contractor to take forward the work under a 20-year contract. Contract energy management basically involves an outside contractor providing investment and expertise in return for a share of the savings. Some describe it as a win-win situation. In the case of Northumbrian Water, contract energy management enables the company to concentrate on core activities whilst the contractor manages the seven plants, keeps them maintained, monitors gas intakes and electrical outputs, guarantees the hot water supply, manages the surplus electricity produced, and sells it to the local electricity company on behalf of Northumbrian Water.

RESULTS

The company is on schedule to achieve its 20% reduction in energy costs by 1995. The results will speak for themselves: annual energy costs will be £1 million less than they would have been had the company not embarked on their energy efficiency programme. Equally important will be the company’s substantial reduction in the emission of environmentally damaging greenhouse gases.
THE FUTURE

There is no doubt that all the improvements the company is securing will remain in place in the years to come. Targets have been set and are regularly reviewed. Management systems and procedures to ensure continuity have been implemented and integrated along with other business systems. Modern technology has also been introduced together with a 20-year operating and maintenance contract for combined heat and power systems. All parties, therefore, have a positive interest to ensure the programme remains successful.
MANCHESTER AIRPORT PLC

ENERGY AND THE ENVIRONMENT ARE MAJOR FACTORS IN THE PURSUIT OF EXCELLENCE

"Effective energy management is one of the key environmental issues facing commerce today. Any company which fails to adopt energy management as a policy will undoubtedly miss a vital commercial opportunity."

Gil Thompson - Chief Executive

HIGHLIGHTS

- Energy and the environment are key parts of the Company Business Plan.
- Environmental Managers are charged with setting policy and standards by which the company will operate.
- Accountability for achieving energy savings is assigned to individuals.
- The result, stable energy costs over the past three years despite a 20% increase in the Airport estate.

THE COMPANY

Manchester Airport Plc owns, develops and operates Europe’s fastest growing airport. Its £100 million annual expansion programme is funded without grants or subsidies and the company believes it probably invests more in environmental protection measures than any other European airport.

Energy costs some £3 million each year. Energy management, to which the company’s chief executive is totally committed, is a key part of the company’s commitment to protect the environment.

ATTITUDES

The company’s ambition to be the “best world airport” is underpinned by six core values. The environment is a key core value and energy an integral part of it. Energy is seen as a management subject and responsibility, and is not delegated totally to an Engineering
Department. The company’s commitment to energy is built into the corporate strategy, and reflected in the translation of that into both development and day to day practice. The Airport recognises that it must invest in environmental measures if it is to continue to operate and develop in an environmentally responsible manner. However, environmental responsibility is not seen as a threat or a curse but a real opportunity to add value to products and services, and thereby increase market share.

**APPROACH**

Drive comes from the top. The company’s core values are taken seriously by all and are built into operational systems and development plans.

Customer Services are responsible for the day to day operations of the Airport and energy use, but the Technical Services Directorate sets policy and operating standards. These standards make it possible to audit performance in energy and resources, air quality, land and ecology, noise, water and waste.

Attention to energy began in 1987 with an audit to identify opportunities; a positive decision to control energy expenditure; acceptance that savings achieved by other organisations were equally applicable to the company, with the added bonus that good energy management would also provide worthwhile environmental benefits.

Key objectives were established covering:

- A clear policy incorporating investment criteria, budgeting, environmental and procedural criteria standards.
- Best Practice Design concepts being rigorously applied throughout the capital development programme. The Energy Efficiency Office assisted by promoting Best Practice examples for the company to consider.
- Accountability being formally assigned to officers with an initial target of 5% savings. In every case these were exceeded.
- Reporting structures being established to provide feedback on progress to top management, and to help all involved maintain and enhance improvements.
- New technology being carefully evaluated and introduced. Again use was made of the Energy Efficiency Office’s technical literature and case studies.
- Staff being trained to raise their level of awareness of energy issues, their impact, and the role that each should adopt.
RESULTS

Rapid expansion of the Airport masks the company’s significant reduction in energy expenditure. Their success is such however that it could be argued that the recent £500 million development programme has been implemented for zero additional energy requirement. In fact, energy consumption per square metre of floor area has fallen by 24% over the past three years, and it continues to reduce.

On the technology front, the company has made a £7.0 million investment in a combined heat and power station. This will reduce energy costs by £1.5 million each year, provide a highly attractive investment return in excess of 20%, and substantially reduce greenhouse gas emissions, equivalent to removing from the roads some 20,000 motor vehicles.

But it is not just the investment and technology areas where results have been achieved. Equally important to the company are simple low cost measures, which were taken forward after a structured, detailed study of all major energy consuming plant and related operating patterns. This study enabled a number of changes to be introduced which gave rise to an immediate cash return.

Another crucial, but low-cost development, is business centre accounting which is now being introduced. Energy fits superbly into this financial mechanism. Indeed it is not only Manchester Airport’s experience that confirms that if budget holders are made aware of energy issues and how to handle them, and then given control of their running costs and allowed to manage, lasting savings will inevitably occur.

Already Manchester Airport’s commitment to the environment and energy, in parallel with other core values, has added more than £1 million to Airport profits each year. Benefits continue to increase, and it is not surprising that Manchester Airport has received a number of awards for environmental initiatives and achievements.

THE FUTURE

It is clear that optimum attention to energy and environmental issues is now a way of life at Manchester Airport, and is well integrated into its business infrastructure. Significant savings have been made but the company does not intend to rest on its laurels. Continuing commitment will secure further savings.
ADDRESSING THE MUNDANE AND MAKING MONEY OUT OF IT

"Good environmental practice and good business practice go hand in hand. Responsible energy use is one of the cornerstones of the corporate energy policy which IBM established more than 20 years ago."

Sir Anthony Cleaver - Chairman

HIGHLIGHTS

- IBM approach is driven by corporate commitment to do better. The energy approach is business-orientated and relatively non-technical.
- 4% reduction targets in energy usage set each year.
- Energy costs reduced by 25% in the five years to 1989 saving £2.5 million at very little cost.
- Energy consumption is a criteria that weighs heavily in any purchase or activity.

THE COMPANY

IBM really needs no introduction. It is the world's largest computer services group, whose machines cover the entire range from small personal computers up to and including mainframe giants. Compared to other manufacturing industries, IBM could never be described as a major energy user for in relation to its turnover, the cost of energy is barely significant. However, after salaries and benefits, energy represents a significant percentage of the company's operating costs. IBM's major uses of energy are air conditioning, lighting and IT equipment and because of its vast size, total expenditure on energy in the UK alone is nearly £17 million each year.

Despite the relatively mundane field of air conditioning and lighting and the large number of offices involved, IBM's situation applies to many organisations. IBM focussed on energy costs more than 20 years ago. Early results confirmed energy management was profitable and cash-generating, so the company has continued ever since to make money out of managing energy sensibly. In 1992 a provisional 3.6% was saved, worth just over £0.5 million. This year and next year the company expects the same again. The commercial case for energy efficiency could not be better.
ATTITUDE

The IBM attitude is very much related to costs. Energy is difficult to see but it costs, and costs need watching carefully, particularly when such costs are incurred in a large number of locations.

IBM also realised that in an office environment the cost of energy is just about the only significant item of office expenditure that is genuinely controllable. The company is firmly convinced that good environmental practice and good business practice are inextricably linked. Hence they have a clear and comprehensive policy to take forward their conviction backed up with annual achievement targets.

APPROACH

Following the energy price leap in the early 1980s the company set a target of a 20% reduction in consumption to be achieved over five years by 1989. Simple issues were tackled first focusing on three different fronts:

- Procedures and controls for office air conditioning and IT;
- Low energy lighting; and
- Energy efficient technology in all company equipment.

Office air conditioning and lighting procedures and controls consist of both ensuring that procedures are defined and the responsibility for enforcement allocated. This is then backed-up with regular information on consumption levels to confirm that responsibility is being maintained. Study of control procedures and technologies should be a key part of any energy efficiency strategy. For example, electronic thermostats accurate to \( \pm 1/2 \degree C \) are now available and can save a further 14% of a company’s heating energy requirement compared with an older mechanical thermostat accurate to \( \pm 2 \degree C \) at best. The cost of the change is a mere £25 too; next to nothing in relation to the saving potential.

IBM has recognised the importance of good procedures and controls. Presence detectors are being introduced in partially occupied areas outside normal hours. Where practical, further zoning of heating and lighting will also be introduced together with pull cords on many lights, which yield greater economy for out of hours working. None of the thinking behind this has escaped staff either. But staff need to be motivated and as computers consume electricity, computer screens are now programmed with a switch off message initiated by the ‘log-off’ routine to remind operators of the costs involved.

Higher levels of technology are also being introduced with electronic thermostats being linked back to computer-based management systems and differing regimes for different time windows. But, and it is a big but, the overall management responsibility for controlling energy use remains with a named manager at every location. It is unlikely that the management responsibility will ever be replaced. Higher technology equipment simply makes it easier to fulfil and improve.

Low energy lighting is also readily available today, and continues to be developed. IBM has introduced it in two stages. Firstly bulb renewal has been standardised into a range of low energy lamps, compatible with existing fittings. Again this has no capital cost implications as it is a maintenance item. Secondly, when fittings need to be replaced, for whatever reason, low energy luminaires are introduced, to yield additional savings. It is also policy, for fully air conditioned buildings, to extract air through the light fittings. This can reduce the cooling load in summer and save on heating in winter.

The company’s equipment policy is excellent and costs little to implement. IBM carefully considers the energy efficiency of all its equipment purchases including that which
originates in-house. Indirectly this has both greatly enhanced the attractiveness of its products, enhancing competitive advantage in the process and it has encouraged suppliers to do likewise; a double edged benefit to the environment.

RESULTS

Results have been exceptional. The 1984 target to achieve a 20% reduction by 1989 was beaten handsomely. A 25% reduction was achieved securing savings worth £2.5 million, equivalent to the profit in any low margin business that could be anticipated from additional sales of more than £100 million. Achieving that even in the best of times is no mean feat.

More importantly, IBM's achievement is neither a one-off nor a short-term situation. It was followed by a 3.4% saving in 1990 and a 4.2% saving in 1991. Good energy management is now an integral part of the IBM corporate strategy and the company is committed to achieving energy savings of at least 4% every year. All within the company are committed to this, there are no abstainers or doubters.

THE FUTURE

More of the same probably best describes the energy future for IBM. Energy management, continued environmental improvement and commercialisation are linked to ensure that energy and environmental efficiency continue to be achieved.
"The key issue is to build energy conservation and usage improvement into the objectives of all relevant projects and to monitor that it is effective".

Ed Gillespie - General Manager

HIGHLIGHTS

- Energy efficiency is never pursued in isolation of other business priorities.
- Yet energy use has improved by 35% in the last five years.
- Energy monitoring is the key to success. Accountability for energy use rests firmly with the energy user.
- A simple approach has secured significant gain. No cost measures first, low cost second; all of which have helped to fund major projects.

THE COMPANY

The Stoneywood Paper Mill of Arjo Wiggins is situated on the south bank of the River Don near Aberdeen. Energy and environmental efficiency have always been considered important and despite their long-standing commitment, Arjo Wiggins continue to find improvement opportunities. The mill produces over 3000 different grades of paper. Processes are complex and energy-intensive. Annual expenditure on fuel exceeds £4 million.
ATTITUDES

Energy is a significant cost. As a result, Arjo Wiggins is constantly striving to reduce energy consumption.

Energy efficiency is tackled the easy way. As a routine, consumption is closely monitored daily and action taken on information acquired. Whenever investment in new plant is contemplated, deliberate action is taken to maximise the energy efficiency impact of that investment to ensure that the high saving potential inherent in the machinery is achieved and maintained.

APPROACH

In detail, the Arjo Wiggins approach was straightforward and cost-effective. Commencing with the quick and easy issues, savings accrued more rapidly than expected and that in turn catalysed significant additional investment in energy efficiency, carried out in conjunction with a major mill refurbishment programme. All opportunities were harnessed logically as follows:

- Savings requiring little spend
- Savings needing investment
- Major projects
- The Gas Turbine Project

LITTLE SPEND

A favourite for positive cash generation. It simply consists of managing energy usage, good boiler house control, enhancing awareness and maintaining good housekeeping.

The driving force behind Arjo Wiggins' success is the energy information and reporting system, of which indices of performance are an integral part. Each main process and machine is treated separately and a standard for each established. This permits regular energy performance reviews, highlights problems at an early stage, analyses the impact of other improvement actions and establishes a reference level for comparison with other mills and organisations, on an anonymous basis, under a scheme co-ordinated by the British Paper and Board Industry Federation.

More recently monitoring has been extended so that each production manager knows by Tuesday of every week: his energy performance of the previous week, separated down to each significant stage of each process line. For the two largest machines the process control computers further speed up the information process and on-line indices of performance are displayed.

An indirect benefit of the improved information and control, is that it becomes even easier to justify and obtain approval for further improvements. Ownership of energy use is now also firmly the responsibility of the users, and no longer left with the Engineering Division. It should never be there, but in many organisations it is, as a result of pure neglect.

Making information available also helps to maintain energy awareness and good levels of housekeeping. Quality information is essential. If the information is poor, all involved cannot correct the situation. In addition if information is not provided, staff will not know if company performance is good, bad or indifferent.
INVESTMENT OPPORTUNITIES

Again a sensible approach was followed. Basic processes were well established but the control of those processes required attention. For example, uncontrolled steam heaters will dry or overdry paper. In some cases just one control valve linked to the end dryness will adjust the steam supply to ensure no more than the correct amount is supplied to the heaters.

MAJOR PROJECTS

Arjo Wiggins rarely carry out major projects for energy saving alone, but energy is addressed as an integral part of each project. The company's earlier attention to managing energy, and also introducing minor investments to achieve significant savings, provided substantial support for these later major investments. The information and details collected under the energy umbrella both catalysed the drive to do even better and by implication already had accumulated some of the finance for it.

The company's most recent major investment at Stoneywood has been a £6.0 million gas turbine driven combined heat and power plant introduced following recognition that the company had been much more successful at reducing heat use rather than electricity use.

The gas turbine produces electricity and its hot exhaust generates steam which first generates more electricity and is then passed out at low pressure to the paper machines. This combined heat and power plant has made the mill independent of the public electricity supply and further reduced energy cost and the primary energy requirement.

RESULTS

The results are staggering. Even though the organisation started the most recent phase of improvements in 1985, from a good base, they have since achieved a 35% reduction in energy consumption, a 50% reduction in energy cost and a massive reduction in greenhouse gas emissions. This success has strengthened the company commercially, as its energy requirement is now 30% below the UK average for similar products.

THE FUTURE

Attention to energy, along with other business priorities, has placed Stoneywood Mill in a powerful position within the paper industry. Attention to energy was a key factor in achieving this position and for that reason alone attention is continuing. The savings, other financial benefits and enhanced cash flow, are all a bonus. Further savings, albeit on a reduced scale, are a certainty, and continue to motivate all involved to do better.
BRITISH SUGAR PLC

MANAGING THE COMPLEX SIMPLY

"By far the most important element of the company's success has been a self critical analysis of what used to be regarded as a reasonably efficient process."

Dr Malcolm Branch - Operations Director

HIGHLIGHTS

- Energy programme driven by detailed and regular monitoring of consumption.
- Energy management is a line activity for existing managers. No extra staff have been recruited or dedicated to energy management.
- Each factory competes to move up the energy cost 'league' table.
- Low grade heat successfully recovered using 'proven' technology.

THE COMPANY

British Sugar is a technically complex multi-site organisation, with an annual turnover of some £700 million from its ten factories. All of these produce sugar solely from home grown sugar-beet. In addition, the company produces animal feed from the spent beet, as well as molasses which are supplied to other processing industries.

The company is a major user of steam and electricity, all of which is generated in-house. Substantial quantities are also sold to local electricity companies. Energy costs total almost £21 million each year.

APPROACH

The company programme began in 1980 when fuel was the biggest variable cost after sugar-beet. Initial analysis revealed wide variability in fuel requirement per tonne of sugar sold, with the most profligate site requiring 48% more than the best.

The company's first step to improvement was to select a pilot factory, and to appoint an existing senior manager to co-ordinate a 'task-force' that would address energy efficiency as part of their normal management responsibilities. This helped ensure that these people effectively owned the problem and worked together to solve it.

The first actions of this team were measurement and analysis. Measurement of all that was feasible was carried out including energy flows, process flows, pump and motor efficiencies, at intervals which were as short as a shift length in some cases.

The resulting analysis involved the preparation of energy balances, the identification of best practice in competing companies, and the identification of 'leading edge' technologies in all aspects of energy usage.

In this way an extensive data base was established and as a result, the company learned a great deal more about its products, systems, procedures, equipment, energy requirements and energy options. It then became possible to optimise operating variables such as steam, hot
water, quality give away and process losses. This was important because previously the optimum was not known, and it would have been by luck only if the company had been operating anywhere near it, to say little of their ability to maintain it as the variables changed. This information also made it much easier to accurately calculate and justify capital investment requirements to achieve yet more savings.

Monitoring and related target setting was then formalised. Targets were set in terms of both cost and other parameters including waste and quality. Weekly monitoring was introduced, together with major changes in the presentation of information gathered. Previously related indices of performance had been based in tonnes of beet processed. But beet is the raw material, not the end product. The new key index became cost per tonne of sugar and animal feed produced, or cost per unit of sales. One year later this pilot factory had produced results which were way ahead of expectations and the company decided to replicate the programme throughout all its factories.

Each factory, therefore, set up its own task-force led by one of their seven managers as a part-time energy manager, and the entire programme was co-ordinated by a corporate task-force. Not surprisingly this led to a highly competitive situation reinforced with a league table of weekly results.

Initial analyses also invariably produced some quick wins when, for example, managers discovered that they were using far greater quantities of process materials, such as hot water, than was necessary.

As energy consumption progressively reduced, more of the cash savings were re-invested. Some of the existing combined heat and power turbine generator schemes were re-designed to produce more electricity, the surplus being sold to the national grid profitably. Modern technology was also introduced for such widespread opportunities as the recovery of low grade heat. Plate heat exchangers were found to be excellent for this, even when the heat source was less than 100°C.

More recently the programme has been extended to incorporate smaller but more repetitive opportunities such as improved lighting and better control of it, more efficient motors, and the re-layout of tanks and pumps to reduce pumping power. Even the latest techniques of infra-red photography have been profitably introduced, and have identified lagging defects which would otherwise have been undetectable.

RESULTS

The results were quite staggering. Energy consumed per tonne of sugar, for this already efficient industry, was reduced by a massive 41% on average worth some £10.2 million each year at today's prices. There was also far less variability between the different factories, indicating
that those with the greater scope to improve had done so. Environmental emissions of carbon dioxide, sulphur dioxide and nitrogen oxides were also reduced by nearly 40%.

It is now company policy for major replacements or refurbishments to incorporate the latest technology into the design, process measurement and process control systems, and to integrate these with the energy producing facilities, to obtain on line optimisation of them all. Despite the capital intensity of its investments, the company has been able to achieve a better than 20% return throughout.

THE FUTURE

The impact of the company’s introduction of a management style, based on continuing analysis of the costs per unit of sales, backed up with clear allocation of ownership to line managers; the absence of additional dedicated manpower replacing the line manager responsibility for energy; and a stated investment policy, has not only been a recipe for success, but is one that is likely to ensure success continues in the future.

British Sugar’s achievements have only resulted from continuing action over many years. Action will continue, for despite the huge savings achieved, and despite the narrowing of the gap between the first and last in the ten factory league table, there is still a gap of nearly 26% between the two extremes. It is inevitable, therefore, that the disciplines, systems and procedures that now comprise the company’s basic philosophy towards energy, will ensure that that gap continues to narrow, and that the leader continues to achieve further improvements.
CONCLUSIONS

The conclusions arising from this comprehensive set of case studies may be summarised best as follows:

- There is no Royal Road or standardised approach towards energy and environmental efficiency. There are, however, a few principles worth following, which are sure to result in success.
- Attention to energy matters requires management and management disciplines. Energy efficiency is not really a technological problem; all that is required is management commitment and the application of known technology.
- The simpler the approach the better. Ideally energy matters should be integrated into the organisation’s existing systems and procedures, in a manner which is compatible with the organisation’s existing culture.
- It is preferable to commence with the no capital cost and low capital cost issues first. The savings and benefits from these may be used to fund the higher cost items subsequently, and in that way the entire programme could have a positive cash-flow throughout.
- Additional staff, dedicated staff or specialist staff are not necessarily essential. The formal allocation of ownership is more essential and, for the more energy intensive situations, achievements tend to be greater when ownership is formally allocated to line management.
- The measurement of energy consumption at regular intervals and the comparison of that with some form of index of performance is absolutely crucial both to achieve improvements and to maintain them subsequently.
- Attention to energy efficiency makes good commercial sense in every case, irrespective of the type of organisation, its style, culture or energy intensity.
- Without exception, big financial savings and other benefits such as quality improvement and enhanced safety, may be achieved. Typically these range between a 20% to 40% reduction in energy requirement over a reasonably limited timescale, with smaller percentage reductions continuing thereafter.

The commercial case for pursuing energy and environmental efficiency is just as strong as the commercial case for any other aspect of business today. However, as attention to energy and environmental efficiency has tended to lag behind that given to other business issues, the catching up process is likely to yield significantly greater rewards.
The Making a Corporate Commitment Campaign

The Making a Corporate Commitment campaign seeks board level commitment to energy efficiency in the private and public sectors. Senior management are encouraged to treat energy efficiency as a high priority by giving a board level Director responsibility for developing an energy efficiency strategy and ensuring that it is an item that is considered regularly at board level.

The central feature of the campaign is the signing - by the Chairman or Chief Executive - of a voluntary Declaration of Commitment. The declaration states the essential management ingredients necessary for an effective energy policy namely:

- publishing a corporate policy;
- establishing an energy management responsibility structure;
- monitoring and evaluating performance levels;
- setting performance improvement targets;
- improving awareness of energy efficiency among employees;
- holding regular reviews;
- reporting performance changes and improvements to employees and shareholders.

For details of how to join the making a Corporate Commitment campaign contact:

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