

# NSCR & OXIDATION CATALYSTS OPERATION AND MAINTENANCE INSTRUCTIONS

## WHY DO CATALYSTS FAIL TO LAST AS LONG AS EXPECTED?

While most people support the need for pollution control, there are issues that cause more expense than necessary. Given good design, good engine and load maintenance a catalytic system should give 7+ years of life with minor care. Here are some issues to consider before replacing a catalyst.

### Issues That Affect Catalyst Life

#### 1. High Temperature:

- a. Our catalysts operate up to a stated 1200F max. We advise customers to stay under 1100F to allow for excursions. Over 1200F, the wash coats and precious metals begin to sinter/crystallize and over a short time become useless. Both metal monolith and ceramic units have the same limitation.
- b. Another source of high temp is misfiring cylinders (raw fuel goes into the exhaust) and 'hot' fuel and combustible contaminants such as oil.
- c. The catalytic action temperature rise plus the exhaust temperature exceeds the limit.

#### 2. Contaminants In The Exhaust Steam:

- a. Heavy metals such as zinc and phosphorous bond with the precious metals. Some heavy metals are present in the oil as wear inhibitors. Most of the oil is kept in the crankcase. Anti-freeze is another source of catalyst poisons. The damage is cumulative. Well maintained engines usually emit such small amounts as to cause a problem.
- b. Excessive oil in the exhaust can build up on a catalyst and catch fire. This is especially true of standby units that are "cold cranked" and never run up to operating temperature long enough to burn off oil that may get into the exhaust when the cylinders are cold.
- c. Contaminants such as sulfur "mask" the catalyst and are removable with careful cleaning --- cleaning frequency varies based on the junk in the fuel and is highly variable. If the engine is properly maintained and if the catalyst is properly sized, a fuel analysis or a laboratory analysis of the catalyst 'coating' should be considered.

#### 3. Back-Firing Or Excessive Exhaust Pulsation:

- a. If the catalyst isn't cross-braced, it may telescope or even be blown into pieces. Bracing in the enclosure only may not suffice.
  - i. Check the engine and load control systems to see if there is a malfunction/maladjustment causing excessive pulsation.
  - ii. Check fuel, startup and operating procedures.

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### 4. Inaccurate Engine Specifications:

- a. Catalysts are sized based on a lot of factors (flow, velocity, temperature, content, dre needs, pressure drop, etc) If the specs do not accurately match reality, the catalyst may be undersized.

### 5. Improper Washing

- a. "Hard" tap/well/bottled water contain a lot of metallic ions that poison the catalyst over several washings. Do not use water from a garden hose.
- b. Chemical bath processes must be carefully monitored for concentration, temperature, technique and time.

### 6. Marginal Sizing:

- a. If sized too closely to the application, catalysts will require more frequent cleaning, and shorter life since only 2-3 cleanings are practical.

*Each manufacturer uses slightly different 'wash coats' and precious metals loading. Some wash coats enhance CO performance at the cost of VOC reduction. Some use palladium as a partial or total substitute for platinum to reduce costs. Cold palladium catalysts may emit an ammonia odor. Cell density standards vary from about 50-700cps. Loading standards and ratios are kept confidential by the manufacturers. These variations can make a single parameter one-to-one comparison difficult. The quality of a manufacturer's warranty and field experience, in the end, are essential.*

### 7. Mechanical/ Chemical Problems Due To Failures In Manufacturing Process Control

- a. Poor winding techniques can cause gapping or sagging of the honeycomb allowing exhaust to bypass the catalyst.
- b. Poor welding practice may result in various separations.
- c. Poor coating practices may result in poor performance and/or sloughing.

*We monitor our embossing and winding equipment settings hourly. We check our solutions every day. Because we form the elements, band and cross-brace, heat-treat and coat – in that order, we have a superior BONDED unit compared to others who use precoated ribbon stock that gets damaged and is prone to gapping/sagging. Most others don't cross brace at all. Some try to speed up production time by reducing the number of coating/drying steps.*

### 8. Improper Storage

- a. Freezing, oil drippings & rainwater puddles all take their toll.
- b. Some contaminants in the water, oil and other droppings may poison the element to some extent.
- c. Visual inspections cannot always evaluate changes in the catalyst bed effectiveness. Only "testing in use" or a factory core test will be definitive.

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PCA sizes catalytic systems based on 24 years' experience supported by factory scientific advice. Formal performance guarantees are available based on certified engine data and specified maintenance and record keeping.