Risk Assessment and Safety Measures Using A3 Refrigerant R290 RAC Systems

JRAIA
The Japan Refrigeration and Air Conditioning Industry Association

RAC Risk Assessment WG3

Introduction

- Natural refrigerant R290 (propane) is considered as one of next gen refrigerant candidate for RACs in Japan.
- R290 is highly energy efficient amongst other low GWP refrigerants. However, its flammability (A3) requires safety measures. Risk assessment is conducted throughout its life, and JRA standards and guidelines will be established

Assessed Systems and Acceptable Levels

- **Risk Assessment (RA) : RAC split units with indoor units mounted on wall 1.8m or higher from floor.**
- **Levels : Conceptually** "1 incident in 100 years with 1 million installation per year", therefore 1.0×10^{-8} .There are **approx. 100 million units in operation so therefore 1.0×10^{-10} was considered, but other than its usage, contractors are installing these units and can be adjusted by a digit, so 1.0×10^{-9} was used.**

Risk Assessment Progress

■ Ignition Rate : Reassessing RA

Reconsidering ignition rate that was presented during 2021 Kobe Symposium。Based on update, additional safety measures needed, **therefore risk assessment being reviewed**

Stage		2021 Kobe Symposium	2024 RA Prog.
Transport/ Storage	Stor.	1.1×10^{-10}	8.9×10^{-9}
	Trans.	1.8×10^{-10}	1.2×10^{-8}
Installation	IDU	1.1×10^{-11}	1.1×10^{-10}
	ODU	4.5×10^{-11}	8.3×10^{-10}
Usage	IDU	1.3×10^{-11}	5.5×10^{-10}
	ODU	1.2×10^{-11}	1.3×10^{-9}
Repair	IDU	4.2×10^{-12}	9.9×10^{-10}
	ODU	4.5×10^{-11}	3.3×10^{-10}
Dismantle	IDU	1.0×10^{-12}	1.1×10^{-9}
	ODU	1.8×10^{-12}	7.3×10^{-11}

※Red numbers, over acceptable levels.

■ Safety Measures (incl. items being considered)

- 【Usage】Leak detection even when not in operation, using fan to reduce concentration levels.
- 【Trans/Storage, Inst., Repair, Dismantle】Portable leak detector
- 【 Inst., Repair, Dismantle】Use brushless motor tools
- 【 Inst., Repair, Dismantle】Use antistatic tools, PPEs
- 【Storage, Inst.】Dedicated space （no-flame area for condenser）
- 【All】Education/Training (on use of flammable refrigerants)
- 【All】Odor/Smell added to refrigerant etc.

※Additional safety measures needed where required levels not met.

■ Next Steps

- Continue RA for product life stage to meet acceptable levels.
- Create/Publish JRAIA Standards, Guidelines
- Establish licensing/certification, for increasing contractor skills
- Risk communication with stakeholders （Wholesalers, Warehouse/Logistics, Recovery/Reclaim etc. ）
- Consider emergency system when there is refrigerant leakage