

1. Module details

Module name **Retrofitting Domestic Refrigeration Systems**

Suggested structured learning time A learner possessing the prerequisite skills and knowledge should achieve the module purpose in 18 to 20 hours.

Module code NUE141

Field of Education code 031315

2. Module purpose

This module provides the knowledge and skills to retrofit existing domestic refrigeration systems with alternate refrigerants, in accordance with regulations and local requirements.

Learners will gain an understanding of the retrofit process to enable an effective and efficient change to an ozone / environmentally friendly refrigerant.

It covers the reasons for retrofitting, system analysis, the identification of appropriate refrigerants and lubricants for retrofitting, the procedure and performance of a retrofit.

3. Learning pathway

Intended use in the structured learning program This module is intended to supplement extensive workplace exposure to domestic appliance servicing work. In particular it applies to retrofitting domestic refrigeration systems to ozone / environmentally friendly refrigerants. Therefore before undertaking this module an apprentice should have a clear understanding and experience of:

- the purpose, properties and applications of common refrigerants
- the Code of Good Practice for the Reduction in the Emission of Controlled Ozone Depleting Refrigerants
- diagnosis and fault repairs of domestic refrigerators and freezers
- selection, installation, charging and commissioning of domestic applications using capillary tubes as metering devices.

Recommended prerequisites For the most effective learning this module should be undertaken only after modules in Refrigerants, Domestic Refrigerators and Freezers and Capillary Systems have been completed.

4. Relationship to competency standards

This module provides part of the underpinning knowledge and skills in the ‘Evidence Guide’ of specific units of competency in the National Electrotechnology Training Package and provides similar support, where mapped, to equivalent units in the National Metals and Engineering Competency Standards. For details refer to the module to unit maps, available from EEQSBA.

5. Content

Summary of content

1. Reasons for Retrofitting
 - Montreal Protocol
 - Kyoto Summit
 - Global warming
 - AS Codes of Practice
 - Acts and Regulations
2. System Analysis
 - Equipment identification
 - Systems options
3. Refrigerant Selection
 - Safety considerations
 - ANSI / ASHRAE Standard 34
 - AIRAH Refrigerant Selection Guide
 - Transitional and drop in-refrigerants
 - Medium and long term refrigerants
 - Refrigerant selection considerations
 - Domestic refrigeration system performance testing
 - Refrigerant recovery, recycling or reclaim
 - Lubricant selection considerations
4. Retrofit procedure
 - Flushing procedures
 - Retrofit procedure for CFC to blended refrigerants

5. Performing a retrofit
 - Refrigerant recovery
 - Flushing the system
 - Oil and drier replacement
 - Evacuation
 - Refrigerant charging
 - System labelling

6. Assessment strategy

Assessment methods

Assessment should be progressive reflecting a holistic approach to ensure the module is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments and written tests consisting of item types, such as multiple choice, short answer and problem solving.

Conditions of assessment

Normally learning and assessment will take place in a formal learning environment.

7. Learning outcome details

Learning outcome 1

Explain the reasons for refrigerant retrofitting in context of the revised Montreal Protocol and Kyoto Summit / legislation / codes.

Assessment criteria

- 1.1 Summarise regulatory controls introduced under the Montreal Protocol and Kyoto Summit.
- 1.2 Identify the function of the ozone layer and the effect of controlled substances on it.
- 1.3 Determine legal and Code of Practice requirements in the domestic appliance industry.

Learning outcome 2

Analyse the operation of existing domestic refrigeration system and determine retrofit or system replacement requirements.

Assessment criteria

- 2.1 Perform a system analysis for three different domestic refrigeration systems, identifying components, system capacity, refrigerant type and quantity, compressor lubricant and other factors that will affect decision making.

Learning outcome 3

Identify appropriate refrigerants and lubricants for the domestic refrigeration system in context of system efficiency and viability.

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| Assessment criteria | 3.1 Explain the ANSI/ASHRAE Standard 34 numbering system. |
| | 3.2 Differentiate between transitional and medium long term refrigerants. |
| | 3.3 Explain the terms ODP, GWP, EAL, TEWI. |
| | 3.4 Determine refrigerant selection considerations including environmental properties, refrigerant compatibility assessment characteristics, safety and handling considerations, availability and cost. |
| | 3.5 Explain the recommended procedures for the recovery, recycling or reclaim of used refrigerant. |
| | 3.6 Select appropriate lubricants for the replacement refrigerant, bearing in mind system compatibility. |

Learning outcome 4 Develop a retrofit procedure complying with the Code of Practice and equipment requirements.

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| Assessment criteria | 4.1 Complete a domestic refrigeration system components compatibility survey in relation to the newly selected refrigerant. |
| | 4.2 Detail appropriate flushing procedures for domestic refrigeration system retrofit. |
| | 4.3 Determine an appropriate procedure for retrofitting a CFC refrigerant to a blended refrigerant. |

Learning outcome 5 Perform a retrofit on a domestic refrigeration system or demonstrate the various operations within a retrofit procedure.

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| Assessment criteria | 5.1 Perform a retrofit procedure on a domestic refrigeration system. |
| | 5.2 Demonstrate the processes of a retrofit procedure including refrigerant recovery, system flushing, oil and drier replacement, evacuation and charging, and labelling. |

8. Delivery of the module

Delivery strategy

Delivery strategies must be suitable for learning both theoretical and practical aspects described in the module purpose. It is considered that the most effective method to achieve this is by integration of theory and practice where students learn by experimentation, research and reports. It is recommended that learning and assessment be facilitated in a holistic manner that may require a learning outcome sequence other than that indicated in the module.

Resource requirements

Resources should be sufficient for students to carry out exercises on an individual basis.

Useful references include:

ASHRAE Handbook, *Refrigeration Systems and Applications*, SI Version, ASHRAE, Atlanta.

Boyle, G., (Latest edition) *Australian Refrigeration and Air Conditioning*, Vol. 1 & 2, A CR&D Project Trust Publication.

Dossat, R.J., *Principles of Refrigeration*, 2nd Ed, SI Version, John Wiley and Sons, New York.

Ozone Protection Acts and Regulations for domestic refrigeration systems applicable in your state.

Standards Australia, Standards New Zealand:

AS/NZS HB40 (Latest edition) *Code of Good Practice for the Reductions of Emission of Fluorocarbon Refrigerants*

AS/NZS 3760 (Latest edition) *In-service Safety Inspection and Testing of Electrical Equipment*

AS/NZS 4836 (Latest edition) *Safe Working Practice on Low-voltage Electrical Installations*

WorkCover NSW, *WorkCover Code of Practice - Low Voltage Electrical Work Local electricity distributor and authority regulations*

Where this module is used in an approved Traineeship or Apprenticeship program learners should be advised to obtain, where available, respective EEQSBA¹ **User Guides** (*these outline in detail what training and work performance the Learner is required to undertake for the program*).

Occupational health and safety requirements

A safe and healthy environment will be provided for learners and teachers. Safety procedures for the particular learning facilities shall be followed as part of the learning / teaching activity and assessment.

¹ EEQSBA – ElectroComms and EnergyUtilities Qualifications Standards Body of Australia Ltd

