

**Workshop Title: Risk Assessment of Mildly Flammable Refrigerants**

**Participants:**

|    | Name             | Chair/Speaker | Affiliation  |
|----|------------------|---------------|--|
| 1  | Eiji Hihara      | Chair         | The University of Tokyo  |
| 2  | Satoru Fujimoto  | Co-Chair      | The Japan Refrigeration and Air Conditioning Industry Association (JRAIA)<br>(Daikin Industries, Ltd.)           |
| 3  | Kenji Takizawa   | Speaker       | National Institute of Advanced Industrial Science and Technology (AIST)  |
| 4  | Tei Saburi       | Speaker       | National Institute of Advanced Industrial Science and Technology (AIST)  |
| 5  | Tomohiko Imamura | Speaker       | Tokyo University of Science, Suwa  |
| 6  | Chaobin Dang     | Speaker       | The University of Tokyo  |
| 7  | Kenji Takaichi   | Speaker       | The Japan Refrigeration and Air Conditioning Industry Association (JRAIA)<br>(Panasonic Corporation.)            |
| 8  | Ryuzaburo Yajima | Speaker       | The Japan Refrigeration and Air Conditioning Industry Association (JRAIA)<br>(Daikin Industries, Ltd.)           |
| 9  | Kenji Ueda       | Speaker       | The Japan Refrigeration and Air Conditioning Industry Association (JRAIA)<br>(Mitsubishi Heavy Industries, Ltd.) |
| 10 | Xudong Wang      | Speaker       | Air-Conditioning, Heating, and Refrigeration Institute (AHRI)  |
| 11 | Zhao Yang        | Speaker       | Tianjin University   |



#### 4) Abstract:

##### · Objective

The purpose of the session is to share new information on risk assessment of mildly flammable refrigerants being carried out through industry, academia, and government cooperation in Japan.

##### · Background

The use of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) has been widely restricted, and to protect the ozone layer they have been replaced with hydrofluorocarbons (HFCs). However, HFCs used in air conditioners have a high global warming potential (GWP), and increasing use of HFCs has become a serious issue with regard to the prevention of global warming. Therefore, it has been widely recognized that replacing HFCs with low-GWP refrigerants would be an important step in solving this problem.

On the other hand, low-GWP refrigerants may have mild flammability and it is thus essential to collect basic data on their flammability and also conduct research on their safety for practical use. The integration of basic information about refrigerant physical properties, flammability, and risk assessment will simplify their selection for practical use.

Since 2011, the New Energy and Industrial Technology Development Organization (NEDO) has been carrying out the Technology Development of High-Efficiency Non-Fluorinated Air-Conditioning Systems project. The goal of this project is to develop practical application technology for low-GWP refrigerants used in the air-conditioning field.

With the objective of gathering essential data for assessing the risk of mildly flammable refrigerants, safety studies are being conducted in NEDO's project by teams from the Tokyo University of Science at Suwa, Kyushu University, The University of Tokyo, and the National Institute of Advanced Industrial Science and Technology (AIST). Results of the studies conducted to date have been used in industry (Japan Refrigeration and Air Conditioning Industry Association (JRAIA)) for risk assessment of mildly flammable refrigerants. In addition, a research committee has been organized by the Japan Society of Refrigerating and Air Conditioning Engineers (JSRAE) to assess risks associated with mildly flammable refrigerants.

As described above, risk assessment of mildly flammable refrigerants is being carried out through cooperation among industry, academia and government in Japan.

##### · Presentations

###### Session 1

###### ● Opening Remarks

13:30 – 13:38 (NEDO)

###### ● Introduction

13:38 – 13:43 Research Project on Risk Assessment of Mildly Flammable Refrigerants

Eiji Hihara (Chair, The University of Tokyo, Project Leader of NEDO)

●Presentations: Research Project on Risk Assessment of Mildly Flammable Refrigerants

13:43 – 14:03 Fundamental and Practical Flammability Properties of 2L Refrigerants

Kenji Takizawa (AIST)

14:03 – 14:23 Hazard assessment of the combustion of mildly flammable refrigerants

Tei Saburi (AIST)

14:23 – 14:43 Experimental evaluation of physical hazard of A2L refrigerant assuming actual handling situation

Tomohiko Imamura (Tokyo University of Science, Suwa)

14:43 – 14:58 Diesel Combustion of Oil and Refrigerant Mixture during Pump Down of Air Conditioners

Chaobin Dang (The University of Tokyo)

●Discussion

14:58 – 15:10

●Coffee Break

15:10 – 15:30

Session 2

●Introduction

15:30 – 15:40 Basic Procedure of the Risk Assessment in JRAIA

Satoru Fujimoto (Co-Chair, JRAIA, Sub Project Leader of NEDO)

●Presentations: Risk Assessment of Refrigeration System Using Mildly Flammable Refrigerants

15:40 – 15:55 Overview of the Risk Assessment for Residential Air-Conditioners

Kenji Takaichi (JRAIA)

15:55 – 16:10 Overview of the Risk Assessment for VRF System

Ryuzaburo Yajima (JRAIA)

16:10 – 16:25 Overview of the Risk Assessment for Chiller

Kenji Ueda (JRAIA)

16:25 – 16:40 Overview of AHRI Risk Assessment Studies for A2L Refrigerants

Xudong Wang (Air-Conditioning, Heating, and Refrigeration Institute (AHRI))

16:40 – 16:55 Research on Flammability of the lower GWP refrigerants

Zhao Yang (Tianjin University)

●Discussion

16:55 – 17:10

●Conclusion

Eiji Hihara (Chair, The University of Tokyo, Project Leader of NEDO)

(※We will offer 2014 progress report booklet to the first 50 people.)

**Contact information:**

1. Name: Masamichi Abe
2. Affiliation/Organization name: New Energy and Industrial Technology Development Organization (NEDO)
3. Address: 19F Muza Kawasaki Building, 1310, Omiya-cho, Saiwai-ku, Kawasaki City, Kanagawa 212-8554, Japan
4. E-mail address: abemsm01@nedo.go.jp