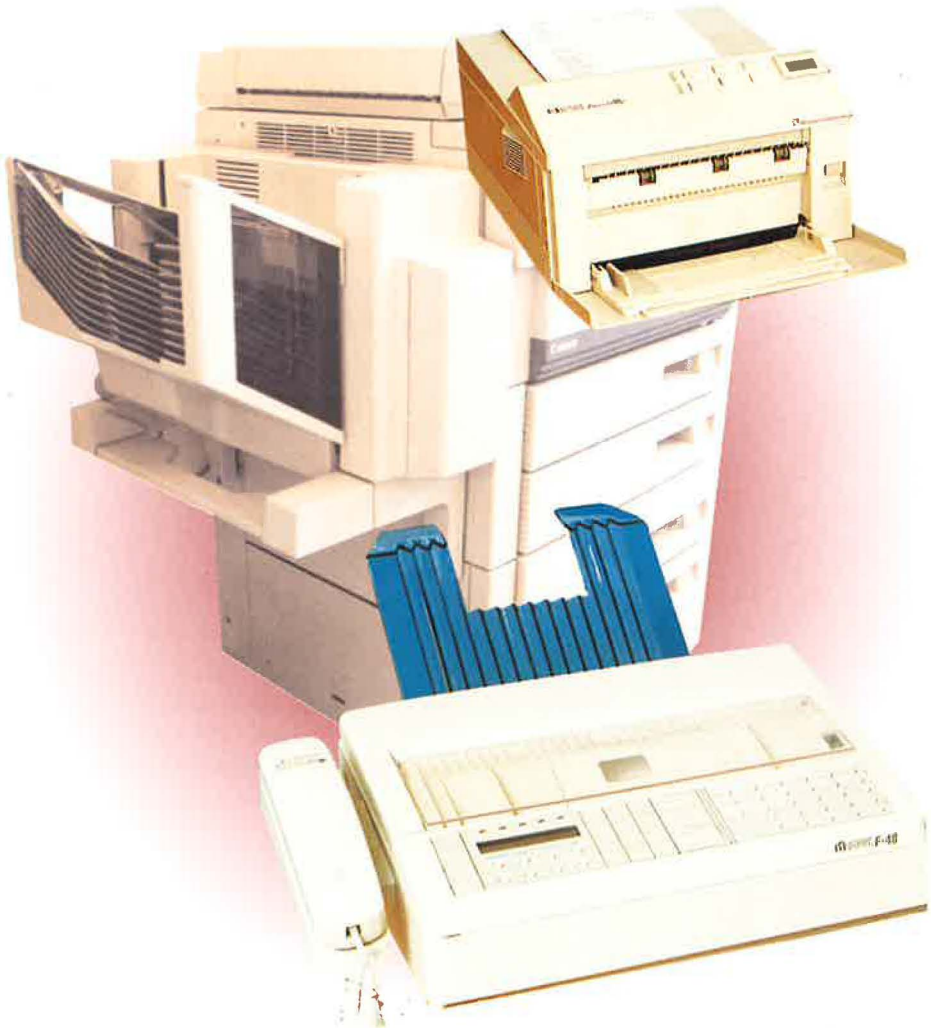
AIVC 10975

Department of the ENVIRONMENT

GOOD PRACTICE GUIDE 118

Managing energy use

Minimising running costs of office equipment and related air-conditioning



- Office equipment can account for up to 70% of the energy used in air-conditioned offices
- Energy efficient equipment could halve the £300 million of energy used by equipment in UK offices
- Energy efficient office equipment can also halve air-conditioning costs
- Substantial savings are possible for little or no cost

BEST PRACTICE PROGRAMME

ENERGY EFFICIENCY

BEST PRACTICE PROGRAMME

GOOD PRACTICE GUIDE 118

CONTENTS

The inclusion of product photographs does not imply an endorsement.

1 INTRODUCTION

Office equipment is now second only to heating as the major user of energy in the majority of offices. The amount of office equipment is doubling every few years, and now consumes around £300 million of energy nationally each year.

Energy costs due to computers, fax machines, copiers, vending machines and other office equipment can be reduced by more than 50% by adopting energy efficiency measures.

Office equipment typically accounts for more than 20% of the energy used, and up to 70% in some offices.

Using energy at current levels creates well over 3 million tonnes of carbon dioxide (CO_2) each year. (CO_2 is one of the main gases responsible for global warming.)

If your organisation increases its energy efficiency, you can gain because of the environmentally friendly image you convey to your stakeholders - business partners, customers, staff and associates. Furthermore, financial savings from energy efficiency contribute directly to bottom-line profits, thus improving your competitive position.

To gain greatest success, energy management needs to be an everyday part of your corporate management. Becoming a signatory of the Department of the Environment's 'Making a Corporate Commitment' campaign (MACC) will help you achieve this.

This Guide provides managing directors, office managers and finance managers with a general understanding of office equipment and the energy it uses. It also shows how energy costs can be reduced for little or no financial outlay.

Chapters 2, 3 and 4 give readers the basic concepts of office energy management and its implications for profitability:

- the need for an energy policy
- the importance of understanding office equipment when considering cooling designs
- good everyday management
- key considerations for new purchases.

Those who also wish to acquire more detailed technical knowledge about energy used by specific office machines will find this in chapter 5.

The total energy consumption that can be attributed to office equipment is made up of:

- the energy consumed by the equipment
- the energy needed to remove the waste heat produced by the equipment.

Inefficient equipment not only uses more energy, it requires more energy to cool the extra heat produced. Designers are well aware of this, but tend to make matters worse by overestimating the energy used by equipment. Over-specified and less efficient cooling systems result.

2 OFFICE EQUIPMENT IN YOUR ENERGY POLICY

Good management of office equipment can create worthwhile energy savings from existing equipment, as well as setting the scene for substantially reduced future consumption. However, to achieve this needs standard practice throughout the organisation. One of the most successful ways is to incorporate such practice into your organisation's energy policy.

Your office equipment will probably be a mixture of products from a number of manufacturers, all with different characteristics. Most will be used for only part of the day (see table 1).

Table 1 Examples of daily use of office equipment

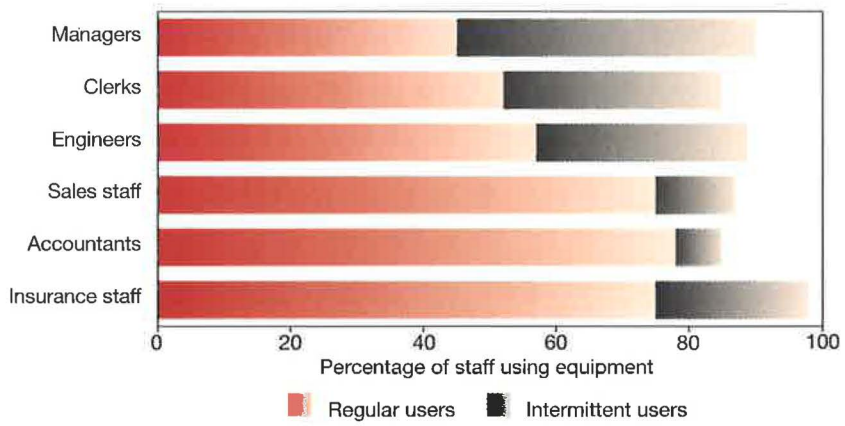
Typical lengths of time that equipment is used per day	
Item	***Daily hours of use***
Personal computers	4 hours per day
Printers	1-2 hours per day
Photocopiers	1-2 hours per day
Facsimile machines	20-30 minutes per day
Vending machines	8-10 hours per day

Use of equipment

The energy used by all the equipment in an office depends not only on the efficiency of the equipment but on:

- the number of staff working in the office
- how often they are there
- how much they use their equipment (see figure 1)
- how the equipment is being operated.

Figure 1 Varying usage of PCs by different staff



Achieving maximum efficiency for all energy used by office equipment can reduce your fuel bills typically by 20%, and in some cases, by as much as 70%. Savings can be achieved at little or no extra cost and can usually also result in savings on the capital cost of air-conditioning equipment, or even its elimination altogether.

Listed below are a few examples of how to reduce the running costs of equipment, efficiently and simply.

Switching off

Encourage your staff to switch off equipment whenever it is not being used, providing it is cost effective to do so. There are times when it can take too long to bring the equipment back into operation for it to be cost effective. All equipment should be switched off at night or at weekends unless required.

Energy saving features

Managers should ensure that energy saving features suitable to your organisation - often built into equipment - are activated.

Assistance can be obtained from instruction manuals or manufacturers on the following:

- which equipment has such features
- the effectiveness of the level of stand-by reached
- how the delays can be set at an appropriate level for your operational requirements*
- the times taken to return to use from stand-by.

* For PCs, the delay time can usually be set at between 3 and 120 mins. Research in Canada indicates that computer operational time can be reduced by as much as 60% using appropriate delay settings to suit your organisation's needs.

OFFICE EQUIPMENT IN YOUR ENERGY POLICY

ENERGY SAVING FEATURES

Most items of office equipment already include energy saving features. Some are more effective than others. Some features are automatic; some have to be activated.

Automatic stand-by mode

Equipment will go into stand-by mode after a predetermined period that you can usually adjust. Most units close down in one or two stages to a state that could use as little as 10% of operational energy. Some may take 30 seconds or more to return to operational state, depending on other characteristics of the equipment. Some models reduce to much lower levels, making them far more effective in saving energy.

Automatic switch-off

The value of this feature depends on the length of time the equipment takes to restart. Automatic switch-off can be particularly useful when machines are left on overnight. It may not be cost effective by day, because of the cost of lost staff time awaiting restart. Saving work at the time of switch-off is an essential requirement.

Retrofit power control devices

Various power control devices can be purchased to switch equipment off when not used for a set period. The purchase and installation costs may be too high, when compared to the value of the extra energy saved, for some devices to be justified. Some may also waste costly staff time, for example, while personal computers are rebooted. (An automatic back-up facility may also be necessary.)

YOUR ENERGY POLICY

An overall energy policy will enable managers to maximise the energy saving benefits from office equipment. Energy efficiency goals for office equipment should be part of the corporate energy policy. The policy should cover purchase, specification and operation of office equipment and cooling systems. If no such policy exists, perhaps this is the time to put one in place by starting with a policy associated with office equipment. The Department of the Environment's Good Practice Guide 186, 'Developing an effective energy policy', (available from BRECSU, see back page for details) provides detailed guidance.

The policy should include:

- setting out the corporate objectives and targets for office equipment
- communicating a commitment from the top of the organisation to the efficient use of energy in offices
- setting out the responsibilities of those who use office equipment
- setting out the responsibilities of those who purchase office equipment to ensure that cost effective energy efficient equipment is obtained
- setting out the responsibilities of those who manage the design of cooling arrangements to brief designers to allow for the real effects of office equipment (see page 7)
- specifying standards of power consumption to be attained
- maintaining interest in the policy by regular communications throughout the organisation – posters, staff forums or groups, incentives, reporting of successes
- requiring an annual review at corporate level and policy changes where necessary.

Benefits of the policy

By implementing a policy which includes energy efficient office equipment and cooling, and following the principles of this Guide, an organisation can obtain:

- substantial savings from existing equipment
- even greater future savings by purchasing appropriate, new energy efficient office equipment
- reduced capital expenditure on air-conditioning or cooling systems
- lower running costs of air-conditioning or cooling systems
- lower fuel bills – typically 20%, and perhaps far more in air-conditioned offices.

Financial savings will go straight to increasing profits or funding other activities.

3 MINIMISING AIR-CONDITIONING COSTS

In air-conditioned offices it can typically take half as much energy again to remove the heat generated by office equipment as it takes to run the equipment. Thus, an item of equipment using, on average, 40 watts more than another can cause a total of 60 watts of energy to be used if cooling is necessary.

The appendix (page 15) outlines an example which shows that designing the air-conditioning to deal with the real heat gains from office equipment can reduce the capital costs of air-conditioning by 20%, while running costs can be reduced by 20% each year.

Overestimating the energy used and the heat produced by office equipment can produce substantially oversized systems. The air-conditioning designer will know that if pumps, fans and, possibly, chillers of an air-conditioning installation are oversized, they will be less efficient. Despite this, air-conditioning designers often believe that the energy rating of office equipment is relatively unimportant, and frequently use the manufacturer's nameplate rating or 'rule of thumb' estimates. The heat produced by equipment can thus be overestimated by a factor of three or four. If design safety factors are added to this in proportion, substantial oversizing can result

Figure 2 shows the average energy used by some common office appliances (excluding stand-by). Figure 3 illustrates the average power demand compared to the nameplate rating levels which occur only occasionally, for example, during start-up.

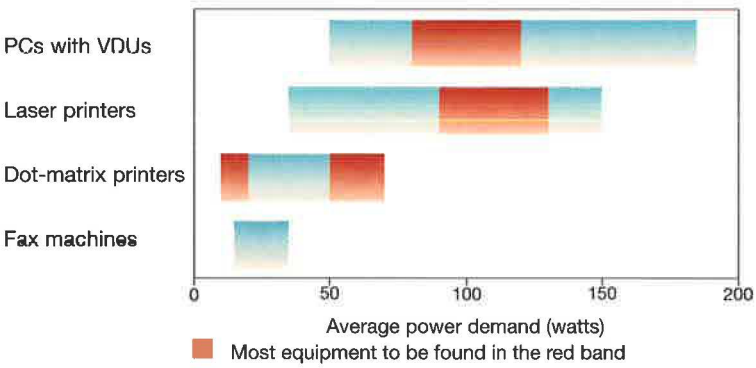


Figure 2 Examples of the average power demanded by items of office equipment

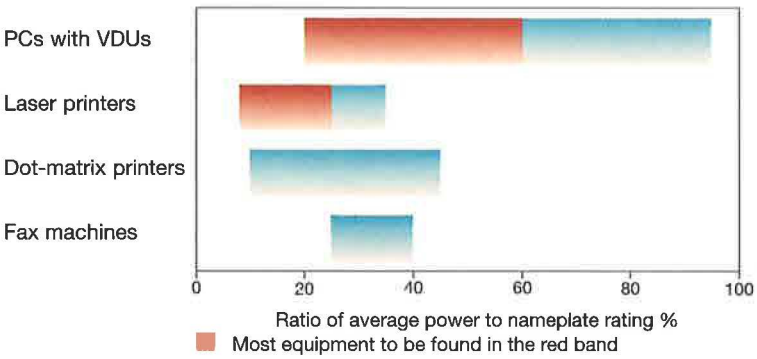


Figure 3 The average power demanded by equipment can be far lower than its nameplate rating

MINIMISING AIR-CONDITIONING COSTS

If the oversized system uses modular chillers it is likely that some chillers will be on stand-by. This is not necessarily inefficient but it may increase the capital cost of the chillers. Pumps and fans will also be oversized, unnecessarily increasing both capital costs and running costs for years of life. In some cases air-conditioning could be avoided altogether.

Specifying air-conditioning

Ensure that the designer understands or obtains data on:

- the amount and type of office equipment that you intend to install, or may need in the future
- the real power consumption data for this office equipment
- the building occupancy and anticipated uses.

The following points should be checked with your designer. ✓

- Are the designs based on the real levels of energy used by office equipment? ☐
- How was this determined (and was the way acceptable to you)? ☐
- For what temperature range is the air-conditioning system designed? (Remember that air-conditioning may not be necessary if working temperatures of around 25°C in warm weather, and overheating on a few days each year, are acceptable.) ☐
- Has natural or mechanical ventilation been considered as an alternative to air-conditioning? ☐
- Is air-conditioning needed throughout the building or just in a few areas where overheating occurs? (Partial air-conditioning could be installed in such areas.) ☐

4 PURCHASING OR RENTING EQUIPMENT

Decisions about purchasing office equipment are often made by the individuals who will be using the equipment. Such staff are not normally experienced buyers, and often have limited resources to investigate the purchase or operation.

The purchasing process

When purchasing or renting office equipment you will, as a matter of course, compare price and specification between different manufacturers and models. To determine which items meet your specification and price, as well as being more energy efficient, ask the supplier or manufacturer to provide:

- the average power consumed under typical operational conditions (to be specified)
- the peak or nameplate power rating
- the stand-by energy consumption
- the means of setting stand-by
- the recovery times from each stand-by and whether rebooting is needed.

Always purchase the most energy efficient units you can, and ensure that the equipment returns from stand-by quickly to minimise wasted staff time.

Research into office equipment has also shown that average power consumption can vary substantially between otherwise similar items of equipment, even from the same manufacturer. Such differences should be identified at the time of purchase.

The average and stand-by consumption levels will determine which units are most efficient for your requirements.

Some examples of average power loads and energy saving features are shown in table 2.

Energy efficient office equipment need be no more expensive than less efficient alternatives. Features which usually make equipment more energy efficient include the following:

Personal computers

- monitor screen sizes no larger than necessary
- monochrome monitors, if acceptable for the range of work.

Printers

- on-demand fixing of toner if the machine's speed is acceptable
- low melting point toner.

Photocopiers

- low-power facilities or switch-off when not in use for a specified period; the copier will need to warm up after an automatic switch off – so ensure the delay time is cost effective in its use of staff time
- easy-to-use stand-by switch where the machine can be switched to stand-by mode manually
- double-sided copying, protecting the environment by saving both timber and the energy needed to make additional paper (but not if this requires wasting costly staff time)
- low melting point toner powders.

Fax machines

- auto-turn off features: adopting standby modes after 15 minutes of idling can reduce average energy use by up to 90%.

Office equipment selection criteria

Item	*Average power consumption (watts)*	*Stand-by energy consumptions obtainable (watts)*	*Target recovery times (seconds)*
Personal computers and monitors	120	30-45	almost immediate
Personal computers	40	20-30	almost immediate
Monitors	80	10-15	almost immediate
Laser printers	90-130	20-30	30
Photocopiers	120-1000	30-250	30
Facsimile machines	30-40	10	almost immediate
Vending machines	350-700	300	can be almost immediate

Table 2 Examples of average power loads and energy saving levels that can be achieved

PURCHASING OR RENTING EQUIPMENT

Energy Star

There are a number of energy saving standards met by manufacturers of energy efficient office equipment in various countries, but perhaps the most common of these is the 1993 Energy Star scheme, promoted by the US Environmental Protection Agency (EPA). This is usually awarded to units with less than 30 watts of energy consumption on stand-by, and a quick restart. However, some Energy Star models achieve much lower energy use on stand-by than others. Energy Star equipment has become widely available in the UK.

Energy Star equipment will still use some energy at night if not switched off, so additional manual or automatic management is still needed. Without such additions, the annual energy use would still be double the energy use levels achievable from nightly switching off a typical non-Energy Star unit.

If Energy Star equipment is purchased, you should remind staff that it still needs to be switched off at night.

Average power consumption

To ensure comparative tenders, you must define average power consumption in your purchase specification. The following wording may be useful:

'The average power load is the typical average power consumed while the unit is fully operational and not in any stand-by, reduced power or "off" mode.'

PURCHASING OR RENTING CHECKLIST

Follow these steps when purchasing or renting office equipment.

Select equipment meeting your specification and in your price range.
Obtain quotations to include the following details:

		✓
■	Levels of energy used in stand-by	☐
■	Recovery time to operational state	☐
■	Average power consumption in use, stating the conditions of use	☐
■	Can the equipment work at higher room temperatures?	YES ☐ NO ☐
■	Will extra room cooling be needed to reach optimum working temperature?	YES ☐ NO ☐
■	Do energy efficiency features need setting after delivery?	YES ☐ NO ☐
■	Are energy efficiency features easily set by the user?	YES ☐ NO ☐

5 ENERGY USED BY OFFICE EQUIPMENT

PERSONAL COMPUTERS

Typical consumption figures

Monitors

- 10-15 W (stand-by)
- 80 W (average)

PCs

- 20-30 W (stand-by)
- 40 W (average)

Energy efficiency options

- Switch off monitors at lunchtime or when the user is away from the desk. This saves two-thirds of the energy used by the PC and monitor.
- Leave the monitor switched off if PCs have to be switched on all day.
- Use quieter laptop computers wherever convenience, specification and price permit – these are the originators of the low energy technology now found in PCs.

Personal computers (PCs) typically account for two-thirds of the energy used by office equipment. Their use has doubled since the early 1990s, and it is estimated that by the year 2000 there will be at least one PC on every desk. PCs are often left on all day, although they are typically used for only a few hours or less.

A typical PC (including monitor) left on for 24 hours each day can use £60 or more of energy per year. Turned off at night and weekends, the same units will only use around £15 of energy per year. This amount can be reduced by a further £10 or more by adopting simple energy management techniques. In an office of 100 PCs, annual energy cost savings could be around £5000 from the equipment alone, and £7500 to £10 000 if sited in an air-conditioned office.

Two-thirds of the energy used by a typical PC is consumed by the monitor. This can be considerably reduced by manually switching the monitor off when not in use, or by using monitors that go into low power mode after a period of inactivity.

Most monitors include screen savers. Although primarily intended to prolong screen life, they can be used as an interim measure to achieve power reductions of 10-20%. Recovery is almost immediate. Far greater reductions are usually obtained from other energy saving features, and it is on these that good management should be concentrated.

Such simple measures can save 80% and more of the energy costs incurred if machines were left on for 24 hours a day, seven days a week.

ENERGY USED BY OFFICE EQUIPMENT

PRINTERS

Typical consumption figures

Laser printers
- 20-30 W (stand-by)
- 90-130 W (average*)

Ink-jet printers
- 20-30 W (stand-by)
- 40-80 W (average)

Dot-matrix printers
- 20-30 W (stand-by)
- 30-70 W (average)

** All models have different capabilities and power use, but there is a range over which most are found*

Laser printers

Laser printers apply toner to an electrostatic charge on the paper which is then heated to fix the toner. They generally use a little less than the energy used by a PC with a monitor, mainly for fusing the toner. Usually they have fans that operate continuously.

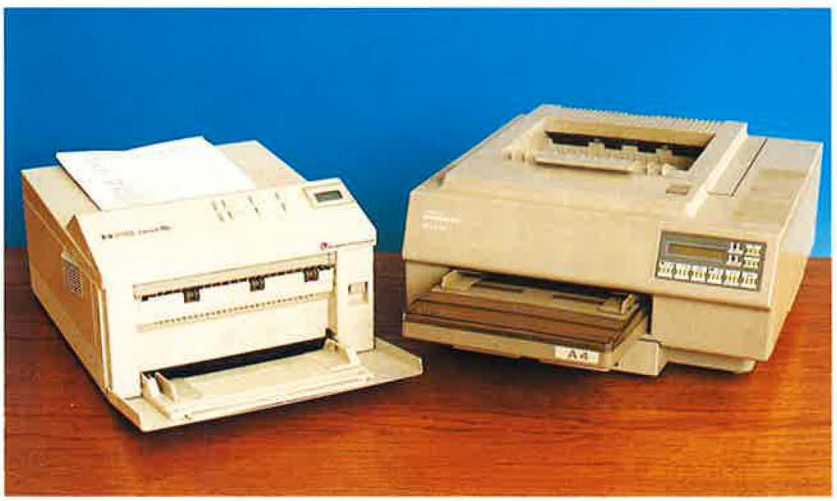
A laser printer without a stand-by facility and operating 8 hours a day for 5 days a week will use £15 of electrical energy per year. If not switched off at night or at weekends, the annual costs will increase to nearly £60 per year.

Ink jet printers

Ink jet printers spray tiny jets of ink on to the paper, and usually print fewer copies per minute than all but the slowest laser printers. They generally cost less and use less energy than laser printers. However, consumables and servicing, as well as energy costs, should be considered when comparing overall running costs. Some high-quality colour printers may use almost as much energy as laser printers.

Dot matrix printers

Dot matrix printers apply ink, as a series of dots, from a ribbon by impact with the paper, and tend to produce poorer quality prints than the other two. There is a tendency towards choosing ink jet rather than dot matrix printers.



Energy efficiency options
- Use ink jet rather than laser printers.
- Share printers among (networked) staff.
- Only switch on the printer when required.
- Use electronic mail.

ENERGY USED BY OFFICE EQUIPMENT

PHOTOCOPIERS

Typical consumption figures

- 30-250 W (stand-by)
- 120-1000 W (in use average)
- Recovery from stand-by: 30 seconds for copiers up to 20 copies/min and 1-2 min for units above 20 copies/min

Photocopiers create an electrically charged image of the original on the paper and this attracts toner powder, adhering it to the image area. Most of the energy used is for heating the fuser unit, usually a drum, and fixing the toner permanently to the paper.

Photocopiers are normally left on all day, but are only used for part of the time. If an average sized photocopier is left on all day and copies for 20% of the time, it will account for about £350 of energy per year. About half of this energy is non-productive – it is being used to keep the photocopier sufficiently warm for immediate use.

Older photocopiers can take a long time to warm up and often need to be left on all day.

Staff time and costs can be wasted, far in excess of any energy savings, if units fall back into stand-by mode too often and take too long to reactivate, even if this is only a 30 second delay. Some wasted staff time is inevitable to enable the fusing unit to heat up to operational temperature, but you need to choose easy-to-reset units with both low stand-by consumption and fast restart times to save costs overall.

Low melting point toners

Photocopiers and printers are now available which use a low melting point toner. This has a number of benefits:

- the warm-up time for the machine is reduced, lessening any wasted staff time
- a faster recovery from stand-by mode can be achieved
- less energy is used during copying or printing.

Energy efficient photocopiers are normally no more expensive than less efficient alternatives. Savings of up to 40% can be achieved in this way.

Energy efficiency options

- Make sure that the copier is switched off out of office hours.
- Use energy saving features such as stand-by switches if they are installed.

ENERGY USED BY OFFICE EQUIPMENT

VENDING MACHINES

Typical consumption figures
- 300 W (stand-by)
- 350-700 W (average)

Vending machines can contain a boiler to heat the water for drinks and/or a chiller.

The energy used depends on:
- the insulation of cases - good insulation minimises heat losses or gains
- internal temperature settings within the required health limits
- evaporation losses
- internal lighting, compressors, pumps and fans
- size of heat exchanger area.

Vending machines are currently available with energy saving features allowing them to:
- heat water only as it is required
- store a minimum quantity of water
- memorise the usage patterns and heat water accordingly
- reduce the temperature of the stored water from 90°C to 70°C (known as power saving mode).

Energy efficiency options
- Switch on only when needed - a simple timer could be used.
- Provide a kettle for out-of-hours use if the main use is during the day.

Energy efficient vending machines need be no more expensive to rent but will cost less to operate.

If left on continuously, a typical vending machine may cost about £400 per year in total energy costs.

FACSIMILE MACHINES

Typical consumption figures
- 10 W (stand-by)
- 30-40 W (average)

Facsimile (fax) machines generally use either thermal or plain paper. The former print the image on to heat sensitive paper, while plain paper machines use ink jet or laser technology to print the image.

Fax machines usually need to be available for 24 hours a day, but may operate for less than 5% of this time. Therefore it is important to choose a machine with a low stand-by energy rating.

Generally, ink jet machines have lower energy consumption and lower costs for paper and ink. Plain paper fax machines have lower running costs than those using thermal paper; the paper is also cheaper and has the advantage of not fading.

Energy efficiency options
- Avoid the use of cover pages whenever possible. These account for a quarter of all fax transmissions.
- Re-use paper whenever possible. (It is important to check whether this is acceptable to the machine.)
- Use electronic mail whenever possible.

COMBINED EQUIPMENT

Combined printers, fax machines and copiers are now widely available. These can make a significant impact on energy consumption as only one machine is required instead of three, cutting energy consuming stand-by time.

However, average consumption and stand-by levels for the whole machine need to be checked to ensure savings.

6 CONCLUSION AND CHECKLIST

CONCLUSION

If office equipment is purchased and managed to minimise energy use without any detrimental effect to operation, substantial energy cost savings can be achieved for little or no financial outlay. It is essential that energy saving features are part of the specification. Further cost savings are obtained in air-conditioned buildings – energy efficient equipment produces less heat and thus less energy is needed to cool it.

Can you afford not to prepare and introduce a clear policy for your organisation on energy efficient office equipment, perhaps as part of your energy policy?

Office equipment policy checklist

Do you have a policy on the purchase or rental of energy efficient office equipment? YES ☐ NO ☐
- If not, consider the benefits of a policy and its value to you.

Does the policy require suppliers to specify the average power consumption of office equipment when in use and in stand-by mode? YES ☐ NO ☐
- If not, reconsider – these will be needed to compare products.

Does the policy require installation of air-conditioning to take into account the real energy consumption of office equipment? YES ☐ NO ☐
- If not, reconsider – now that office equipment accounts for 20% of energy costs, the real heat gains should no longer be ignored. Overdesigned, inefficient systems can be costly.

Is the policy communicated to all employees who are responsible for the purchase and operation of office equipment or air cooling systems? YES ☐ NO ☐
- If not, consider a simple awareness programme – simple no-cost measures can reduce fuel bills by 20%.

Does the policy require office equipment to be turned off overnight and at weekends? YES ☐ NO ☐
- If not, reconsider – this simple measure can save 75% of the energy costs.

Are energy saving features on office equipment enabled? YES ☐ NO ☐
- If not, why not?

APPENDIX

APPENDIX

The following typical design example shows how designing the air-conditioning to deal with the real heat gains from office equipment can reduce the capital costs of air-conditioning by 20%, and the running costs by 20% each year.

Administrative staff of an organisation are to be housed in a new, open plan office of area 2150 m^2 over six floors. Typical working hours are: 10 hours per day, five days per week, 52 weeks per year. The building is constructed to meet Building Regulations and is of traditional construction.

Full air-conditioning is installed using a constant air velocity (CAV) cooling system. The system consists of chillers, condensers, air-handling fans and circulating pumps.

Using traditional methods of calculating the cooling requirements for office equipment, the building cooling load would be assessed at 275 kW. Assessing the gain from office equipment as recommended by this Guide and by Energy Consumption Guide 35 'Energy efficiency in offices - small power loads' (ECON 35, available from BRECSU), with its guidance on assessing power demands of office equipment, gives a cooling demand of 179 kW.

- Using the 275 kW capacity load, a chiller with a 284 kW maximum load (the nearest next-sized chiller) would be selected. This would have a power consumption of 96 kW. Alternatively, using the 179 kW capacity load, a chiller could be selected with a 179 kW maximum load and a power consumption of 60 kW.

- The fans required consume 86 kW for the 284 kW maximum load and 56 kW for the 179 kW maximum load. Power consumption by the circulating pumps tends to be proportional to the maximum load.

Gains:

- a capital cost saving of over £8000 (20% of costs)
- an energy running cost saving of nearly £5000 per year (20% of costs)
- over a lifetime of, say, 15 years, savings of over £80 000.

The calculation of these figures is summarised below.

Seasonal variation in cooling has been ignored to simplify this example.

Savings from an air-conditioning system based on real office equipment loads

	Traditional load calculation	*Load calculation using current guidance*	*Savings*
Cooling demand	284 kW	179 kW	-
Initial capital costs:			
Chillers and condensers	£24 000	£21 000	£3000
Air handling units	£15 700	£10 500	£5200
Pumps	£475	£375	£100
Totals	**£40 175**	**£31 875**	**£8300**
Running costs each year:			
Chillers and condensers	£9400	£9400	nil
Air handling units	£13 400	£8700	£4700
Pumps	£340	£170	£170
Totals	**£23 140**	**£18 270**	**£4870**
Lifetime costs over 15 years	**£387 275**	**£305 925**	**£81 350**

Table 3 Summary of the example of potential savings from correctly sized air-conditioning

The Department of the Environment's Energy Efficiency Best Practice programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice programme are shown opposite.

For further information on:

Buildings-related projects contact:
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Internet **ETSU** – http://www.etsu.com/eebpp/home.htm

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Introduction to Energy Efficiency: helps new energy managers understand the use and costs of heating, lighting etc.

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