



Save time, money and the environment

**Benefits of preventative maintenance and
leak detection for mobile air conditioning**



Australian Government

Department of Climate Change, Energy,
the Environment and Water



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Introduction

Regular servicing, maintenance and repairs to mobile air conditioning systems are critical in ensuring minimum downtime of mine site vehicles and optimisation of air conditioning performance and capacity.

The air conditioning in light vehicles, ancillary equipment (such as dozers, diggers and shovels) and haul trucks must be maintained and serviced to ensure the highest level of reliability (downtime minimisation) and optimum performance.

This booklet will provide you with general information on how you can save time, money and the environment by implementing regular preventative maintenance and leak detection processes on mobile air conditioning systems at your mine site.



Benefits of preventative maintenance and avoiding refrigerant emissions

Mine site vehicles and equipment operate under severe conditions including high temperatures, humidity and high dust levels. This means air conditioning equipment is working at much higher pressures and thermal loads, making failure of parts and loss of refrigerant more likely.

Regular equipment maintenance programs can optimise energy efficiency and performance of mobile air conditioning systems. All air conditioning systems will suffer faults over their operating lifetime leading to performance degradation. Preventative maintenance practices can minimise the occurrence and impacts of these faults.

Regular refrigerant leak monitoring can identify issues when they occur, reducing costs associated with refrigerant loss and unproductive downtime when equipment fails unexpectedly. It also minimises the risks of emissions of refrigerants to the atmosphere.

The level of maintenance and servicing has a direct relationship with the level of emissions over time from air conditioning equipment. Regular maintenance to reduce emissions from refrigerant leaks and energy use in stationary equipment is expected to reduce greenhouse gas emissions by 35 million tonnes CO₂e to 2030. Best practices in this area are shown to reduce energy use by 10 to 20 per cent.*

Faults that develop due to a lack of maintenance include incorrect refrigerant charge, dirty filters, fouled evaporators and condensers, and inappropriate changes to control settings. These faults tend to build up over the operational life of the system. Environment and operator behaviour play a significant role in these faults.

A maintenance program that addresses common faults would include finding and repairing refrigerant leaks, ensuring the correct refrigerant charge, cleaning coils (condensers and evaporators), replacing filters and ensuring good airflow, and resetting controls.

Always refer to the product manufacturer's guidance when implementing a maintenance program for your air conditioning systems.



**Leaks, maintenance and emissions: Refrigeration and air conditioning equipment
www.environment.gov.au/protection/ozone/publications/leaks-maintenance-emissions-refrigeration-air-conditioning-equipment*

The environment

Refrigerants contained in air conditioners can be extremely harmful to the environment. Older refrigerants such as chlorofluorocarbons (CFCs) damage the ozone layer and contribute to climate change. Refrigerants now commonly in use now do not deplete the ozone layer but are potent greenhouse gases.

That's why Australia has specific laws and regulations applying to people who acquire, possess, dispose of or handle ozone depleting substances or synthetic greenhouse gases.

One of the key objectives of the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989* is to 'promote responsible management and handling of ozone depleting substances and synthetic greenhouse gases to minimise their impact on the atmosphere'.

Under the *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995*, people who handle these substances in bulk or in equipment, and people who work on equipment containing these gases, are required to hold a refrigerant handling licence (RHL) through the Australian Refrigeration Council (ARC).

Companies or persons who acquire, possess or dispose of these substances are required to hold a refrigerant trading authorisation (RTA) through the ARC.

The ARC administers the refrigeration and air conditioning industry permit scheme on behalf of the Australian Government Department of Climate Change, Energy, the Environment and Water.

Main types of emissions

In the context of mobile air conditioning equipment on mine sites, greenhouse gas emissions can come from refrigerant leaks and indirectly from the energy used to run these systems. Types of refrigerant leaks can include:

- Gradual leaks during normal operation
- Catastrophic losses during normal operation
- Losses during equipment service and maintenance
- Losses at end of equipment life as equipment is handled for disposal



Obligations of mine managers

While some refrigerant leakage is unavoidable during the life of equipment, more refrigerant is lost into the atmosphere from faulty or poorly maintained air conditioning equipment, or if equipment is improperly disposed of. The national laws around handling and maintaining air conditioning equipment are aimed at reducing refrigerant leaks to protect the environment.

People who own or manage mobile air conditioning equipment on mine sites are required to ensure only technicians with an automotive RHL install and service these systems.

Refrigerant must be handled safely and carefully, and recovered so it can be recycled or destroyed. Refrigerant Reclaim Australia works with refrigerant wholesalers to collect and destroy refrigerants that are ozone depleting substances and synthetic greenhouses gases.

In addition to the national permit scheme under the Ozone Protection and Synthetic Greenhouse Gas legislation, it is a requirement under work health and safety obligations, and some state occupational licences, that employers must also ensure only competent workers work on air conditioners and other refrigeration systems. Workers must be provided with appropriate information and training on the hazards and safe use of the specific refrigerants to which they could be exposed when performing installation, commissioning, service, repair and decommissioning of refrigeration and air conditioning equipment.

As the holder of an RTA certain actions and reporting are required by law. These include:

- Refrigerant records – amounts purchased, recovered, sold and otherwise disposed of
- Equipment held – leak detector, vacuum pump and refrigerant recovery unit
- Refrigerant risk management plan – tailored to your workplace equipment maintenance records
- Cylinder leak test and test date records
- List of staff who hold a current RHL
- All trainee RHL holders are supervised (if applicable)
- That you display your RTA number on relevant advertising and stationery

You can read more about your RTA obligations by visiting: www.arctick.org/refrigerant-trading-authorisation/permit-condition-check-audit/



Penalties

There are a number of penalties relating to breaches that mine site managers and employees should be aware of.

Unlawful discharge of refrigerant

It is an offence under section 45B(1) of the Act to act in a way that results in the unlawful discharge of refrigerants that are ozone depleting substances or synthetic greenhouse gases. A penalty of up to \$66,600 for an individual or up to \$333,000 for a corporation may apply.

Breaching permit conditions

It is an offence under regulation 136 for an RHL holder to breach a condition of their licence. A penalty of up to \$2,200 may apply. It is an offence under regulation 142 for an RTA holder to breach a condition of their permit. A penalty of up to \$2,200 may apply.

Effects of breaches on gaining future permits

Under regulation 122, an individual or corporation who is convicted of an offence under the Act or Regulations, or who has had a permit or licence cancelled, may be considered unfit to hold a refrigerant handling licence or refrigerant trading authorisation.

As a result, their permit or licence may be refused on reapplication or, in accordance with regulation 123, their permit or licence may be cancelled. The result of this will be that the business will not be able to purchase refrigerant, or work on systems that contain refrigerant.



'Topping up' of air conditioning/ refrigeration systems is not allowed

'Topping up' means adding refrigerant to air conditioning systems before checking for, and fixing, any leaks. This is not allowed under the Australian codes of practice for automotive refrigerant systems.

'Topping up' is not allowed for any existing system charges.

'Topping up' can also be an offence, with unlawful discharge of refrigerant leading to penalties of up to \$66,600 for an individual or up to \$333,000 for corporations. It is also a breach of a condition of holding a permit (licence or authorisation) and penalties of up to \$2,200 may apply.

'Topping up' is bad for the environment. If you haven't checked for, and repaired, any leaks you will release refrigerant to the atmosphere.

You also run the risk of mixing refrigerants. If you add refrigerant to an existing system charge before you identify the existing refrigerant, you risk mixing refrigerants. This can weaken the performance of the system, contributing to equipment downtime. There may also be a safety risk.

Safety

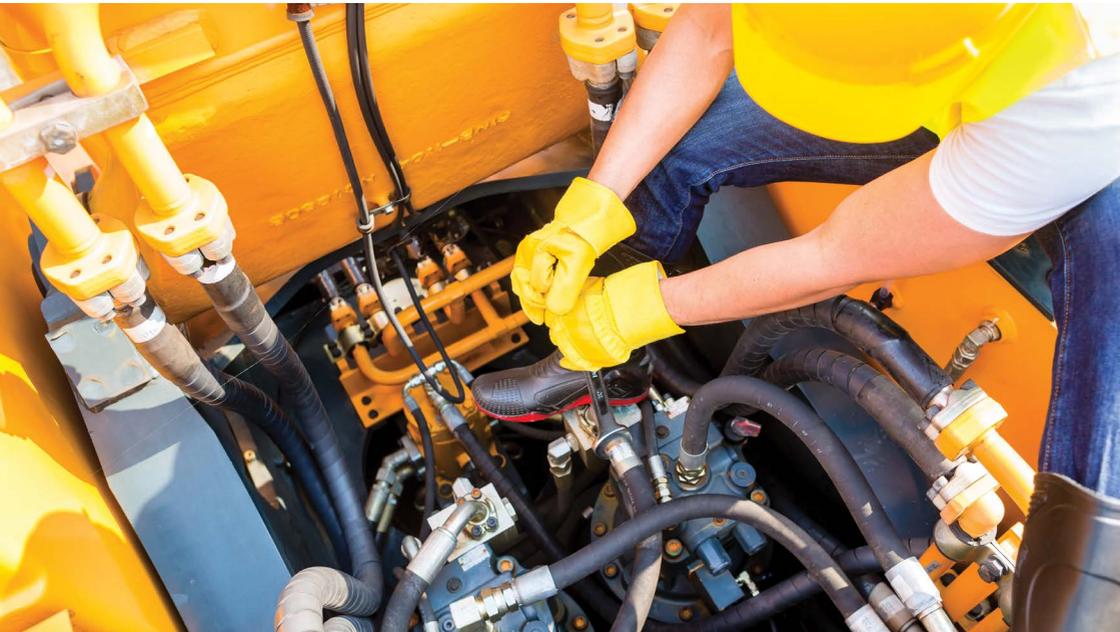
The relevant standards and codes of practice must be followed in any refrigerant charging. For example, equipment should not be charged with refrigerant that has a higher hazard classification, such as replacing A1 rated refrigerant with an A2L or A3, unless the system has been converted in accordance with all relevant codes of practice, Australian Standards and Commonwealth, and state and territory laws. If a system is to be retrofitted for use with a different refrigerant, full refrigerant evacuation and recovery, and system leak testing, are required and seeking guidance from manufacturers is recommended.



Common causes of poor performance and refrigerant leakage

The most common causes of poor performance and refrigerant leakage across mobile air conditioning equipment include:

- Damage to flexible hoses
- Fixed pipe fractures and damage
- Joint integrity, o-ring condition, correct tension
- Condenser fouling and restricted airflow
- Evaporator fouling and restricted airflow
- Compressor shaft seal leakage, dirt ingress, overheating
- Incorrect refrigerant charge (undercharge most common)
- Refrigerant contamination, degradation and non-condensables
- Control system faults



Solutions for implementing preventative maintenance and leak detection processes

Examples of maintenance activities to increase reliability and minimise emissions:

- Assessing refrigerant charge
- Cleaning heat transfer surfaces
- Review of the installation for deficiencies
- Sealing/repairing of the cabin and system ductwork
- Logging and ongoing analysis of monitoring information – flows, pressures, temperatures, refrigerant leakage rate, etc.

Examples of maintenance activities to target refrigerant leakage would include:

- Regular servicing should be conducted as per manufacturers' recommendations and mine site maintenance policies
- Regular visual inspections for oil sweating and signs of physical damage to system
- Regular monitoring of system charge through system pressure and pipe temperature analysis

- Completion of documentation relating to system inspections
- Annual servicing or replacement of critical components

Leak detection processes

Leak detection should be conducted in conjunction with routine maintenance service procedures or commissioning of an air conditioning (AC) system or testing of an AC system post-repair (as per the Australian automotive code of practice).

Formalised leak detection procedures must be followed when system servicing and repairs are conducted (electronic, nitrogen pressure testing, bubble detection, dye detection etc).

This information is used as a guide only. Please refer to the air conditioning manufacturer's recommendations for appropriate maintenance and servicing of your mobile air conditioning equipment.



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More information

Mobile fleet air conditioning – Refrigerant leakage detection

www.arctick.org/information/mining

Refrigeration and air conditioning industry permit scheme

www.arctick.org

Australian Automotive Code of Practice 2008

www.arctick.org/refrigerant-handling-licence/codes-of-practice/

Leaks, maintenance and emissions: Refrigeration and air conditioning equipment

www.environment.gov.au/protection/ozone/publications/leaks-maintenance-emissions-refrigeration-air-conditioning-equipment

To access the relevant Australian Standards, visit:

www.standards.org.au

Refrigerant Reclaim Australia

www.refrigerantreclaim.com.au

Contact the relevant equipment manufacturer, importer or supplier/wholesaler for further information on your equipment and the refrigerants it uses.

Australian Refrigeration Council (ARC)

The ARC administers the refrigeration and air conditioning industry permit scheme on behalf of the Australian Government, under Australia's Ozone Protection and Synthetic Greenhouse Gas Management legislation.

www.arctick.org

This initiative was developed by:



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