Practical Tips on Energy Consumption.

Mike Birks.

I would like to give you a talk today on practical tips on energy consumption

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Following on from David Smith's presentation on climate change levy, 1 hope what I am going to say today will give you some guidance on how you can improve energy consumption and therefore meet the challenges of the climate change levy.

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The Energy Efficiency Best Practice Programme provides support to companies in helping them wish energy efficiency matters. There is help in terms of energy management, research and development and technical support. We can also help with providing expert advice your site. Where a site has a significant heat demand and electrical demand combined heat and power may be an option. The Energy Efficiency Best Practice Programme also offers industrial companies a partnership so that we can work together to get the best out of your company in terms of efficiency improvements.

We also offer an environmental and energy helpline which is free to anyone who wants to call for specific advice.

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We have heard from David Smith on how negotiations have taken place on the climate change levy. The levy actually raises the cost of your energy by 0.15p/kWh for gas and coal and 0.43p/kWh for electricity. However, under a negotiators agreement you can get a rebate on this rate as long as you as a company committed to energy savings.

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Collecting the Levy. Energy supply companies gas, coal, electricity will collect the levy as part of an increase in tax when they present you with their bill. If you have an energy efficiency agreement then the energy supply company will only charge you 20% of the levt when they present the bill. Clearly to remain receiving the reduced levy rate the commitment to energy savings needs to be monitored and recorded and presented to the DETR, on a regular basis.

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The Fiscal Equation. The climate change levy is designed to be revenue neutral. Any revenue collected by Government will be returned through a reduced national insurance contributions and reduced payment as a result of negotiated agreement.. There will also be a significant figure provided to provide energy efficiency advice through something similar to the Energy

Efficiency Best Practice Programme.

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Is it worth the effort? Let's have a look at a typical company and see how their cost of energy will change as a result of the levy. I've looked at a company whose consumption in MWh/a is 45,000 uinits in electricity, 60,000 in gas, a total of 105,000. I've assumed cost of energy in p/kWh that's 4.2 for electricity and 0,7p/kWh for gas. The total bill therefore without the levy is, £1890 for electricity, and £420 for gas giving a total bill to the company of £2310. If we then add the cost of the levy at 0.43p for electricity and 0.15p for gas the increase to the company with the climate change levy gives a total of £2593. If you take off the discount for a company whose entered into a negotiated agreement then the bill reduces by the 80% to £2367 but if that company as a result of the negotiated agreement makes an energy saving of 15% then the total bill comes down to £2011. The net result is that the company has entered the negotiated agreement under the levy would have seen an increase of nearly £300 in their bill but as **a** result of negotiated agreement with the levy and making a concerted effort to save energy of 15% then their next bill has come down by £300.

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Under a negotiated agreement, energy savings are made up of various different opportunities I've taken an industrial bakery as an example and if that bakery has a 14% improvement target over 10 years for the climate change levy, the energy savings are made up from various opportunities. I estimate that 50% of the savings will come from improved energy management. These are savings that usually come from improved energy awareness making staff aware of what energy savings mean, providing them with feedback reports, putting in low cost or no cost energy saving measures. In addition, there will be savings as a result of improvements in technology. In the case of our industrial bakery, may be there will be some plant changes where technical measures can be introduced that provide energy savings.

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One of the conditions of a negotiated agreement is that at least 90% of enegy is used on the food making process. Therefore a site has to take care to ensure that it

only reports that energy that it's used in the process and not as an example, in the office that is part of the site.

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Where will be energy savings, come from? My experience tells me that energy savings will come from these four measures. Combined heat and power clearly is a major opportunity. Retro-fit measures where as an example in our bakery a motor is replaced with a high efficiency replacement. New plant where an oven as an example may be replaced and a high efficiency unit is fitted. Finally energy management, this is the biggest opportunity whereas I have explained in my view 50% of all savings will come from improved management procedures.

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Let's take the industrial bakery and see where energy is used. If we look at gas consumption, over 75% is used on ovens, the rest is in improvers, water heating and building surfaces. As far as electricity consumption is concerned, it is a much bigger distribution with ovens, coolers, provers, mixers, compressed air, refrigeration all making a major demand on the electricity used.

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A recent survey of craft bakers has looked at where energy and cost savings may come from. One of the biggest measures can be checking the tariff provided by the utility supplier. Of the 57% of the sites that we looked at the cost savings as a result of this measure was between 3 and 40%. 9% of the sites also found opportunities for savings from an alternative utility supplier and 3% have changed to energy efficiency equipment. One of the biggest energy saving opportunities at 36% of the sites was rescheduling production and finally 11% of sites showed improvements in energy efficiency from reusing waste heat from the process.

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Let us take two craft bakeries as a case study and look at what the energy saving opportunities were. In case 1 we have a small bakery which uses 38 kilograms of flour. The electricity cost is £5880 per annum and the gas £750. The additional cost due to climate change levy for this particular company will be £561. However, if they enter into a negotiated agreement they will get an 80% reduction and as a result the levy cost will be £113. However, in order to enter into a negotiated agreement the company will perhaps have to commit to a 10% energy saving improvement which gives a saving of £663 on the current bill.

Case 2 the bigger craft bakery uses 1,334,000 kilograms of flour per year. The electricity cost for this particular bakery is more than case 1 at £51,700, and gas at £41500. The levy cost on this energy bill will be £17,260 but if a negotiated agreement is entered into, then the levy will be reduced to £3452. Again, this particular company will have had to look for opportunities in savings as a result of a negotiated agreement and on their current bill a 10% saving will provide £9,320.

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Let's have a look at the opportunities for improving energy efficiency as a result of improved energy management. Energy management requires a logical disciplined approach to energy utilisation. We need to look at the technical opportunities and undertake some financial assessment of those and see how they fit into the overall plan of improved performance. Management is the key and should link into all other management duties. Link energy management to your everyday task. Cost effectiveness is the basic rule. We have a term ACE = all cost effective. Any investment that you make should give reasonable pay back in a time of, let's say less than 3 years. We say energy consumption is controllable. It's a controllable cost and therefore there is every opportunity to save energy, and save cost as a result of improved management in energy consumption.

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Energy management requires knowledge of energy use. You will need energy data, you will need to undertake some analysis on the data as part of a good monitoring process. Combined with this, look at energy purchases. There are a number of things that you can look at.

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Combined energy data analysis with an in depth look at cnergy purchasing, look at your energy bills and see whether they compare with the energy data that you hive collected. Make sure that you only pay for what you use. Where you are going to invest in a project evaluate that project and make sure that you are making the right decision. Look at the cost, look it the energy saving potential. When you implement the measure make sure that people know what you've done and where you've done it. Communication is a significant part of the process. Make sure that you make people aware of what you've dons and how successful you've been with the energy saving measure. There are several common elements of success in energy management. Energy management applies to all companies that are using energy and therefore it is a common approach. There is no particular need for additional staff when implementing a good energy management policy. Capital investment is not always needed. Some of the measures can come from no cost or even very 1ow cost investment. Employee participation is essential. Technology can help to provide the energy savings but it's the people that make the difference. Management is a top priority and ensure that a statement from a manager showing that they are fully committed to energy saying is shown in a prominent position at the workplace. A logical but simple approach is necessary to ensure that energy management is successful.

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Monitoring and targeting is a simple tool to help in the process of successful energy management. It combines a loop of data collection undertaking some analysis, recording the findings and then taking some action to make some improvements. Following this you need then to take data again, do some analysis and report so it's

a continuing loop monitoring targeting energy savings and making sure that you record the improvements.

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Let's have a look at an example of monitoring and targeting in a bakery. My suggestion is that utility meter readings are taken on a monthly basis in kilowatts. You also need to measure production in terms of loaves of bread, rolls or whatever it may be. From this, calculate the specific energy consumption the kilowatts the energy used divided by the production in loaves of bread, rolls etc. If you can, compare this with benchmark data. This may be available from the Best Practice Programme. Give them a call and see whether they have some,, comparison data you can use. Once you have this specific energy consumption take action to save some energy. Then you need to repeat; take the meter readings, measure production, calculate the SEC and do some comparisons. Go round the M & T loop that I explained earlier.

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I'd like now to look at some possible technical solutions. By taking out a couple of areas of interest. These may provide you with some opportunities for savings. Compressed air systems. We've done a survey through the Best Energy Efficiency Best Practice Programme and by looking at sites we have determined that a typical size can reduce the cost of compressed air by 30%. This comes from a selection of measures which includes improvements to the generation of the air, the distribution and the end use.

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This slide shows the effect of a typical factory in reducing it's air use and cost through a leak detection campaign. The site originally had a leakage of about 140 litres a second. This was reduced significantly to about 90 litres per second through one leak reduction exercise and then again to 50 or 60 litres a second through a second reduction exercise over a 2 week period. For this company the two exercises provided a cost of leakage reduction from about £11,000 a year to £5,000 a year, a significant cost reduction. The most important thing about compressed air is that it needs to be maintained on a regular basis. Because of the nature of compressed air it tends to, through the ware of components, to increase leakage.

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Sources of Air Leakage. There are many opportunities for air to leak. in a one system condensate valves left open, shut off valves, leaking pipes and joints, leaking hoses and couplings, leaking pressure regulators, cooling lines. All of these things provide a source for air leakage and as a system you need to be looking at these items to reduce the leakage.

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I've looked at the power wastage through air leaks. Taking cost of 3.7p/kWh.. I've looked at what the cost of a leak of 0.4mm about the size of a pinhead**.** This is equivalent to 2.2 litres a second from a seven bar system. The power required to service that leak is about 0.4kW and over a 120-week operating period, that's equivalent to £23 a year. If you multiply that leak of the 0.4mm pinhead several times to accommodate the whole of the systcrn using a 3mm hole this is equivalent to 11 litres per second on a seven bar system and increases she cost of annual leakage to £808. Clearly you don't need many holes in a compressed air system to provide significant leak and significant cost. Finding these leaks and putting them right is a major opportunity to save energy.

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The major opportunity to saving energy is switching off equipment when it is not required. Motor Is a good example of this. Don't rely on people to switch them off, use automatic sensors, use time switches or connect to an energy management system where thermostats, humidity sensors, pressure switches all control and switch off the item.

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Steam is used widely in all forms of process as an energy source. We've looked through the Energy Efficiency Best Practice Programme at a number of sites that use steam and we've found a wide ranging system efficiency ranges from 40% up to nearly 80%. Clearly there are opportunities to operate the system at close to 80%. Best Practice Programme publications show how this improvement in efficiency of the system is achieved.

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Electric Motors. Survey of UK Industry shows that motors consume 67% of industrial electricity. They are quiet, they sit in the corner, often forgotten but they are a significant energy user. It can cost as much to run a motor for a month as it does to buy a motor in the first place. It is therefore important to get the best energy efficiency standard. A rewound motor could reduce efficiency by 1 or 2% and therefore a policy of either rewinding or buying a new higher efficiency motor is very important.

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As far as electric motors are concerned, always use high efficiency although there is a small increase in the capital cost. The energy savings over its lifetime will be

significant and it will pay for itself in a very short period of time. Always look at motors and see if it's possible to fit a smaller size. Remember rewinding is not always the best policy and where possible always use the soft start unit when you have a motor that is frequently cycling.

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The relationship between speed and energy used of an electric motor is a cube function and therefore by reducing the speed with a variable speed drive, you can significantly reduce the energy that it uses. In some processes speed reduction is a major advantage and by utilising a variable speed drive to reduce speed you can provide major energy savings to the process.

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Combined heat and power can be used to provide a site with electricity and heat. There is also an opportunity to use the heat to provide chilling through an absorption system. By matching the heat load with the requirement for chilled air the CHP system can provide heat, cold and electricity. It's worth investigating CHP where heating, cooling and electricity are parts of the process. Advice from the Best Practice Programme can help you you with the selection of the appropriate size of CHP unit.

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The Energy Efficiency Best Practice Programme can provide site specific advice. We will arrange for a consultant to come to your site, free of charge, to help you determine what the improvements in energy efficiency are likely to be. Please contact the Best Practice Programme to arrange your site visit.

We also are very keen to promote partnerships within industry or trade associations which might include energy audits, literature packs, site based training or specialist help from the Best Practice staff. We have a significant number of publications and by ringing ETSU at 01235 436747 we can give you some details of what publications are available. We have a free call helpline 0800 587794 where you can get some advice on any environment or energy issue.

Please feel free to contact me, Mike Birks on 01235 433468 or by fax on 01235 433727, if you need any energy efficiency advice.