

Attachment 2
RETROFIT VERIFICATION APPLICATION OUTLINE

- 1. Introduction**
 - 1.1 Manufacturer and product identification
 - 1.2 Selection of specific engine family and application for verification
 - 1.2.1 Emission control system design (*model, catalyst, loading, size, etc.*)
 - 1.2.2 Claim of emission reduction
 - 1.3 Status of Vehicle Code 27156 exemption

- 2. Emission Control System (ECS) Information**
 - 2.1 General description of the ECS
 - 2.1.1 Discussion of principles of operation
 - 2.1.2 Schematics depicting operation
 - 2.2 Description of regeneration method
 - 2.2.1 Operating condition requirements for regeneration (*temperature, etc.*)
 - 2.2.2 Thresholds and control logic integrated into the ECS to activate regeneration
 - 2.3 Favorable operating conditions
 - 2.4 Unfavorable operating conditions and associated reduction in performance
 - 2.5 Fuel requirements and misfueling considerations
 - 2.6 ECS installation requirements
 - 2.7 ECS maintenance requirements

- 3. Testing Background**
 - 3.1 Identification of specific engine family and application for verification
 - 3.2 Emission reduction test information
 - 3.2.1 Test facility description
 - 3.2.2 Test procedure description (*de-greening period, test cycle, etc.*)
 - 3.2.3 Quality assurance and quality control
 - 3.3 Durability test information
 - 3.3.1 Test facility/field application description
 - 3.3.2 Test procedure description (*field or bench, test cycle, etc.*)
 - 3.3.3 Quality assurance and quality control

- 4. Test Results**
 - 4.1 Emission reduction test results and comments
 - 4.2 Durability test results and comments

- 5. Discussion**
 - 5.1 Compatibility of the ECS with the engine
 - 5.1.1 Effects of ECS on overall engine performance
 - 5.1.2 Effects of ECS on engine back-pressure
 - 5.1.3 Relationship of control logic with engine operation

- 5.1.4 Additional load on engine (*magnitude, frequency, etc.*)
- 5.1.5 Effect of ECS on fuel consumption
- 5.1.6 Engine oil consumption considerations
- 5.2 Compatibility of the ECS with the application
 - 5.2.1 Typical temperature profiles, duty cycles and other relevant parameters from field-collected data for the intended application
 - 5.2.2 Comparison of operating conditions suitable for the ECS with those expected in the application
- 5.3 Safety
 - 5.3.1 Discussion on uncontrolled regeneration
 - 5.3.2 ECS behavior during extended periods of idling
 - 5.3.3 ECS effects on particle size and number
 - 5.3.4 Ash removal considerations

6. References

7. Appendices

- A. Test reports
- B. Quality assurance and quality control documentation
- C. ECS label
- D. Owner's manual
 - D.1 Installation
 - D.2 Maintenance requirements
 - D.3 Safety
 - D.4 Fuel requirements
 - D.5 Fuel penalty
 - D.6 Durability statement
 - D.7 Warranty and liability policy
- E. Other supporting documentation