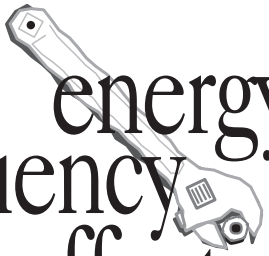
BEST PRACTICE PROGRAMME

ENERGY EFFICIENCY

• EVERYONE'S GUIDE TO •



energy efficiency *through* effective maintenance

Contents

What has maintenance got to do with energy?

All equipment usually works best when it is brand new or just run in. All settings are usually optimised by the supplier, and controls have not been adjusted or altered.

However, to maintain optimum performance equipment needs to be maintained effectively and before faults develop. Unfortunately the majority of maintenance is carried out based on the principle of 'fire fighting. Very little is planned – usually due to a shortage of maintenance staff and the low priority of maintenance as a business issue

Energy is related to maintenance in that the condition of the plant will be reflected in how effectively it does its job and how much energy it consumes.

We all know that if our car is not checked and maintained regularly it will start to develop faults and then use more and more fuel with an obvious increase in running costs. It's the same with plant: regular maintenance means more efficient performance all round.

Action plan

Suggest to colleagues and supervisory staff that all staff can make a contribution to energy efficient maintenance.

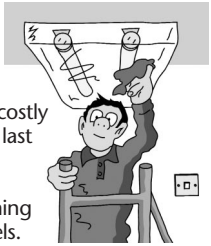
Action checklist

- Create asset list.
- Note all energy consuming components (remembering compressed air, steam, hot water etc).
- Decide how to monitor and carry out spot checks.
- Create reporting structure for all staff.
- Train staff on what to report (leaks, noise, vibration, overheating etc.).
- Create and keep logs of compressor leakage rates, running currents, previous repairs and previous faults.
- Explain to staff the importance of maintenance via team and group briefings.
- Contact the Environment and Energy Helpline for more advice and information.

Lighting

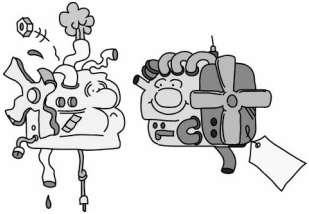
It is a well known fact that lighting deteriorates with time, however it is not usually known to what level. Light emitters, and the fittings in which they are installed, tend to become dirty whether they are in an office or the middle of a foundry.

Office lighting levels can drop by up to 50% in 18 months due to the build up of contamination on the surfaces of tubes plus the gradual deterioration of the 'bulb'. Modern light emitters, such as the latest fluorescent tubes with tri-phosphor coating, last longer and maintain output at more than 90% but can still get dirty!



Compact fluorescent bulbs, although more costly than tungsten, use a fifth of the energy and last 10 times as long. The longer life of modern emitters reduces the need for regular replacement and maintenance. Simple cleaning is sufficient to maintain efficient lighting levels.

Purchasing



Energy efficiency isn't just part of effective maintenance. It is also part of an effective purchasing policy.

When choosing and specifying new plant and equipment engineers should not just consider the cost of the equipment and its basic payback. They should also note the running costs. For instance new Higher Efficiency Electric Motors cost no more than current motors but save 5 - 6% in energy consumed over a ten year period. Similarly 1" diameter fluorescent tubes (T8) save 8% in energy compared to the old $1^1/_2$" diameter units (T12) and yet cost no more.

Running efficiently

Maintenance staff should be aware of the running costs of plant and equipment so that they can signpost to management when replacement is cheaper than continued operation.

Heating

Heating requires the conversion of energy resources such as electricity, gas/oil etc to useable heat. This may take place via a radiant surface, by convection, or by conduction.

Unfortunately the effectiveness of all these methods of heat transfer can be

severely diminished through the build up of contamination. Fan-assisted warm air heaters can become coated in oil/grease which allows dust and fluff to adhere. The build-up acts as an insulating layer that stops heat from releasing its energy to the atmosphere. Similarly reflectors behind heat emitters will become dirty and less effective.

The coating of heat transfer surfaces by dirt is the reason why boilers undergo annual cleaning to remove the build-up of soot. Annual maintenance programmes should also include heater and radiator cleaning.

Boilers

Water and heating boilers consume large amounts of energy resources yet tend to operate inefficiently for a large part of the time.

The flue gas temperature can be an excellent indicator of efficient combustion. Typically a thermometer in the flue will show a certain temperature at full firing after boiler maintenance and cleaning. When this flue temperature rises by 40°C above the original that is an indication that cleaning is required.

Insulation

Uninsulated or poorly covered pipework will lose heat at a rapid rate. After maintenance, insulation must be replaced or renewed. All valves and pipes must be protected if they carry warm or hot medium.

Motors

Motors are one of the largest energy consumers. A standard £500 motor can consume £50,000 of electricity in its lifetime.

Electric motors attract little maintenance and servicing apart from the occasional greasing of bearings. When they go wrong they are replaced with a spare unit and the motor is usually rewound and fitted with new bearings. However engineers should be aware that smaller motors reduce in efficiency by at least 15% by the second rewind. Continued rewinding is only cost effective with larger motors. Engineers should be aware of the opportunities offered by Higher Efficiency electric motors.

Motors can easily be monitored with a clip-on ammeter: an increase in current drawn by the motor, under constant load conditions, clearly demonstrates the need for maintenance.

Compressed air

Compressed air system maintenance is a highly effective energy efficiency measure as the energy consumed is more than 75% of the total cost of an air compressor installation over a typical ten-year life. So even a slight improvement in efficiency will create a considerable reduction in operating cost.

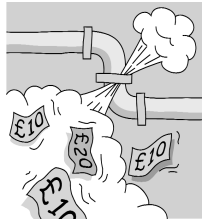
Maintenance of compressed air installations can be broken into three sections: The compressor, the distribution network and the point of use.

Up to 90% of the energy consumed by an air compressor is converted to waste heat; this has to be removed.

Usually a fan driven heat exchanger does the job, however dirt in the grilles or matrix will reduce the transfer thereby

leaving more heat in the system and more work for any refrigeration equipment fitted to cool the output and remove excess moisture.

The compressed air distribution system, in any establishment, will lose considerable volumes of the resource through simple leakage from fittings, reducers, filters and pipework flanges/connectors. In a typical organisation up to 75% is lost! Even the most efficient installation will still suffer from leakage. So repair is not a one-off activity.



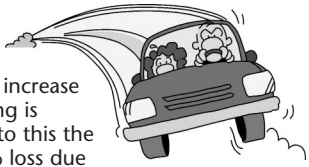
A continuous rolling maintenance repair programme will reduce the number of leaks to a minimum on the network. Such a programme will also consider the end user and the associated fittings. An open hose loses large volumes of air yet the fitting of simple nozzles and restrictors related to application will minimise the wastage at the point of use.

An old maintenance technique for monitoring the degree of leakage is to wait until no one is using air on site – either during holidays or at the end of a shift and then allow the compressor to work until it off-loads.

The rate of decay in pressure against time for the first 10 or 20 psi drop should be logged. Subsequent similar checks, some time later, will indicate if the situation is getting worse or maintenance and repair is being effective.

Vehicles

Company vehicles, whether cars, lorries or fork lift trucks, all need regular servicing otherwise their performance deteriorates and they consume more energy resources.



Typically car efficiency will reduce by 2% if tyres are under-inflated. Inefficiency will increase to 4% if the front wheel tracking is slightly out of alignment. Add to this the potential of a further 10 – 20% loss due to a sticking automatic choke, poor carburettor settings, or blocked air filter.

Maintenance is therefore considered a worthwhile activity as each decrease in efficiency of 1% is the same as paying 6.5p more for every gallon of fuel you use.

The need for maintenance is clearly indicated by manufacturer's recommended mileage intervals and fuel purchasing records available via tachographs or invoices.

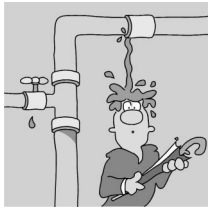
Plant and machinery

Virtually every piece of plant and equipment in a company will be an energy consumer. Its performance will be critical to the profitability of that organisation. It may be a simple office computer or a complex CNC machining centre. Whatever it is there will be many opportunities for maintenance staff to help it to operate more efficiently.

Some complex plant will use motors, compressed air, water circuits, thermal fluid supplies, fuel burners and conveying systems. Collectively these create a considerable energy loading. Individually maintained and 'tuned', the performance will increase considerably.

Dealing with leaks of air, fuel, water, lubricants and other consumables will reduce operational costs considerably. Replacing pipe-fittings with push fit couplings will save time and reduce losses. Making sure that drains operate with zero losses will create benefit. Filters that are cleaned and replaced regularly will reduce the loading on fans and pump motors.

Water



Water is used in a multitude of applications, industrial, process and domestic. Unfortunately its cost is not recognised.

Water leaks have a damaging effect and tend to get worse. A simple dripping tap, if left un-repaired, will consume over £7 of water in one year. If that drip becomes a dribble then the leak costs in excess of £50 in one year. An open hosepipe or one without a stop tap or shut off valve will consume 1,000m^3 every hour, which will cost £1.30 approx. per hour. If the water is hot then the costs are even greater.

Water leaks are therefore another opportunity for resource wastage reduction. Leaks should therefore be responded to, as the volume and cost of the loss will only increase until repaired. Most operational staff, once they are aware of the costs, will happily report water leaks.

Teamwork

As everyone in the organisation is affected by inefficiency and poor performance, maintenance staff should use their operational colleagues as their remote 'eyes and ears'.

Effective lines of communication and procedures should be drawn up so that any member of staff can notify maintenance of either existing or identified potential problems. Suggestions should be listened to to make life easier for both the operator and the maintainer.

Maintenance staff can also keep their colleagues informed of what to look out for in terms of minor faults that could eventually lead to major breakdowns. Maintenance should

therefore have representation on every committee, whether related to health and safety, environment, energy or quality, as they have the expertise in knowing how to get the best out of the installed equipment. After all they are the true 'technician' on site.

Finding out more

Advisory publications and case studies on all the issues raised in this booklet are freely available via the **Environment and Energy Helpline** on **0800 585794**.

Publications that may help with the issues raised in this booklet include:

- *Cutting energy losses through effective maintenance* **Good Practice Guide 217**
- *Workforce partnerships to reduce waste and save energy* **ET228**
- *Action Agendas – Lighting, Heating, Water and Compressed Air* **FL0036**
- *Compressed air and energy costs* **Fuel Efficiency Booklet 4**
- *Steam* **Fuel Efficiency Booklet 2**
- *The economic thickness of insulation for hot pipes* **Fuel Efficiency Booklet 8**
- *Economic boilers* **Fuel Efficiency Booklet 14/15**

Other useful contacts

The Amalgamated Engineering & Electrical Union

Hayes Court, West Common Road, Hayes, Bromley, Kent BR2 7AU
Tel: 020 8462 7755 Fax: 020 8315 8234
Web site: www.aeeu.org.uk

The Institute of Energy

18 Devonshire Street, London W1G 7AU
Tel: 020 7580 7124 Fax: 020 7580 4420
Web site: www.instenergy.org.uk
E-mail: info@instenergy.org.uk

Other guides in the series:

- *Saving energy and reducing waste*
- *Compressed air*
- *Boilers*

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