

Assessment Requirements

Unit HV02.2K – Knowledge of Heavy Vehicle Fuel, Air Supply and Exhaust System Units and Components

Content:

Mechanical Injection Systems

- a. The layout and construction of inline and rotary diesel systems. To include governor control.
- b. The principles and requirements of compression ignition engines
 - i. combustion chambers (direct and indirect injection)
- c. The function and operation of diesel fuel injection components:
 - i. fuel filters
 - ii. sedimenters
 - iii. injector types (direct and indirect injection)
 - iv. fuel pipes
 - v. cold start systems
 - vi. manifold heaters
 - vii. fuel cut-off systems

Electronic Diesel Control

- a. The function and operation of common Electronic Diesel Control components:
 - i. air mass sensor
 - ii. throttle potentiometer
 - iii. idle speed control
 - iv. coolant sensor
 - v. fuel pressure sensor
 - vi. flywheel and camshaft sensors
 - vii. electronic control units

Electronic Common Rail Systems

- a. The layout and construction of Common Rail diesel systems
- b. The function and operation of Common Rail diesel fuel injection components:
 - i. low and high pressure pumps
 - ii. rail pressure regulator
 - iii. rail pressure sensor
 - iv. electronic injector

Electronic Unit Injector Systems

- a. The layout and construction of Electronic Unit Injector diesel systems
- b. The function and operation of Electronic Unit Injector diesel fuel injection components:
 - i. low pressure pump
 - ii. electronic unit injector

Forced Induction

- c. The purpose, construction and operation of:
 - i. superchargers
 - ii. turbochargers
 - 1) waste-gate controlled

- 2) variable geometry
 - iii. after-coolers
- d. Explain the procedures for injection pump timing and bleeding the system
- e. The procedures used when inspecting the diesel system

Fuel

- a. Key engineering principles related to engine fuel systems:
 - i. properties of fuels
 - ii. combustion processes
 - iii. exhaust gas constituents
- b. The meaning of terms related to:
 - i. hydro-carbon fuels
 - ii. volatility
 - iii. calorific value
 - iv. flash point
 - v. cetane value
- c. The composition of hydro-carbon fuels:
 - i. % hydrogen and carbon in compression ignition fuels
- d. The composition of air
- e. Symptoms and faults associated with diesel fuel systems
 - i. air in fuel system, water in fuel, filter blockage leaks, difficult starting, erratic running, excessive smoke(black, blue, white), engine knock, turbocharger, faults

Air supply and exhaust systems

- a. The construction and purpose of air filtration systems.
- b. The operating principles of air filtration systems.
- c. The construction and operation of air supply and exhaust systems to include:
 - i. supercharging
 - ii. turbo charging
- d. The construction and purpose of the exhaust emission control systems including:
 - iii. exhaust gas recirculation (EGR)
 - iv. selective catalytic reduction (SCR)
 - v. particulate trap (filter)
- e. The operating principles of the systems.
- f. Exhaust system design to include silencers and vertical stacks
- g. The procedures used when inspecting induction, air filtration and exhaust systems
- h. Symptoms and faults associated with air and exhaust systems
 - i. exhaust gas leaks
 - ii. air leaks
- i. Regulated pollutants to include:
 - i. Hydrocarbons (HC)
 - ii. Particulate matter (PM)
 - iii. Oxides of Nitrogen (NOx)
 - iv. Carbon Monoxide (CO)
- i. Key principles in exhaust emission control systems to include:
 - i. flame travel
 - ii. injection timing
 - iii. fuel pressure
 - iv. combustion chamber design

General

- a. The preparation, testing and use of tools and equipment used for:
 - i. dismantling
 - ii. removal and replacement of engine units and components
- b. Appropriate safety precautions:
 - i. PPE
 - ii. vehicle protection when dismantling
 - iii. removal and replacing engine units and components
- c. The importance of logical and systematic processes.
- d. The inspection and testing of engine units and components.
- e. The preparation of replacement units for re-fitting or replacement.
- f. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance and safety requirements.
- g. Refitting procedures.
- h. The inspection and testing of units and system to ensure compliance with manufacturer's, legal and performance requirements.
- i. The inspection and re-instatement of the vehicle following repair to ensure customer satisfaction;
 - i. cleanliness of vehicle interior and exterior
 - ii. security of components and fittings
 - iii. re-instatement of components and fittings