**REFRIGERANT GASES**

**DESCRIPTION:** Fluid used for heating and cooling cycle in refrigeration and air conditioning systems.

**GLOBAL PRODUCTION/DISPOSAL:** 2.8 million tonnes in the global refrigerant bank (i.e. all refrigerant quantities stocked in refrigerating systems) – roughly equal to 4.5 times the annual demand (i.e. annual refrigerant quantities consumed) (2006).^1

**COMMON SOURCES:** Any residential and commercial air conditioning system, fixed and mobile AC units (e.g. in vehicles), heat pumps used for heating of buildings, domestic and commercial refrigeration (e.g. fridges, vending machines), transport and industrial refrigeration. See also separate fact sheet on E-waste.

**IMPACTS IF NOT MANAGED CORRECTLY:** All AC systems leak refrigerant gases to some degree (referred to as fugitive emissions). Some types of refrigerants (e.g. HCFCs such as R22, R12) cause ozone layer depletion, others (e.g. HFCs such as R134a, R143a) have very high global warming potentials and contribute to climate change. Impacts on human health may include poisoning, frostbite and asphyxiation.^2 Some refrigerants’ components such as ammonia and propane are toxic and flammable if released. Larger gas releases are usually caused by improper working practices during installation, maintenance or decommissioning.

**OPTIONS FOR REDUCING:** Each cooling or heat pump unit, used in premises or vehicles, requires a specific refrigerant gas. Older units typically use HCFCs, CFCs and HFCs— including R22, R12 and R134a, which are the most dangerous for the environment and are being phased out under the Montreal Protocol.^3

When equipment needs to be replaced, make sure the new model is not oversized/over specified (it will likely contain larger amounts of gas) and choose models that contain less harmful refrigerants such as HFOs (hydrofluorooolorefins) or HFCs with low GWP potential (e.g. R1234yf). Other substitutes currently available are R123^4, R32 and R152A. These gases are efficient as heat transfer fluids and have reduced global warming and ozone depletion potentials. Moreover, as Montreal Protocol gases are being phased out worldwide, it will become increasingly difficult to buy them, even in developing countries (which are implementing more gradually). Therefore, it won’t be possible to top up units that use them; they will have to be replaced even if they haven’t reached the end of their useful life (see the e-waste fact sheet for advice on their sustainable disposal).

**OPTIONS FOR REUSING:** Due to fugitive emissions, the quantity of refrigerants inside refrigeration/AC systems decreases over time, and needs to be topped up. When recharging refrigerants, a maintenance review should identify and fix any leakages. If maintenance activities require removal, gases should never be released (vented) into the atmosphere: ensure maintenance staff/contractors use refrigerant recovery equipment to store gases while performing maintenance activities. In some countries, a government licence will be needed for this work. Ensure your own staff, or your contractors, have the appropriate training and licences.

Refrigerants have a longer life than the equipment they are used in. They will persist for decades or longer in the atmosphere. They should never be deliberately vented to the air, even when disposing of the equipment that used them. Refrigerants should be extracted, and stored in sealed and pressurised cylinders while awaiting collection or re-use.

Used refrigerants can be directly reused with little or no treatment (e.g. cleaning with filters using low tech refrigerant recovery equipment). Always check that the type of refrigerant is compatible with the equipment that requires re-gassing, and ensure transfers are performed by appropriately qualified and experienced technicians.
Used refrigerants can be sold/donated to an organization/individual that has the capacity to safely and sustainably reuse them, but it is essential your agency understands the intended end use prior to disposal.

**OPTIONS FOR RECYCLING:** Beside direct reuse, in large cities specialist companies may be able to perform more sophisticated cleaning activities on used refrigerants. A recommended starting point in identifying such companies is to investigate possible solutions with suppliers of refrigerants or the equipment containing refrigerants.

Before disposing of any equipment containing refrigerant gases, remove all gas for proper recycling or disposal.

**OTHER OPTIONS (LAST RESORT):** Do not send refrigerants to landfills as they would pose several hazards to people and surrounding environments. In some countries, there are specialised disposal facilities that destroy refrigerants without causing environmental harm.

If reuse and recycling options are not available, long-term storage is needed until an alternative can be found. Refrigerants should be stored in a well ventilated area away from heat and fire sources and separately from other chemicals (e.g. chlorine) with which they could react. It is advisable to paint containers according to their contents, using the [international colour code for refrigerants](http://www.ces.mines-paristech.fr/Donnees/data06/653-Short-report-complete.pdf).

**OTHER COMMENTS:** Release of refrigerant gases is illegal in some countries, and this practice must be discontinued on environmental and workplace safety grounds. Ensure technicians working on AC systems are appropriately trained.

**ENDNOTES**
2 WFP, 2017.
3 R12 and R22 have high Ozone depletion potential, R134a is an HFC with high GWP (1430).
4 R123 has to be phased out by 2040, however it is a good alternative during the transition period from other more harmful gases, whose use should be stopped as soon as possible.

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**DID YOU KNOW?**
The Global Warming Potential of some refrigerant gases is thousands of times higher than for carbon dioxide. Just one kilogram of a common gas such as R-143a is equivalent to releasing more than 4 tonnes of CO₂ – the same as flying around the world, or driving a family car for 1 year. Minimize or avoid the need for mechanical cooling of facilities (e.g. by relying on natural ventilation); install automated refrigerant leak detection and containment system.