Annex II - Hydrocarbon Refrigerants in RHVAC Systems Casualties (selected incidents)

Hydrocarbon Refrigerant Casualties

There is no systematic monitoring of accidents due to thermodynamic systems charged with exploding hydrocarbon refrigerants (propane, butane, isobutane, methane, propylene - also so-called *"natural refrigerants"*), installed in- or outside buildings (refrigeration, deep freezer, fridge, cold room, heat pump, dryer, air conditioner, etc.). Until now, fire brigades and house insurances do not survey natural refrigerant casualties. Despite few installations, the number of accidents happening in field services, with human injuries, is abnormally high. Repair and disposal risks are considerably high due to human error.

Certain widely media reported case are listed below:

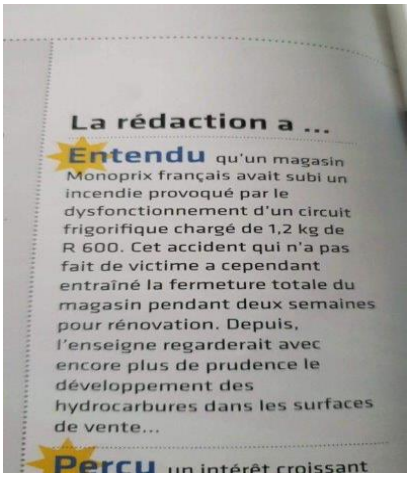
1. Bangladesh – 12 dead upon AC system in mosque.
Bangladesh: 12 morts et des dizaines de blessés dans l'explosion des climatiseurs d'une mosquée (actucameroun.com)

2. - Explosion of an air conditioner in Montpellier France followed by building fire.
https://www.francebleu.fr/infos/faits-divers-justice/explosion-d-un-climatiseur-dans-un-immeuble-a-montpellier-declenche-un-incendie-1635924416

www.francebleu.fr

3. First Italian technician victim on thermodynamic system charged with natural refrigerant, registered in Torino Italy in August 2021
https://torino.repubblica.it/cronaca/2021/08/10/news/incidente_sul_lavoro_nell_astigiano_muore_un_operaio-313610186/

4. Accident field repair of a food deep freezer charged with natural refrigerant (R 600A methylpropane) in a Monoprix food household market (see VID MONOPRIX)



5. Accident field repair of a deep freezer charged with 150gr hydrocarbon natural refrigerant (propane) refrigerant (see VID-20230406). Monobloc heat pumps will be charged with 500 gr.

VID-20230406-WA0000.mp4

6. Exploding fridge charged with hydrocarbon natural refrigerant.
https://vm.tiktok.com/ZMYgg1sG2/

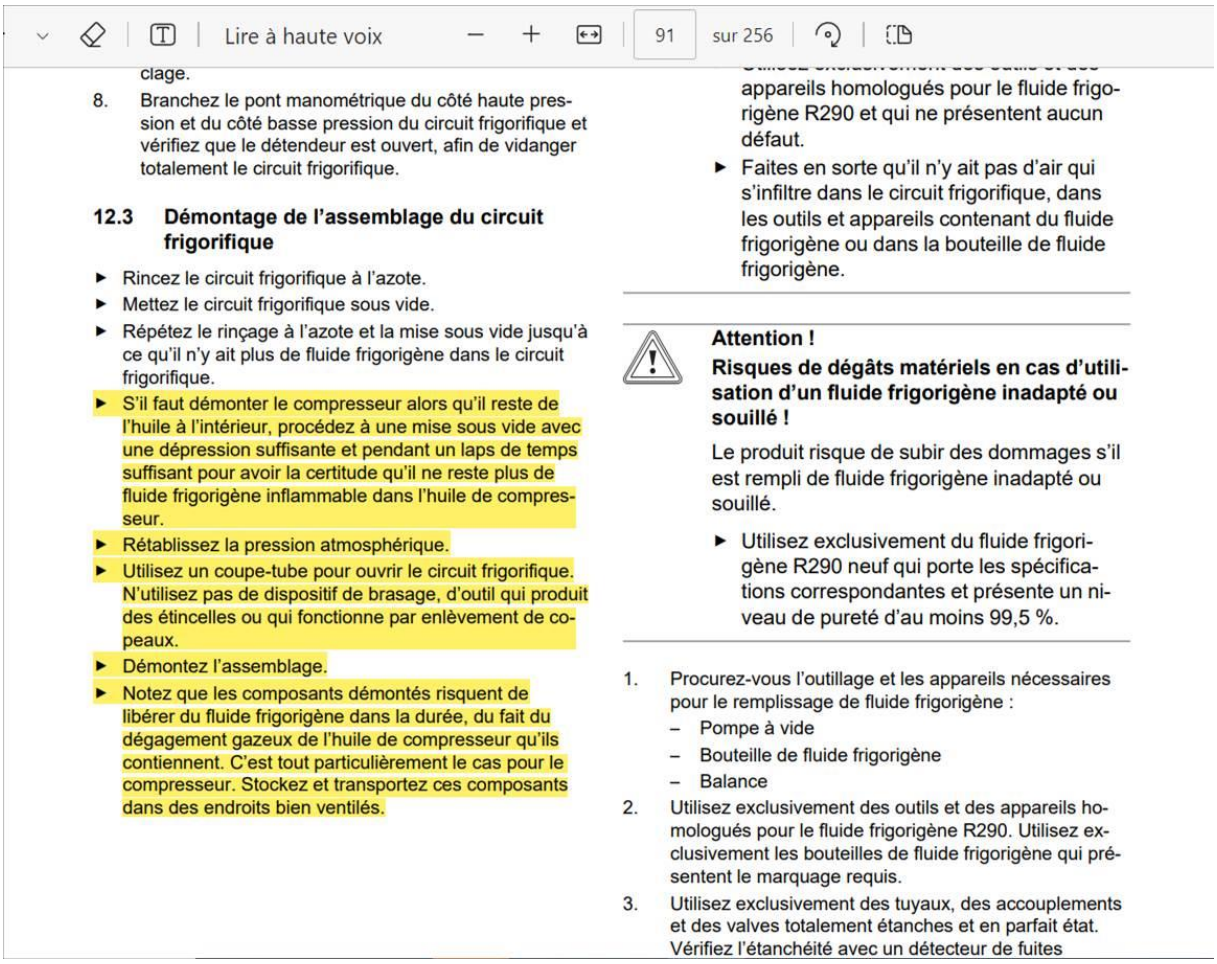
7. Exploding dryer charged with hydrocarbon natural refrigerant.
https://vm.tiktok.com/ZMYggeXkj/

8. Untrained technician, caused accident on deep freezer charged with hydrocarbon natural refrigerant (methylpropane).
https://www.linkedin.com/feed/update/urn:li:activity:7049650035281584128?commentUrn=urn%3Ali%3Acomment%3A%28activity%3A7049650035281584128%2C7049674206594088961%29

9. Accident 28 March 2023 cold room charged with hydrocarbon natural refrigerant.
https://www.paris-normandie.fr/id400440/article/2023-03-28/aumale-les-cuisines-de-lhotel-le-dauphin-prennent-feu-trois-personnes-en-urgence

10. Accident 24 March 2023 restaurant fridge charged with hydrocarbon natural refrigerant.
https://actu.fr/normandie/evreux_27229/incendie-dans-le-restaurant-flunch-d-evreux-que-s-est-il-passe_58409327.html

11. Vaillant monobloc heat pump charged with hydrocarbon natural refrigerant (propane): inaccurate installation guide to homeowner. Insufficient warning of responsibility of homeowner, for the installation and repair of his monobloc heat pump.
https://www.vaillant.fr/downloads/notices/pompe-a-chaleur/arotherm-plus-1/vaillant-arotherm-plus-vwl-1256-a-230v-s3-vwl-1556-a-s3-notice-demploi-unit-extrieur-202212-0020326641-01-2552779.pdf
see page 91/256



Lire à haute voix 91 sur 256

clage.

8. Branchez le pont manométrique du côté haute pression et du côté basse pression du circuit frigorifique et vérifiez que le détendeur est ouvert, afin de vidanger totalement le circuit frigorifique.

12.3 Démontage de l'assemblage du circuit frigorifique

- Rincez le circuit frigorifique à l'azote.
- Mettez le circuit frigorifique sous vide.
- Répétez le rinçage à l'azote et la mise sous vide jusqu'à ce qu'il n'y ait plus de fluide frigorigène dans le circuit frigorifique.
- S'il faut démonter le compresseur alors qu'il reste de l'huile à l'intérieur, procédez à une mise sous vide avec une dépression suffisante et pendant un laps de temps suffisant pour avoir la certitude qu'il ne reste plus de fluide frigorigène inflammable dans l'huile de compresseur.
- Rétablissez la pression atmosphérique.
- Utilisez un coupe-tube pour ouvrir le circuit frigorifique. N'utilisez pas de dispositif de brasage, d'outil qui produit des étincelles ou qui fonctionne par enlèvement de copeaux.
- Démontez l'assemblage.
- Notez que les composants démontés risquent de libérer du fluide frigorigène dans la durée, du fait du dégagement gazeux de l'huile de compresseur qu'ils contiennent. C'est tout particulièrement le cas pour le compresseur. Stockez et transportez ces composants dans des endroits bien ventilés.

appareils homologués pour le fluide frigorigène R290 et qui ne présentent aucun défaut.

- Faites en sorte qu'il n'y ait pas d'air qui s'infiltre dans le circuit frigorifique, dans les outils et appareils contenant du fluide frigorigène ou dans la bouteille de fluide frigorigène.

Attention !

Risques de dégâts matériels en cas d'utilisation d'un fluide frigorigène inadapté ou souillé !

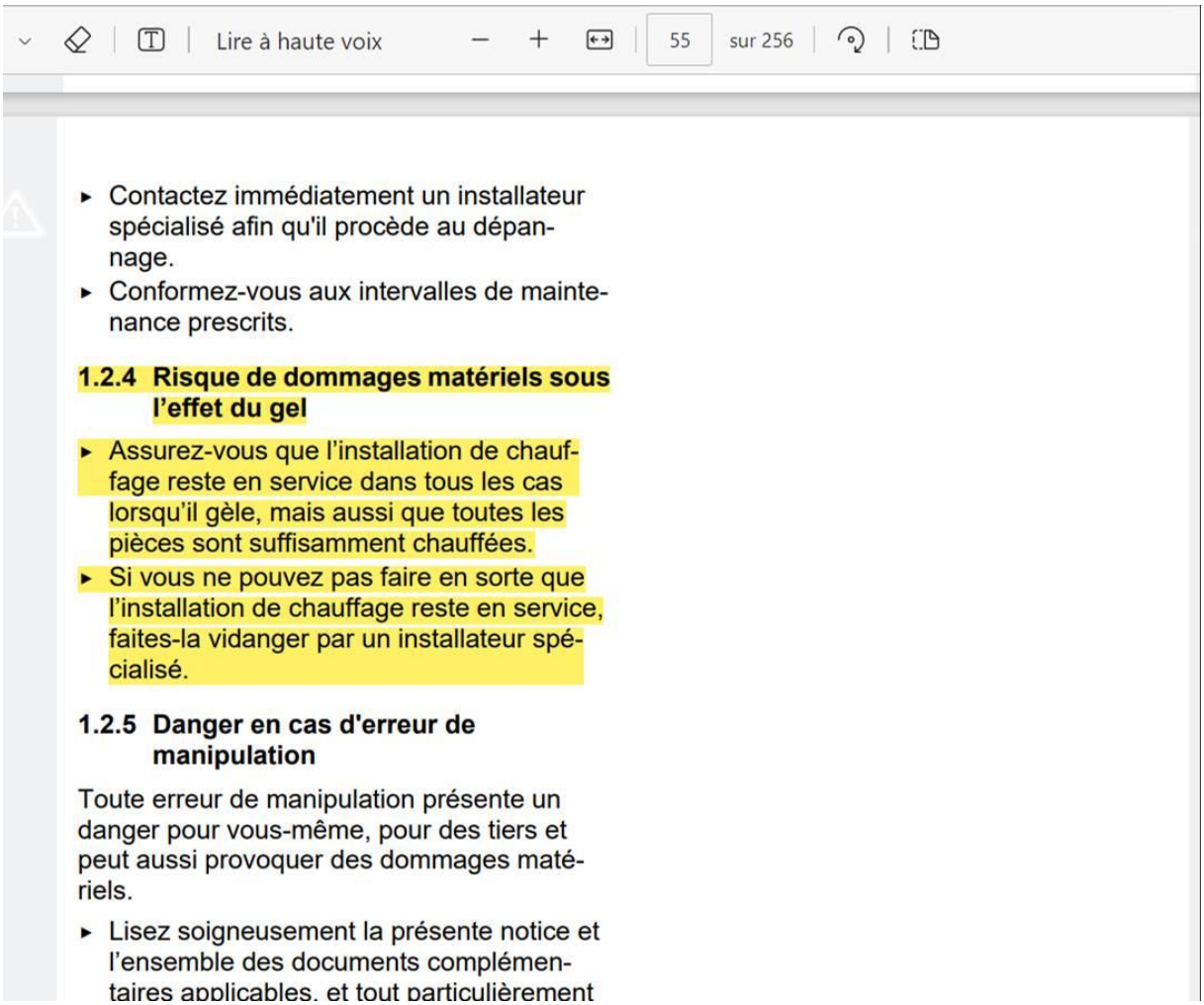
Le produit risque de subir des dommages s'il est rempli de fluide frigorigène inadapté ou souillé.

- Utilisez exclusivement du fluide frigorigène R290 neuf qui porte les spécifications correspondantes et présente un niveau de pureté d'au moins 99,5 %.

1. Procurez-vous l'outillage et les appareils nécessaires pour le remplissage de fluide frigorigène :
   - Pompe à vide
   - Bouteille de fluide frigorigène
   - Balance
2. Utilisez exclusivement des outils et des appareils homologués pour le fluide frigorigène R290. Utilisez exclusivement les bouteilles de fluide frigorigène qui présentent le marquage requis.
3. Utilisez exclusivement des tuyaux, des accouplements et des valves totalement étanches et en parfait état. Vérifiez l'étanchéité avec un détecteur de fuites

Danfoss lab-testing verified that **48 hours at 150°C oven** was the essential minimum time to fully eliminate hydrocarbon natural refrigerant (propane) from compressor oil in thermodynamic system, before repair. Any propane residue in compressor oil is risk of explosion.

12. Vaillant monobloc heat pump charged with natural refrigerant (propane): inaccurate installation guide to homeowner. Insufficient warning of responsibility of homeowner, for the installation and repair of his monobloc heat pump.



13. German media Bild: EU wants to stop German heat pump exclusive preference for hydrocarbon natural refrigerant.
https://www.linkedin.com/feed/update/urn:li:activity:7046129253846773760?utm_source=share&utm_medium=member_android

14. Tribune GB, May 28.2021 Karachi - 4 killed and 4 injured as A/C charged with hydrocarbon natural refrigerant blows up.
https://tribune.com.pk/story/2302078/four-killed-as-many-injured-as-air-conditioner-blows-up

15. Explosion in a hotel in Victoria (June 14. 2014) with 2 technician killed. A/C was charged with hydrocarbon natural refrigerant.
https://refrigeranthq.com/flammable-refrigerant-blamed-for-two-deaths/

16. 1 fireman killed and 7 injured in New Zealand 4. May 2008, from a massive explosion on a refrigeration system with leakage, charged with hydrocarbon natural refrigerant (propane) (see picture attached IMG 20230407)

■Accident example of Hydrocarbon Refrigerant

Reference

	Type	Refrigerant	Place/Date	Detail of accident
1	Refrigeration	Propane	New Zealand 2008/4/5	**Propane Refrigerant leaked and massive explosion occurred** in cold storage, **killed one fireman and injured seven.** Refrigeration units originally charged with HCFC-22 was replaced with propane.
2	Refrigeration	Propane	New Zealand 2010/5	**Propane was exploded during welding work.** Markings on the valve he was repairing and other parts of system indicated it contained non-flammable R22 or Freon.
3	AC	HR429 or neat Propane	Hong Kong 2013/1/9	**During maintenance, AC was exploded.** Witnesses at the time said they heard two explosions which smashed all the windows in the second floor restaurant. **More than 20 people were injured.**

IMG 20230407

17. In New Zealand, May 2010, while repairing a refrigeration system, welding and replacing a defective valve, the unit charged with hydrocarbon natural refrigerant (propane) exploded. (see picture attached IMG 20230407)

18. 9.Jan 2013 in Hong Kong, during maintenance of an air conditioner in a restaurant, charged with hydrocarbon natural refrigerant (propane) exploded. More than 20 people seriously injured. (see picture attached IMG 20230407)

19. During the serviceman decommissioned in Singapore in 2014 an air conditioner charged with hydrocarbon natural refrigerant, flash fire killed the worker and injured 2 persons.

20. An air handling unit, charged with hydrocarbon natural refrigerant and a leakage, resulted in a flash fire during its normal operation resulting in damages

21. A flash tank charged with liquid hydrocarbon refrigerant propane, exploded in USA, killing 4 persons and injuring another 6 persons.

22. In Brazil 2010 an explosion caused by a propane leak killed 18 people in a supermarket and injured 27 others.

23. In a factory in China that produced propane refrigerant an explosion resulted in the death of one worker and injured seven others.

24. In 2015 a propane leak in French supermarket caused an explosion that injured four people and destroyed the building.

25. In 2016 a propane leak in a supermarket in USA caused an explosion that injured one person and resulted in significant property damage.

26. In 2017 a propane leak in a USA warehouse caused an explosion that injured one person and significantly damaged the building

27. In 2018 a propane leak in a food processing plant in the USA resulted in an explosion that injured four people and caused significant damages to the building.

28. In 2019 a propane in refrigerator of a restaurant in China caused an explosion that injured 17 people.

29. In 2020 in Australia a propane leak resulted in an explosion that injured 2 persons and significantly damaged the property.

30. In 2020 a propane leak in a food processing plant in Canada caused an explosion that injured one person and damaged the building.

31. In 2021 a R290 refrigerant leak in a warehouse in USA caused an explosion that injured 4 people with significant property damage

32. In 2021 a propane refrigerant leak in a supermarket in Mexico caused an explosion that injured 22 people with property damages

33. In 2021 a propane refrigerant leakage in a supermarket in Brazil caused an explosion that injured 1 person and significant building damage.

34. In 2021 a R290 leak in a supermarket in Indonesia caused an explosion that injured 4 person and damaged badly the property

35. In 2021 a propane refrigerant leak in Poland, in a supermarket, injured 1 person and destroyed part of the building.

36. In 2021 a propane leak in Portugal caused an explosion that injured 2 people and resulted in significant property damage

37. In 2021 a propane leak in the refrigeration of a supermarket in Romania injured one person and damaged the building

38. In 2021 a propane leak in the refrigeration of a supermarket in Serbia caused an explosion that injured three persons and resulted in significant property damage

39. In 2022a propane leak in a supermarket in USA caused an explosion that injured one person and resulted in building damages.