
**AUTOMOTIVE ELECTRICAL AND
ELECTRONICS**
**Demonstrate knowledge of hybrid
electric vehicle (HEV) technology, and
service requirements**

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| level: | 5 |
| credit: | 6 |
| final date for comment: | December 2008 |
| expiry date: | December 2009 |
| sub-field: | Motor Industry |
| purpose: | People credited with this unit standard are able to describe hybrid electric vehicle (HEV) systems and components; describe and analyse technology design and operational challenges for HEVs; and describe and analyse service requirements for HEVs. |
| entry information: | Open. |
| accreditation option: | Evaluation of documentation and visit by NZQA and industry. |
| moderation option: | A centrally established and directed national moderation system has been set up by the NZ Motor Industry Training Organisation. |
| special notes: | <ol style="list-style-type: none">1 The following legislation must be consulted and followed where applicable: Health and Safety in Employment Act 1992.2 For the purpose of this standard, <i>hybrid electric vehicles (HEVs)</i> are defined as those that combine the internal combustion engine of a conventional vehicle with a battery and electric motor of an electric vehicle. |

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Elements and Performance Criteria

element 1

Describe HEV systems and components.

performance criteria

- 1.1 Description identifies the main components of an HEV drive train according to the vehicle manufacturers' specifications.
- Range: may include but is not limited to – electric traction motors or controllers, electric energy storage systems, hybrid power units, fuel systems, transmissions.
- 1.2 Description identifies the layout of components of a HEV propulsion system according to the vehicle manufacturers' specifications.
- Range: series hybrid configuration, parallel hybrid configuration.
- 1.3 Description identifies nickel-metal hydride (NiMH) batteries according to the manufacturers' descriptions.
- Range: life cycle, chemical make-up, self-discharge properties, heat generation, recharging, servicing.
- 1.4 Description identifies energy management and system control operation according to the manufacturers' specifications.
- Range: series design, parallel design, combined (series/parallel) design.
- 1.5 The function and characteristics of an electric traction motor are described according to the manufacturers' specifications, and reviewed in relation to HEVs.
- Range: characteristics include but are not limited to – full torque at low speeds, drive control and fault tolerance, low noise, high efficiency, flexibility in relation to voltage fluctuations.

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- 1.6 Regenerative braking features are described according to the manufacturer's descriptions, and reviewed in relation to HEV operation.
- Range: may include but is not limited to – recapturing braking energy, lower emissions, higher efficiency.
- 1.7 Idle-off (idle-stop) capability for HEVs is described in terms of environmental performance and vehicle heating requirements.

element 2

Describe and analyse technology design and operational challenges for HEVs.

performance criteria

- 2.1 The primary importance of hybrid technology for cars, sport utility vehicles (SUVs), and trucks is described and analysed.
- Range: fuel economy standards; vehicle emission standards; energy security and oil dependence; global warming emissions and healthier environment; improving technology of motors, electronics, and batteries; consumer and manufacturer choice; step to future fuel cell technology.
- 2.2 Descriptions identify the options for alternative energy storage systems according to the manufacturers' descriptions.
- Range: ultra-capacitors, flywheels.
- 2.3 Hybrid engine technology is described and analysed according to the vehicle manufacturers' specifications.
- Range: down-sizing, functions and shared power responsibilities, frequency of stop-start cycles and impact on driven accessories, emission control, use of alternative fuels.

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element 3

Describe and analyse service requirements for HEVs.

performance criteria

- 3.1 Safety requirements and precautions when servicing and/or testing HEVs are described according to the vehicle manufacturers' specifications.
- Range: working with high voltage and high current systems, electronics.
- 3.2 Driving characteristics and consumer benefits of HEVs are described and analysed as an aid to providing technical advice.
- Range: how and when the electric motor assists, low-end torque, smooth acceleration, reduced noise and vibration, added electrical capacity, reduced engine and brake maintenance, fuel economy.
- 3.3 Performance challenges of HEVs are described and analysed as an aid to providing advice to consumers.
- Range: reduced high-end torque, sustained high-speed grade ability, reduced high-speed towing capacity.
- 3.4 Diagnostic testing procedures are described according to the manufacturer's specifications.
- Range: includes but is not limited to – electronic and electronic failures, mechanical components.

Comments on this unit standard

Please contact the NZ Motor Industry Training Organisation jlane@mito.org.nz if you wish to suggest changes to the content of this unit standard.

Please Note

Providers must be accredited by the Qualifications Authority or a delegated inter-institutional body before they can register credits from assessment against unit standards or deliver courses of study leading to that assessment.

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Industry Training Organisations must be accredited by the Qualifications Authority before they can register credits from assessment against unit standards.

Accredited providers and Industry Training Organisations assessing against unit standards must engage with the moderation system that applies to those standards.

Accreditation requirements and an outline of the moderation system that applies to this standard are outlined in the Accreditation and Moderation Action Plan (AMAP). The AMAP also includes useful information about special requirements for providers wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

This unit standard is covered by AMAP 0014 which can be accessed at <http://www.nzqa.govt.nz/site/framework/search.html>.