

Specification: Diesel Oxidation Catalyst (DOC)

PART 1 GENERAL

1.0 SUBMITTALS

- A. Provide drawings and product data including the following:
1. Drawings, catalog cuts, brochures, and other materials required to completely describe the systems and equipment being furnished.
 2. Project specific sales drawing of Converter Housing.
 3. Ten-Year Life Cycle Cost Analysis for general operation & maintenance costs with associated assumptions.
 4. Diesel Oxidation NSCR System design shall be based on the following engine exhaust data:
 - a. Carbon Monoxide (CO) in grams/BHP-hr
 - b. Total Hydrocarbons (THC) in grams/BHP-hr
 - c. Formaldehyde (CH₂O) in grams/BHP-hr
 - d. Particulate Matter (PM₁₀ or PM_{2.5}) in grams/BHP-hr
 - e. Fuel Sulfur Level in ppm
 - f. Exhaust Temperature in °F
 - g. Exhaust Flow Rate in lbs/hr
 - h. Exhaust Oxygen Content in percent
 - i. Allowable Exhaust Back Pressure Limit in Inches of Water Column (“WC)
 5. Guaranteed exhaust gas emission data at the stable design point following 3-Way catalytic converter system include:
 - a. Carbon Monoxide (CO) in grams/BHP-hr
 - b. Total Hydrocarbons (THC) in grams/BHP-hr
 - c. Formaldehyde (CH₂O) in grams/BHP-hr
 - d. Particulate Matter (PM₁₀ or PM_{2.5}) in grams/BHP-hr
 6. O&M Manuals including installation guidelines for the converter housing and catalyst shall be provided in hard copy with the equipment and available electronically for review.

1.1 QUALITY ASSURANCE

- A. The non-selective catalytic reduction system shall be successfully proven in similar stationary applications.
- B. Manufacturer/Supplier to have successfully commissioned at least (1000) NSCR units installed on stationary reciprocating internal combustion engines within the United States.
- C. Manufacturer/Supplier to have at least 10-years experience supplying NSCR equipment for stationary reciprocating internal combustion engines within the United States.
- D. The following shall be tested for accuracy by the NSCR Manufacturer prior to shipment:
1. Converter and Catalyst Dimensions

1.2 DELIVERY, STORAGE AND HANDLING

- A. Equipment, material and spare parts will ship to customer complete, for installation by others.
- B. Standard shipping terms are F.O.B. Tulsa.

1.3 MAINTENANCE

- A. The NSCR System supplier shall maintain an adequate stock, within the United States, of maintenance/replacement parts for the system, including complete catalyst elements.

1.4 WARRANTY

- A. All equipment supplied under this Section shall be warranted by the manufacturer for a period of 12 months from when the equipment is placed into service, or 18 months from the date the equipment is available for shipment, whichever occurs first. The specifics of the warranty should be included within the quotation.
- B. The supplier shall provide a written guarantee of performance tied directly to the engine manufacturer's written guarantee and shall be evaluated on stated levels of pollutants.

1.5 COMMISSIONING AND FIELD SERVICE SUPPORT

- A. Supplier/Manufacturer shall have a United States based service department staffed with no less than (2) factory trained and certified emissions technicians. Service technician qualifications must be available for review and approval upon request.
- B. Service technicians must be qualified to train operating personnel on the general operating, maintenance and troubleshooting of the system.

PART 2 PRODUCTS

2.0 CATALYTIC REDUCTION SYSTEMS FOR ENGINE EXHAUST

- A. Available Non-Selective Catalyst Reduction System Manufacturers:
 - 1. MIRATECH Corporation.
- B. The engine(s) shall be furnished with a catalytic reduction system to reduce engine exhaust emissions detailed in 1.0.A.5 of this specification.

2.1 NSCR System Components

- A. NSCR Reactor Housing
 - 1. Shall contain an insertion track system, which allows one or two layers of catalyst elements to be slid into place from outside the housing.
 - 2. Shall be a rigid structure, which will not warp or deform significantly during normal operation.
 - 3. Shall be designed to allow for thermal expansion differences within the housing, while preventing exhaust gas from leaking past the catalyst.

4. Shall be designed as a free-standing, self-supported structure. The housing shall be complete with inlet and outlet flanged pipe sections designed for bolting to the exhaust gas ductwork. Connection to the engine exhaust system will be via standard ANSI 150 lb pattern, flat faced flanges. Two (2) lifting lugs shall be provided for ease of handling.
5. Shall be equipped with a bolted on access door(s) to the catalyst elements. The door(s) shall incorporate a handle and can be easily removed without the assistance of lifting equipment and be on the top or the side of the housing. Door(s) shall be designed with non-asbestos gasket sealing to prevent exhaust gas from leaking to the atmosphere.
6. Shall be constructed of carbon steel, painted on the exterior only, or unpainted stainless steel, based on the recommendation of the manufacturer. Fabrication steel is 12 gauge or thicker to provide structural support and rigidity.
7. Shall provide (4) ½-inch NPT couplings for differential pressure and temperature measurement upstream and downstream of the catalyst elements. Additionally, an 18 mm coupling shall be provided for installation of an oxygen sensor.
8. Flange bolt holes shall straddle the vertical centerline.
9. Shall have a stamped metal nameplate providing serial number and manufacturer reference material.
10. Shall be designed as a stand alone converter and as a combination converter/silencer. Silencer designs shall be available for critical grade (25-30 dBA) and hospital grade (30-35 dBA) sound reduction.

B. Diesel Oxidation Catalyst Elements

1. The catalyst shall be composed of a substrate, washcoat, and catalytically active materials.
2. The substrate shall be a high-temperature rated alloy metal foil, with alternating corrugated and flat layers. The foil is rolled up to create a honeycomb-like structure with many small channels for the exhaust to flow through the element. The channels provide a high surface area without causing excessive exhaust backpressure. The use of flat foil prevents nesting by providing positive separation between the corrugated layers.
3. The catalyst foil shall be 74.5 mm in length.
4. The washcoat and catalytically active materials shall be applied onto the metal foil prior to rolling the finished element.
5. The washcoat shall be composed on a high surface area alumina-based material, with additives designed to resist sulfur poisoning and to limit the conversion of SO_2 to SO_3 .
6. The catalytically active materials shall be a combination of Platinum Group Metals (PGM), including platinum. The PGM shall be deposited on the washcoat by chemisorption.
7. The rolled catalyst element shall be wrapped with a stainless steel band.
8. The banded catalyst element shall be drilled and pinned with at least (6) stainless steel pins to maintain the catalyst structure within the band.
9. A combination sealing plate/lifting handle shall be welded to the band. The plate shall be constructed of stainless steel.

10. A single high temperature fiberglass gasket shall be wrapped around the element to seal it within the housing. The top surface of the sealing plate shall be sealed against the door when it is installed.
11. The minimum catalyst inlet temperature is 450° F. Higher temperatures will lead to higher reduction percentages. The maximum catalyst outlet temperature is 1,350° F.
12. The completed elements shall weigh less than 60 pounds, so they can be installed without the need of overhead lifting equipment.