Guidelines for the storage of flammable solvents in refrigerators

The storage of flammable solvents in laboratory fridges is a practice that presents a risk to the health and safety of individuals working within the vicinity of the fridge or those accessing the fridge. There is also the potential for damage to equipment and property, due to fire or explosion should the contents not be appropriately stored.

Problems associated with storing flammables in domestic refrigerators

Refrigerators are commonly but inappropriately used to store volatile, noxious and air sensitive material and it is not uncommon for the atmosphere inside the unit to be saturated with chemical vapours. Over time, these vapours can penetrate porous surfaces and lead to odour problems. Similarly, material from spills or leaking containers can impregnate surfaces that then give off odours long after the original material is cleaned up..

In addition to problems associated with odour, accumulated vapours arising from chemicals stored in fridges present a flammable or explosive hazard due to the in-built ignition sources in the fridges. Loss of electrical power can produce extremely hazardous situations. Flammable or toxic vapors may be released from refrigerators and freezers as chemicals warm up and/or certain reactive materials may decompose energetically upon warming. Examples of ignition sources within fridges include:

- Switches associated with the internal light and thermostat;
- Timers and heating elements in frost free fridges;
- The compressor motor, if the cabinet is not effectively sealed and vented from water in the drain tube of frost free fridges or chemicals present in the fridge;
- Power points.

Requirements for storing flammable liquids

Australian Standard 2243.2 – Safety in Laboratory (Chemicals) states that,

A refrigerator may be used to store flammable chemicals provided it has been designed and manufactured to eliminate ignition sources. It may be possible for a domestic refrigerator to be modified by a competent person to eliminate ignition sources.
NOTES:
1 Refrigerators unsuitable for solvent storage should bear a prominent label inscribed with the words 'Not suitable for flammable solvents'.
2 For a normal domestic refrigerator, removal of ignition sources entails removal of the wiring for the internal light, removal of the switching part of the thermostat from inside the compartment and possibly modification of any automatic defrosting procedure and internal fans, depending on the results of a competent person's checks for their potential as ignition sources.
3 Solvents stored in suitable refrigerators should be properly labelled and sealed. A complete check of the condition of the refrigerator contents should be carried out at least monthly.

Cool rooms are not intrinsically safe and advice should be sought prior to the storage or use of flammable solvents in walk-in cool rooms or freezers.

The Australian Standard 2243 series requires that flammable and combustible liquids be stored away from ignition sources and excessively hot locations. Any electrical systems installed in hazardous locations, where the lower flammable or explosive limit could be exceeded, must be EX rated in accordance with the zoning classification and hazard class (AS/NZS 60079). Alternatively electrical sockets, switches and equipment may be located outside of the hazardous location. Similar consideration must also be given to the location of switches and sockets in relation to where chemicals vapours may accumulate or be vented from the fridge.

Approved refrigerators

Although AS2243.2 allows for the modification of fridges to eliminate ignition sources, The University of Queensland requires that only approved flammable refrigerators and freezers designed for laboratory use should be utilized for the storage of flammable chemicals with a flashpoint below 37.7^{o}C (100° F). These refrigerators have been constructed with special design factors, such as heavy duty cords and corrosion and resistant interiors to help reduce the risk of fire and explosion. Flammable liquid-approved refrigerators are designed with spark-producing parts on the outside to avoid accidental ignition

Exemption from this requirement is permitted for small volumes if a risk assessment deems this a safe practice.

Refrigerator/Freezer Labeling

All refrigerators or freezers in laboratories not specifically designed to be explosion proof should be labelled with a prominent warning sign indicating that they are unsuitable for the storage of flammable substances. Refrigerators and freezers should also be labelled clearly for their intended purpose (e.g., “No Food or Drink to be Stored in this Refrigerator” or "Not For Flammable Storage".

Refrigerator/Freezer Contents

All materials in refrigerators or freezers should be labelled with the contents, owner, date of acquisition or preparation, and nature of any potential hazard. All containers should be sealed, preferably with a cap, and placed in secondary containers or catch pans. Since refrigerators are often used for storage of large quantities of small vials and test tubes, a reference to a list outside of the refrigerator could be used. Labels and ink used to identify materials in the refrigerators should be water-resistant.

Storing chemicals safely within the fridge

The following steps should also be followed to reduce offensive odours and the release of vapours into the fridge:

- Wrap caps of volatile materials in parafilm wax;
- Place volatile materials in ziplock bags;
- Secondary, removable trays or containers to store all materials should be used (this ensures that when spills occur, the storage container can be removed for easy cleaning);
- Promptly clean up any spilled material;
- Cork and glass stoppers are also unacceptable because they do not necessarily form good seals. Screw-cap tops with a seal inside may provide a solution, but only if closed properly
- Regularly inspect container integrity (no cracked caps, no blurred labels)
- Do not overfill the refrigerator or freezer;
- Dispose of old materials through the University chemical waste program. This applies in particular to when a researcher leaves the University.