



Information Guide

Maintenance,
Replacement
and the
WEEE Directive

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Information Guide

This is an independent guide produced by Mitsubishi Electric to enhance the knowledge of its customers and provide a view of the key issues facing our industry today. The guide accompanies a series of seminars, all of which are CPD accredited. The changing face of construction in the 21st Century demands that designers, specifiers and suppliers work as teams to create better buildings - for occupants and the environment. Mitsubishi Electric aims to be a part of this by encouraging employees and customers to work together to increase their knowledge of the latest technology, legislation and markets.

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A lifetime of air conditioning

A great deal of effort goes into the design and installation of air conditioning systems and rightly so since they are key factors in energy efficient and trouble-free operation. But given the financial investment made in these systems, intelligent clients will take a long term view of the equipment and establish a proper maintenance programme.

Recent legislation is also creating a greater need for closer monitoring of air conditioning systems. The Energy Performance of Buildings Directive requires that from January 2009, regular checks are carried out on all air conditioning systems over 250kW of cooling; and from January 2011 the same rule will apply to systems of 12kW and above.

A good maintenance programme shouldn't rely entirely on visits from engineers. In light of the forthcoming regulations, CIBSE has worked with a number of trade associations and organisations including HVCA, FETA and BSRIA to produce Technical Manual 44 which gives guidance on meeting these regulations.

Fundamental to the recommendations is that a 'responsible person' should initiate an inspection of the air conditioning system - which must be carried out by someone who has undergone an accredited government training scheme.

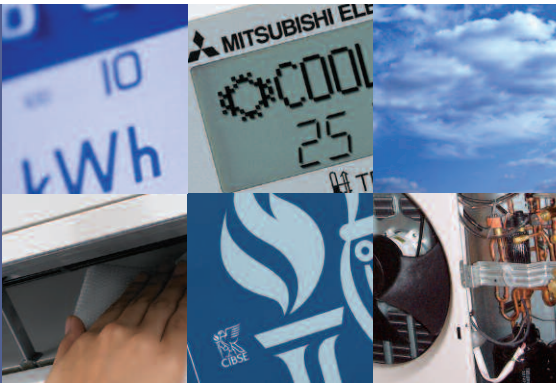
A key output of any inspection will be a report to owners and operators on the performance of the equipment. The aim is to produce information which will enable more energy efficient operation of the system.

There are three principle aims of the inspection:

To encourage good maintenance

To encourage efficient use of controls

To identify opportunities to reduce cooling loads or operating times



An important aspect of good maintenance is record keeping. The Energy Performance of Buildings Directive requires information on energy use, operating times and maintenance so the ability to find and use records easily will be a time and money-saving advantage. The CIBSE TM 44 document is designed to make the inspection process easier for those who can demonstrate good maintenance in practice.

As well as scheduled maintenance visits by engineers, it is possible for the in-house facilities team to take simple but effective measures to ensure efficient operation of air conditioning systems. Recommended for inclusion in such a programme are the following:

- Store records and any plant-related documentation for easy access
- Establish a clear format for maintenance records
- Initiate a regular cleaning programme (e.g. cleaning obstructed heat exchangers) for the in-house facilities team
- Show where low energy technology such as free cooling or variable speed fan drives have been used

Use of controls is a vital part of the long-term energy efficiency of air conditioning. Educating occupants about proper use of hand-held air conditioning controls (where available) will help to reduce power use. However, it is also sensible for the facilities team to take steps to ensure that the air conditioning can't be used inefficiently. Some ideas for achieving this are shown below.

1. Set the default for air conditioning to OFF. Room controls should set to OFF automatically so that anyone entering the room has to make a conscious effort to turn the cooling to ON.

2. Check that no heat producing equipment (such as a photocopier) has been placed under a room sensor. This can trigger a reaction from the sensor to initiate cooling when it's not required.
3. Ensure the air conditioning is off at night. It is surprisingly common for air conditioning systems to run for many hours longer than eight hours a day. Air conditioning that is left on overnight can **TRIPLE** the energy consumption and CO₂ emissions.
4. Restrict the available set-point range. Occupants sometimes believe that by turning the cooling to very low temperatures they can cool a room quicker. This is not the case, and will use a lot more energy. A reasonable limit is 21°C to 24°C.

Establishing a simple but effective programme of maintenance and keeping clear records will help to make transition into the legally required checks much easier and also help to save time and effort.

Our next feature will examine the choice between continuing to maintain and repair old equipment, or buying a whole new system.



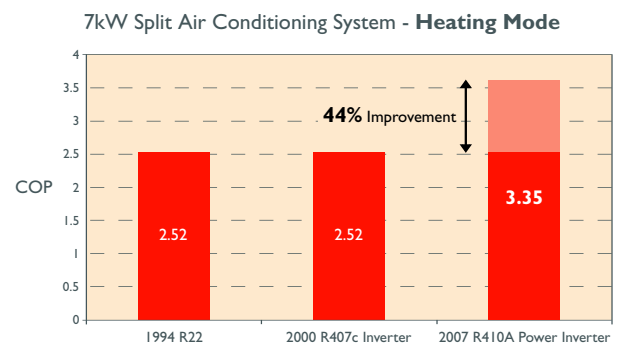
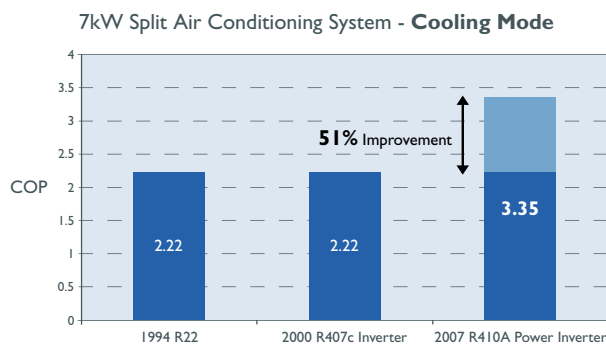
Repair or replace

No building services equipment will operate forever. There comes a time when replacement has to be considered. Clearly there are cost implications to this decision, which can be discouraging. However, it is important to identify the tipping point between repairing or replacing an air conditioning system.

Most owners of air conditioning equipment do not consider replacing older systems until there are major problems, or it stops operating altogether. But the problems that old equipment causes may not be as noticeable as a complete breakdown.

Older equipment could be adding substantially to the running costs of the building. It is not just that older equipment doesn't run well, but also that more modern equipment has been designed for greater energy efficiency.

The graphs below show the improved energy efficiencies and reduced CO₂ emission reduction of equivalent products manufactured in 1994, 2000 and 2007. There is over 50% improvement using the most up-to-date plant.



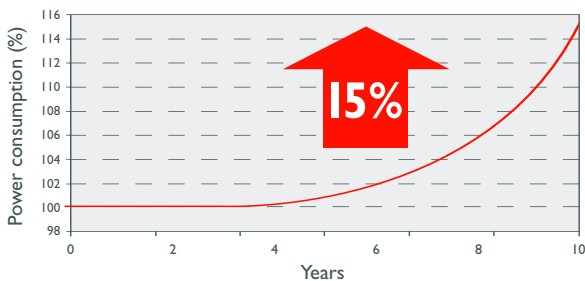


In general, if an air conditioning unit is used for over ten years the performance efficiency falls off due to corrosion; the deterioration of the fins of the heat exchanger; and wear of the piston cylinder of the compressor.

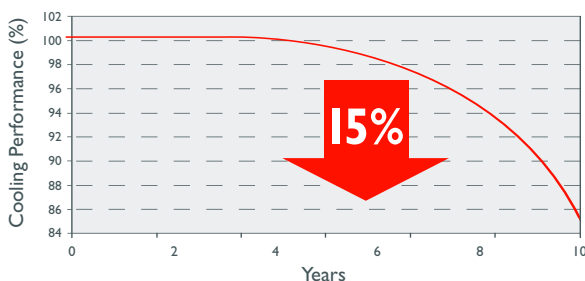
Regular maintenance can extend the life of equipment, but there are inevitable problems with running old equipment. Not least of these is the fact that it will cost more to run.

The graphs below show increased power consumption and accompanying decrease of cooling performance over ten years of operation.

Power Consumption Increases Over 10 Years



Cooling Performance Decreases Over 10 Years



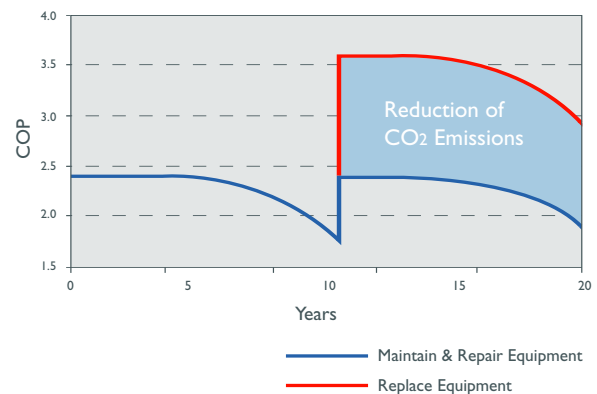
This means that by around a decade of operation, rated capacity has reduced by 15% and energy consumption has risen by 15%. The conclusion is that the efficiency of the equipment has dropped by 75% ($0.85/1.15 = 74\%$).

By being proactive and replacing equipment before efficiency falls this far, building owners can reduce their energy bills and also make a positive contribution to a more energy efficient and sustainably operated building. Add to this the fact that modern air conditioning systems are cheaper to run and there is also a strong economic argument for replacement.

By taking the replacement option, the coefficient of performance (COP) of the equipment is increased, reducing CO₂ emissions.

On the graph below the blue line represents equipment that is maintained and repaired beyond ten years. The red line represents the replacement of old equipment with new equipment, providing significant improvement in COP. The shaded area shows the amount of CO₂ emissions saved by replacing rather than repairing.

CO₂ Emissions Can be Reduced by Replacing Old Units



The end of the lifecycle

The UK construction industry produces 36 million tonnes of landfill waste every year - 35% of the country's total waste. Landfill sites will be full in around 6 years, so there is an imperative to find new ways of dealing with all waste resulting from the build, or refurbishment, of commercial buildings.

In Germany and Denmark around 80% to 90% of construction waste is recycled - a much higher level than in the UK. However, this is slowly beginning to change. The Government has introduced landfill tax, aggregate levy and other waste management regulations. One of these is the Waste Electrical and Electronic Equipment (WEEE) Regulations which came into force in January 2007.

The WEEE Regulations affect manufacturers and distributors (including wholesalers, retailers, mail order and internet sales) of electronic and electric equipment. A full list of the equipment which is affected by the Directive is available in Schedule Two of the WEEE Regulations (*see More Information section at the back of this Guide*).

However, there are a number of products which are of interest to the building services. These include, under the large domestic appliances section, air conditioner appliances, electric fans and 'other fanning, exhaust ventilation and conditioning equipment'. The regulations also cover heating regulators, smoke detectors, thermostats and 'other monitoring and control instruments ... (for example in control panels)'.





Both manufacturers and distributors must be registered with a relevant compliance scheme (according to their industry). Producers have to mark the relevant products with the crossed-out wheeled bin symbol. The amount of WEEE that a producer is considered responsible for under the law will be calculated according to their market share. They will then be financially responsible for collecting, treating, recovering and disposing of an equivalent amount of WEEE.

Distributors must provide information on their equipment for customers, which includes details on how they, as users, can safely deposit WEEE for proper treatment and recycling free of charge. Records of the information must be kept for four years.

Distributors must set up a 'take back' system so that customers can dispose of WEEE free of charge. This can be an 'old for new' system, where the distributors accepts a waste item from customers when they buy an equivalent new one. Alternatively distributors can pay for membership of a joint take-back scheme, which is operated by Valpak and supports a network of national designated collection facilities.

With the pressure on the construction industry to be leaner and greener, careful disposal of waste is crucial. For building managers it is a question of finding the balance between careful long-term maintenance of products and sensible replacement of old equipment with newer and more energy efficient systems.

They will be looking to specialist contractors in the field to offer advice and to be ready with the facts on the relative costs and benefits of each course of action.

How your old air conditioning unit is recycled.

Good quality air conditioning systems have a high recovery ratio of around 85% to 95%. This means that they can be disposed of with minimum impact on the environment. The recycle path for a product is:

1. All refrigerant removed from outdoor unit and returned to A-GAS in designated cylinders
2. Units are dispatched to a recycling centre partner
3. Special machinery removes ferrous and non-ferrous metals by use of eddy current magnets
4. The small amounts of plastic and paper are reduced to fine powder form which is disposed of or recycled
5. All the metals (a high proportion of indoor and outdoor units) are recycled. The process separates iron, steel, aluminium, brass and copper into shredded strips
6. Recycled materials sent to other manufacturing and processing plants

The WEEE Regulations apply to electrical and electronic equipment (EEE) in the ten categories below with a voltage of up to 1000 volts AC or up to 1500 volts DC.

1. Large household appliances
2. Small household appliances
3. IT and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools
7. Toys, leisure and sports equipment
8. Medical devices
9. Monitoring and control equipment
10. Automatic dispensers

Further information

WEEE Directive

Find a copy of this at
www.dti.gov.uk/innovation/sustainability/weee/page30269.html

Information on the Energy Performance of Buildings Directive (EPBD)

For further reading on this, and on building energy labelling, please see previous Mitsubishi Electric Guides

Green Gateway document

This is a recent document from Mitsubishi Electric and contains further detailed information in issues such as maintenance programmes and replace/repair:

If you missed the CPD seminar on **Maintenance, Repair and the WEEE Directive**, you can call your Mitsubishi Electric Regional sales office to arrange an in-house presentation of this information.

Please call one of the numbers below:

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