



UNDERWRITERS LABORATORIES INC.

FLAMMABLE REFRIGERANT STAKEHOLDER FORUM
TUESDAY, JANUARY 11, 2011 - 9:00 AM TO 5:00 PM

CRYSTAL GATEWAY MARROITT HOTEL

ARLINGTON, VA

REPORT

Representatives of a number of organizations participated in a stakeholder forum hosted by Underwriters Laboratories Inc. (UL) on the potential widespread introduction and use of flammable and semi-flammable refrigerants in appliances and HVAC/R equipment in the US. This is a report of the meeting. It is not intended as a complete record of the discussions but rather it serves to highlight some of the topics discussed.

1. Welcome

The objective of the stakeholder forum was to serve as a catalyst for the US safety system to appropriately anticipate and ultimately address the safety challenges presented by flammable refrigerants. The forum was designed to bring key stakeholders (identified by UL) together to share their unique perspectives regarding the post-production transport, installation, use, storage, servicing and ultimately disposal of HVAC/R equipment and appliances employing flammable refrigerants. Participants were asked to represent the views of their broader stakeholder community as well as to share their particular expertise.

The expected outcome of the forum was the identification of current activity and trends for introduction of flammable refrigerant technology to the market, stakeholder concerns, potential gaps in currently applicable installation codes and safety standards, need for education in the market and other matters identified by the participants. Participants would also help determine next steps.

2. Introductions

A total of 35 individuals participated in the meeting. Everyone introduced themselves and their affiliation. Refer to Appendix A for a list of participants.

3. Background

The market situation and need for stakeholder coordination was described in a White Paper published by UL, "Revisiting Flammable Refrigerants." An advance copy was provided to the participants and a final version will be publicly available shortly via UL University at:

<http://www.uluniversity.us/common/ncsresponse.aspx?rendertext=thoughtleadership>. Although some relevant UL product safety standards were updated in the last 15 years, the US market was rather quiet regarding flammable refrigerants in appliances and HVAC/R until a little over 4 years ago. Since then the interest in flammable refrigerants has increased and a number of stakeholders had begun to act on how to accomplish their introduction safely and within the appropriate regulations.

The US relies on a safety system to assure public safety. Equipment standards are a part of the system, but there are other equally important elements, including the efforts of producers, installers, enforcement, etc. The knowledge of the user / service personnel, whether through general education / training or information provided on the product or in instructions, is also a very important part of the system.

Representatives of government agencies, installation and product safety standards committees, fire and mechanical code committees, professional associations and other stakeholders provided background and status of their areas of responsibility with respect to flammable refrigerants. Perspective was also shared on what the future may hold for flammable refrigerants in appliances and HVAC/R.

Of most significance to the participants was the expectation that a final rule would be published by EPA in 2011 that would recognize isobutane, propane and two additional refrigerants (HCR-188C and HCR-188C1) as substitutes for R-12 and R-22 in household refrigerators, freezers, and combination refrigerator and freezers and commercial refrigeration (retail food refrigerators and freezers – stand-alone

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units only). The extent to which this rule may apply to products similar to those described (e.g. wine coolers) is yet to be determined.

In addition, interest was expressed in the upcoming (February 2011) meeting of a Joint Task Group of the UL product safety standards technical panels (STP's). Lastly, the new 2L refrigerant class was discussed at length.

During the meeting it was confirmed that the Clean Air Act rule prohibiting venting of refrigerant to the atmosphere applies to hydrocarbon refrigerants, though it does not apply to industrial applications.

4. Industry Trends (AHAM / AHRI)

Representatives of trade associations and manufacturers shared their perspective on experience to date in other markets, the technical challenges of the new refrigerants and insight into the distribution and service networks that currently support the use of appliances and HVAC/R.

While it was generally agreed to be too early to authoritatively forecast the use of flammable refrigerants, hydrocarbon refrigerants were anticipated for use in residential appliances. This would be dependent upon the ultimate outcome of the EPA final rule. HFO refrigerants are being considered for automotive applications. However, it is not currently known whether they will be used in appliances and HVAC/R applications. Commercial refrigeration and HVAC was expected to still predominantly employ HFC's due to the need for a larger charge, though room air conditioners may eventually use hydrocarbon refrigerants.

5. Discussion on Stakeholder Impact

The bulk of the stakeholder forum involved discussion of the potential impact of flammable refrigerant usage in appliances and HVAC/R. The subjects discussed included:

Installation and Use

Retail (Restaurants / Convenience / Supermarkets)

- Kitchen design (placement of adjacent heating equipment, side-by-side installation)?
- Remote vs self-contained refrigerators (leak potential)? When / where refrigerant charging be done (off hours? Is charging location designed to meet fire codes?)
- ASHRAE 15 requires special permission for A3 refrigerant except for portable refrigeration? Will AHJ's accept?

Workplace

- Water coolers, vending machines near means of egress?

Residential

- DIY quick connects for split system A/C?
- Multi-family dwellings?
- Potential for installation markings not taking into account multiple units with flammable refrigerant charge
- Need for odorization?
- Anticipate huffing?

Special Occupancies (School / Institutional)

- Concern with vandalism, abuse?
- "Unregulated" portable equipment

Servicing

- Training of technicians? Toolbox contents?
- Repairing in-place? Recovery? Charging? Discharging (what does Clean Air Act allow)?
- Availability of flammable refrigerant recovery equipment?
- Preventing DIY

Fire Service (mass storage / warehousing)

- Identification of equipment w/ flammable refrigerant?
- Venting due to overpressure?
- Warehouse (and other) sprinkler design density
- Do "design to code" installations have adequate "safety margin?"

End-of-Life

- Rules for disposal?
- Venting of “natural refrigerant?”

Refrigerant Supply Chain

- What types of cylinders for service (5# vs larger)?
- Fuel grade versus refrigerant grade HC's? Anything different in supply chain?
- Need for odorant? Consistent color-coding of refrigerant containing components?

6. Future Plans

Upon completion of the general discussion on stakeholder impact, the participants summarized the gaps identified and related observations. The intent was to capture where stakeholders could individually or collectively take future action. These can be found in Appendix B.

Stakeholder participation in UL product safety consensus committees was discussed. Subject to maintaining a balance of interests, UL encouraged participants to consider membership in these committees. Refer to Appendix C for details on the interest categories and how one could apply for membership.

The remainder of the forum was spent discussing the value of the meeting and whether another such meeting should be held at a later date. The consensus was that there was a good exchange of information and the participants believed that another meeting should be held shortly after the adoption of EPA's final rule on hydrocarbon refrigerants. UL agreed to organize such a meeting at that time.

7. Close

The meeting was closed by 5 pm. All the participants were thanked for their contributions to an open and informative dialogue.

Report Recorded by UL Staff

APPENDIX A – Forum Participants

Name	Company
Alan W. Perdue	International Association of Fire Chiefs
Andrew Sullivan	Liebherr Refrigeration
Barry Kalian	UL
Bruce E. Johnson	International Code Council
Chuck Schlosser	Manitowoc Ice
Christianna Papazachariou	Shecco
Cindy Newberg	U.S. Environmental Protection Agency
Claire Kammer	UL
Claudette Juska	Greenpeace
Dave Godwin	U.S. Environmental Protection Agency
Ed Altizer	Virginia State Fire Marshal & IFMA
Evelyn Swain	U.S. Environmental Protection Agency
Glenn Hourahan	Air Conditioning Contractors of America
James Douglas	Tecumseh Products Company
Jeff Staub	Danfoss
Jim Flowers	Linde Canada
Karim Amrane	Air Conditioning, Heating, and Refrigeration Institute (AHRI)
Kevin Daniels	UL
Kevin Messner	Association of Home Appliance Manufacturers (AHAM)
Lasse Lykke Espersen	Nestle
Marc Scancarello	Emerson Climate Technologies
Margaret Sheppard	U.S. Environmental Protection Agency
Matt Williams	Association of Home Appliance Manufacturers (AHAM)
Monica Shimamura	U.S. Environmental Protection Agency
Patrick Walsh	Association of Home Appliance Manufacturers (AHAM)
Phillip Johnson	McQuay International
Rafael Sanchez	U.S. Environmental Protection Agency
Randy Haseman	UL
Reinhold Resch	AHT Cooling Systems Austria
Robert Wilkins	Danfoss
Roy Deppa	National Association of State Fire Marshals
Scott Ayers	U.S. Consumer Product Safety Commission
Scott MacLeod	UL
Sonny G. Sundaresan	Sundaresan Consulting Services, LLC
Tom Blewitt	UL

Representatives from North American Association of Food Equipment Manufacturers (NAFEM), Food Marketing Institute (FMI) and National Fire Protection Association (NFPA) were also invited, but were unable to attend.

APPENDIX B – Action Items

Potential gaps in standards, codes and regulations regarding the use of flammable refrigerants identified by the stakeholders present during the forum discussion are shown bulleted below. No formal attempt to validate the gaps identified or to develop a consensus approach to address them was performed,

- There was discussion about a reported fire event attributed to the lubricant of a fire suppression system described as comparable to a system containing a Class 1 refrigerant. Do ASHRAE standards 15 and 34 need to consider the potential for fire from lubricants?
- Do ASHRAE standards 15 and 34 need to consider the potential for ignition of fusite due to a lightning strike on outdoor installations?
- Current published refrigerant standards (e.g. ASHRE 34, ISO 817 and UL2182) make no specific reference to purity / impurity requirements for refrigerants (flammable or otherwise). Should they?
- Stenching (odorization) is required for LP fuel gas. Should hydrocarbon refrigerants be odorized?
- UL 484 labeling requirement for allowable charge vs room size for room AC units does not take into consideration the potential use of multiple units in a single room. *[The Joint Task Group of product safety standards technical panels will consider this matter.]*
- UL471 refrigerant leakage test does not specifically take into account the proximity of adjacent appliance ignition sources. *[The Joint Task Group of product safety standards technical panels will consider this matter.]*
- EPA Snap flammable refrigerant notice of public rulemaking does not currently address vending machines, household AC, water coolers, chillers, dehumidifiers and ice machines.
- There is no known published EU or US standard regarding servicing of non-industrial appliances and HVAC/R containing hydrocarbon refrigerants. It is reported that discharge to the atmosphere is permitted in Europe. If so, what criteria are applied? **[Secretary Note: Subsequent to the meeting, a participant provided background information published by German Technical Cooperation – Programme Proklima, “Guidelines for the safe use of hydrocarbon refrigerants.” It is available for download at <http://www.gtz.de/en/themen/umwelt-infrastruktur/28719.htm>. Note that this document is being cited for reference only and should not be construed as endorsed by the Stakeholder Forum or Underwriters Laboratories Inc.]**
- No public training or certification program is known to exist for service technicians and other handlers of flammable refrigerants during servicing and disposal. “EPA 608” requires a one-time certification of technicians working with ozone depleting substances and EPA develops the test(s) for certification that are administered by organizations recognized by EPA. This certification is not required for hydrocarbon refrigerant service technicians.
- Servicing of un-odorized hydrocarbon refrigerant systems in household and commercial applications could result in an undetectable flammable gas – air mixture in the occupancy. Should these units be serviced off-site? Should the hydrocarbon refrigerant be stenching?
- Retailers, insurers and end of life equipment recyclers do not appear to be part of the current standards and related activities regarding flammable refrigerant use. Should they be?
- The Clean Air Act requires recovery of refrigerants including hydrocarbons using equipment authorized by EPA. The reported EU practice is understood to be that hydrocarbon refrigerants are not required to be recovered, and that their environmental release is acceptable within limits. Should the US consider emulating this practice? If so, what restrictions if any should apply? Will there be refrigerant recovery equipment and processes suitable for use with flammable refrigerants?
- Storage locations may be designed for fire suppression on the assumption of the known heat of release for traditional refrigerants. The presence of flammable refrigerants may require reevaluation of a sprinkler system design.
- Traditional refrigerants (aside from ammonia) have been exempted by fire codes from regulations affecting flammable gas installations. Where such regulations consider hydrocarbon gases, these gases are assumed to be odorized as required by NFPA 58 for fuel gases. Should odorization (stenching) of hydrocarbon refrigerants be considered?

APPENDIX C – Consensus Committee Membership

What are UL Standards Technical Panels and how do you become a member?

A Standards Technical Panel (STP) is a balanced group of individuals representing a variety of interest categories, formed to review submitted proposals and to meet and discuss UL standards-related issues. An STP serves as the consensus body to review and vote on proposals prior to publication. The interest categories for a UL STP are defined as follows:

- **Authority Having Jurisdiction (AHJ):** Those involved in the regulation or enforcement of the requirements of codes and standards at the regional (e.g. state or province) and/or local level.
- **Commercial/Industrial User:** Organizations that use the product, system, or service covered by the applicable standards under the STP in a commercial or industrial setting. An example is a restaurant owner/operator serving on an STP for commercial cooking equipment.
- **Consumer:** Consumer organizations, consumer departments at universities, home economic departments at universities, and professional consumers.
- **General Interest:** Consultants, academia, scientists, etc. that are not covered by the other participation categories, also including professional societies, safety experts, and trade associations.
- **Government:** Representatives from national government agencies. For U.S. representatives these may include CPSC, FDA, EPA, DOT, DOE, DOD, NIST, etc.
- **Producers:** For standards establishing product requirements, a representative of a company that is engaged in the manufacture of products covered by the standard.
- **Supply Chain:** Component producers for an STP responsible for standards covering end products, or end-product producers for an STP responsible for standards covering components; and installers, distributors, and retailers.
- **Testing and Standards Organization:** Organizations that test and/or certify products, services, or systems covered by the standard, or that develop standards/codes related to the products, services, or systems covered by the standard.
- **International Delegate:** An individual representing a National Standards Body outside the United States (e.g. JISC, DIN).

There are no membership dues associated with STP's, and anyone interested in membership is encouraged to complete an STP application. The STP Chair appoints members to the STP based on completed applications, and UL's goal is that an interest category should not exceed 33.3% of the overall membership. Therefore, balance plays a role in determining acceptance to the STP.

To view all active STP's, their scopes and responsible UL staff, visit:

<http://ulstandardsinfolnet.ul.com/stp/active-stps.html>

If interested in joining an STP, send a request for an STP application to the responsible STP Project Manager. Additional information regarding UL STP's can be found at:

<http://ulstandardsinfolnet.ul.com/stp/>