Trend of Legislations and Conversion for Refrigerants
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1. Who is JRAIA?

**JRAIA**

The Japan Refrigeration and Air conditioning Industry Association

➢ Established in 1949.

➢ Objective

JRAIA contributes to the steady development of Japanese industry and improvement in people’s standard of living.

➢ 170 member companies including the associate members.

(1) Regular members: 105

(2) Associate members: 65

➢ The business fields of the member companies are :

- Air conditioning (residential, commercial, automotive)
- Refrigeration (commercial, industrial, transport)
- Ventilation
- Heat pump system (HP water heaters)
- Refrigerants
- Parts
2. Trend of legislation and Protocols

1) Timeline


➢ Vienna Convention (1985)

➢ Montreal Protocol (1987)

➢ UNFCCC (1992)

➢ Kyoto Protocol (COP3) (1997)

➢ Kigali Amendment (MOP28) (2016)


Global

Ozone layer protection

Global Warming prevention

Japan

- Ozone Layer Protection Act (1988)
- Revised “OLP” Act (2018)
- EoL Automotive Recycle Act (2002)
- Revised F-gas Act (2015)
- Home Appliance Recycle Act (2001)
- Fluorocarbon Recovery & Destruction Act (2001)

UNFCCC: United Nations Framework Convention on Climate Change
ROLP: Ozon Layer Protection
Revised F-gas Act: Act on Rational Use and Proper Management of Fluorocarbons
EOL: End Of Life

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2. Trend of legislation and Protocols

2) Overview of Legislation in Japan

**Legislation on refrigerants**

"Ozone Layer Protection Act" (Scheduled to be reviewed in 2018)

- Regulation on production and consumption of CFC and HCFC (abbr. OLP Act)
- Phase down of production and consumption of HFCs similar to the Kigali Amendment

"Act on Rational Use and Proper Management of Fluorocarbons" (revised in 2015)

- Regulation on emission of HFC/HCFC/CFC refrigerants (abbr. F-gas Act)
- Target GWP and year for each product group

"High Pressure Gas Safety Act" (revised in 2016 and 2017)

- Regulation on safety of flammable (toxic) gas
- Regulation on safety by capacity of equipment performance
- Method of safe use of products and refrigerants
- A2L refrigerants are included as “particular inert gas”

"Global Warming Countermeasure Plan" (Cabinet Decision in 2016)

- Regulation on emission of energy origin CO₂
### 2. Trend of legislation and Protocols

#### 3) Regulated by “Act on Rational Use and Proper Management of Fluorocarbons”

<table>
<thead>
<tr>
<th>Designated Products</th>
<th>Target GWP Weighted Average GWP</th>
<th>Target year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential air conditioning (Mini-Split)</td>
<td>750 (R32)</td>
<td>2018</td>
</tr>
<tr>
<td>Commercial air conditioning (Split : Small-size)</td>
<td>750 (R32)</td>
<td>2020</td>
</tr>
<tr>
<td>Automobile air conditioning</td>
<td>150 (R1234yf)</td>
<td>2023</td>
</tr>
<tr>
<td>Condensing unit and refrigerating unit</td>
<td>1500 (R410A, CO₂)</td>
<td>2025</td>
</tr>
<tr>
<td>Cold storage warehouses</td>
<td>100 (NH₃/CO₂)</td>
<td>2019</td>
</tr>
<tr>
<td>Urethane foam</td>
<td>100 (R1233zd/CO₂)</td>
<td>2020</td>
</tr>
<tr>
<td>Dust blowers</td>
<td>10 (CO₂, DME)</td>
<td>2019</td>
</tr>
</tbody>
</table>

**Lower row: planned as the second stage**

<table>
<thead>
<tr>
<th>Designated Products</th>
<th>Target GWP Weighted Average GWP</th>
<th>Target year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial air conditioning (Excluding VRF and facilities)</td>
<td>750 (R32)</td>
<td>2023</td>
</tr>
<tr>
<td>Turbo Chiller</td>
<td>100 (R1233zd(E), R514A, R1234ze(E), R1234yf)</td>
<td>2025</td>
</tr>
</tbody>
</table>

(・・・): Expected alternative refrigerants

DME: dimethyl ether
3. Market trend

Products

- Residential A/Cs
- Commercial A/Cs
- Commercial ref. separated (cabinets etc.)
- Condensing units
- Refrigeration units
- Commercial ref. integrated (cabinets etc.)
- Residential H/P water heaters
- Commercial H/P water heaters
- Vending Machines
- Domestic Refrigerator

Water chilling units
Turbo Chiller

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## 3. Market trend

### 1) Refrigerant conversion status in each product sector

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Number of Units in 2016FY (x 1,000)</th>
<th>Refrigerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential A/Cs</td>
<td>8,527.5</td>
<td>R410A (2088) ⇒ R32 (675) ⇒ (? ?) (almost 100%)</td>
</tr>
<tr>
<td>Commercial A/Cs</td>
<td>793.9</td>
<td>R410A (2088) ⇒ (R32 (675)) ⇒ (? ?) (only Small-size; 41%)</td>
</tr>
<tr>
<td>Water chilling units</td>
<td>12.9</td>
<td>R410A (2088), R407C (1774), R404A (3922), R134a (1430) ⇒ (? ?)</td>
</tr>
<tr>
<td>Turbo Chiller</td>
<td>0.268</td>
<td>R245fa (1030) ⇒ (R1233zd(E) (5), R1224yd(Z) (1), R514A (7)) R134a (1430) ⇒ (R1234ze(E) (6), R1234yf(4))</td>
</tr>
<tr>
<td>Residential H/P water heaters</td>
<td>424.4</td>
<td>CO₂ (1), R32 (675)</td>
</tr>
<tr>
<td>Commercial H/P water heaters</td>
<td>3</td>
<td>R410A (2088) ⇒ (R454C (149) ?), CO₂ (1)</td>
</tr>
<tr>
<td>Commercial ref. separated (cabinets etc.)</td>
<td>127.5</td>
<td>R404A (3922) ⇒ R410A (2088) ⇒ R448A (1386), R449A (1396), R407H (1495), R463A (1494) ⇒ (? ?) CO₂ (1)</td>
</tr>
<tr>
<td>Condensing units</td>
<td>91.3</td>
<td></td>
</tr>
<tr>
<td>Refrigeration units</td>
<td>29.7</td>
<td>R404A (3922), R410A (2088), R134a (1430) ⇒ (? ?)</td>
</tr>
<tr>
<td>Commercial ref. integrated (cabinets etc.)</td>
<td>184.6</td>
<td>R404A (3922), R410A (2088), R134a (1430) ⇒ (? ?) R600a (3), CO₂ (1)</td>
</tr>
<tr>
<td>Automobile A/Cs</td>
<td>(4,700)</td>
<td>R134a (1430) ⇒ (R1234yf(4)) ⇒ (CO₂ (1) ?)</td>
</tr>
<tr>
<td>Vending Machines</td>
<td>(320)</td>
<td>R404A (3922), R134a (1430) ⇒ R600a (3), CO₂ (1), R1234yf(4)</td>
</tr>
<tr>
<td>Domestic Refrigerator</td>
<td>(4300)</td>
<td>R600a (3)</td>
</tr>
</tbody>
</table>
## 4. Schedule of Risk Assessment for AC and others

### 1) Main Timeline

**A2L refrigerant risk assessment has difficulty and long period**

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</thead>
<tbody>
<tr>
<td>Residential AC</td>
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<tr>
<td>Commercial AC</td>
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<tr>
<td>Build multi-AC (VRF etc.)</td>
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<tr>
<td>Chiller</td>
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<tr>
<td>Others (Refrigeration equipment)</td>
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<tr>
<td>Guideline and Requirements of JRAIA</td>
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<tr>
<td>Amendment of the Act</td>
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</tbody>
</table>

- **2012**: Selling of Mini-Split
- **2014**: Selling of Small-size
- **2016**: Selling of Turbo Chiller
- **2018**: New risk assessment of A3 refrigerant.

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**High Pressure Gas Safety Act**

**CO₂**
4. Schedule of Risk Assessment for AC and others

2) Abstract of A3 Refrigerants

■ Direction
  • In the trend of deregulation of A3 refrigerants, JRAIA will propose ACs and Showcases be secured.
  • Based on RAC’s risk assessment method and results for A2L refrigerant, JRAIA also conducts risk assessment for A3 refrigerant and recommended measures to ensure safety from the evaluated result.
  • JRAIA collaborates with universities and research institutions to compare the hazards to the refrigerant of A2L and A3 refrigerants.

■ Schedule
  • First year; A3 refrigerant risk assessment and countermeasure
  • Second half year; Estimation method and make plan for estimation
  • Last year; Practical estimation for risk assessment.

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk assessment</td>
<td></td>
<td></td>
<td>6,7/12/2018 Kobe Symposium</td>
</tr>
<tr>
<td>Hazard estimation</td>
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<td></td>
</tr>
</tbody>
</table>

- Risk assessment
- Risk reduction
- Reduction effectiveness
- Plan for estimation
- Hazard estimation

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Please participate in the symposium!!

The 13th International Symposium on New Refrigerants and Environmental Technology 2018

JRAIA hosts International Symposium on New Refrigerants and Environmental Technology, so-called Kobe symposium, which has been held every two years since 1994. The topic of the symposium include latest development of HVAC/R equipment and new refrigerant technology, and international and domestic legislations. Japanese-English translation is available in all sessions.

URL: https://www.jraia.or.jp/english/symposium/index.html
Thank you for your kind attention!