

## 1. Module details

**Module name**

**Retrofitting Refrigeration Systems**

**Module duration**

0.5 module (18-20hrs).

**Module code**

NR048.1

**Discipline code**

0703320

## 2. Module purpose

To provide the student with the knowledge and skills to enable them to effectively and efficiently retrofit existing refrigeration systems with alternate refrigerants in accordance with regulations and local requirements.

## 3. Prerequisites

NR03 Refrigerants and NR09 Refrigeration System Operation

## 4. Relationship to competency standards

NES305, NES402, NES406

## 5. Content

### **Reasons for Retrofitting**

- Montreal Protocol
- Kyoto Summit
- Global warming
- Acts and regulations,
- SAA Codes of Practice

### **System Analysis**

- Equipment identification
- Refrigerant usage audit
- Systems options
- Refrigerant management program

### **Refrigerant Selection**

- AIRAH refrigerant selection guide
- ANSI/ASHRAE Standard 34
- Transitional and drop-in refrigerants
- Medium and long term refrigerants
- Refrigerant selection considerations
- System performance testing
- Refrigerant recovery, recycling or reclaim
- Lubricant selection considerations

### **Retrofit procedure**

- Flushing procedures
- Retrofit procedure for CFC to HCFC refrigerants
- Retrofit procedure for CFC or HCFC to HFC refrigerants

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| <p><b>6. Assessment strategy</b></p> <p><b>Assessment methods</b></p> <p><b>Conditions of assessment</b></p>   | <p><b>Performing a retrofit</b></p> <ul style="list-style-type: none"> <li>• Refrigerant recovery</li> <li>• Flushing the system</li> <li>• Oil and drier replacement</li> <li>• Evacuation</li> <li>• Refrigerant charging</li> <li>• Refrigerant control adjustment</li> <li>• Other system adjustments</li> <li>• System labelling</li> </ul> <p>Assignment, Short Answer Testing and Training tasks</p>   |
| <p><b>7. Learning outcome details</b></p> <p><b>Learning outcome 1</b></p> <p><b>Assessment criteria</b></p> <p><b>Learning outcome 2</b></p> <p><b>Assessment criteria</b></p> <p><b>Learning outcome 3</b></p> | <p><b>Explain the reasons for refrigerant retrofitting in context of the revised Montreal Protocol / Kyoto Summit /Legislation / Codes</b></p> <p>.</p> <p>1.1 Summarise regularity controls introduced under the Montreal Protocol and Kyoto Summit</p> <p>1.2 Identify the function of the ozone layer and the effects of controlled substances on it.</p> <p>1.3 Determine legal and Code of Practice requirements in the refrigeration and air conditioning industry</p> <p><b>Analyse the operation of existing refrigeration systems and determine retrofit or system replacement requirements</b></p> <p>2.1 Perform a system analysis for three different refrigeration or air conditioning plants, identifying components, system capacity, refrigerant type and quantity, compressor lubricant and other factors that will affect decision making.</p> <p>2.2 Prepare a refrigerant usage audit</p> <p>2.3 Determine options for the systems future operation, and devise a refrigerant management program</p> <p><b>Identify appropriate refrigerants and lubricants for the refrigeration plant in context of system efficiency and viability</b></p> |

**Assessment criteria**

- 3.1 Explain the ANSI/ASHRAE Standard 34 numbering system.
- 3.2 Differentiate between transitional and medium to long term refrigerants.
- 3.3 Explain the terms ODP, GWP, EAL, TEWI
- 3.4 Determine refrigerant selection considerations including environmental properties, refrigerant compatibility, performance characteristics, safety and handling considerations, availability and cost
- 3.5 Complete a system performance test including Coefficient of performance, Compression ratio, Mass flow rate and the Refrigerant Volume to be handled by the compressor.
- 3.6 Explain the recommended procedures for the recovery, recycling or reclaim of used refrigerant
- 3.7 Select appropriate lubricants for the replacement refrigerant bearing in mind system compatibility

**Learning outcome 4**

**Develop a retrofit procedure complying with the Codes of Practice and equipment requirements..**

**Assessment criteria**

- 4.1 Complete a system components compatibility survey in relation to the newly selected refrigerant
- 4.2 Detail an appropriate flushing procedures for system retrofit.
- 4.3 Determine an appropriate procedure for retrofitting a CFC refrigerant to a HCFC refrigerant
- 4.4 Determine an appropriate procedure for retrofitting a CFC or HCFC refrigerant to a HFC refrigerant

**Learning outcome 5**

**Perform a retrofit on a refrigeration or air conditioning system or demonstrate the various operations within a retrofit procedure**

**Assessment criteria**

- 5.1 Perform a retrofit procedure on a refrigeration or air conditioning system if available.

## 8. Delivery of the module

### Delivery strategy

- 5.2 Demonstrate the processes of a retrofit procedure including refrigerant recovery, system flushing, oil and drier replacement, evacuation and charging, refrigerant control and pressure control adjustment, and plant labelling

Delivery strategies must be suitable for both theoretical and /or practical learning and module purpose.

It recommended that learning and assessment be facilitated in a holistic manner, which may require a learning outcome sequence other than that indicated in the body of this module. Also, an integrated theory/practice approach should be used where students learn by practical exercises and through research and workshop reports.

### Resource requirements

Appropriate practical equipment, service manuals, and schematic diagrams test equipment.

Code of Practice requirements in the Refrigeration and Air Conditioning Industry

Access to commercial refrigeration or air conditioning plant

Refractometer demonstrating the testing of oil samples

Manufactures equipment catalogues and retrofit information

Pressure/Enthalpy charts for various refrigerants as required

Useful references include:

Australian Refrigeration and Air Conditioning, Volumes I & II, A CR & D Project Trust Publication.

Dossat R.J., Principles of Refrigeration, Second Edition, SI Version, John Wiley and Sons, New York. Latest Edition.

ASHRAE Handbook, Refrigeration Systems and

Applications., SI Version, ASHRAE, Atlanta.

### Occupational health and safety requirements

Protective clothing and safety footwear must be worn when performing practical training tasks. The use of safety glasses is required when handling refrigerants. A safe and healthy environment will be provided for students in regards to classroom and workshop safety.