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## **SPECIFICATIONS - CATALYST WASHING PROCEDURE**

### **Caution**

Handling the DCLI metal catalyst element does not pose any particular health or safety hazard related to catalyst composition or formulation. However, this procedure does not include detailed safety precautions relative to the operations described. **When following this procedure, ensure that all work is carried out in a safe manner in accordance with occupational health & safety and other applicable safety regulations.**

**Consult your company health and safety officer for details of safe working practices.** Areas of concern include, but are not limited to:

1. Safe removal of the catalyst element from the converter.
2. Safe handling of chemicals (sodium hydroxide, acetic acid).
  - a) Ventilation.
  - b) Personal protection (gloves, coveralls, etc.).
  - c) Safety glasses.
3. Safe disposal of spent cleaning solutions in accordance with applicable water pollution regulations.

### **Introduction**

Washing of the catalyst element in base and acid solutions is recommended after two to three years of operation, in order to restore activity to an old catalyst. Sodium hydroxide is an effective wash solution for removing many fouling and masking agents which can accumulate on the surface of the catalyst. It is particularly effective against organic residues and chars. Certain inorganic deposits may also be more soluble in basic solutions than in acidic.

### **Procedure**

1. In order to submerge the catalyst element in the wash solution, a tank large enough to hold the catalyst charge will be needed. The tank must be impervious to attack by concentrated (5% by weight) sodium hydroxide (5% NaOH).
2. It is required that the wash solution be fresh, un-used, chloride-free 5% NaOH. If anhydrous powder is used, dilution should be made with de-ionized water. Due to the heat generated in the mixing of anhydrous NaOH and water, sufficient time is needed to cool the solution before submersion of catalyst elements.
3. It is required that the NaOH wash solution be maintained at a temperature between 60°F (16°C) and 80°F (27°C).
4. Sufficient NaOH solution is needed to completely submerge the catalyst element. It is required that two (2) liters of solution be used for each liter of catalyst element.
5. Submerge the catalyst element horizontally in the wash solution, with approximately 3/4" (19 mm) of space between other catalyst elements and the bottom of the tank.

6. Cover the tank and allow the catalyst element to soak for four (4) hours.
7. Remove the catalyst element from the tank and shake the block several times until excess solution is drained from the honeycomb channels.
8. Immerse the catalyst element horizontally in a tank containing de-ionized water with spacings as outlined in step 5. Sufficient de-ionized water is needed to completely submerge the catalyst element. It is required that a minimum of two (2) liters of de-ionized water is used for each liter of catalyst element.
9. Allow the catalyst element to soak in de-ionized water for 30 minutes.
10. Remove catalyst element from the tank and shake several times until excess water is drained from the honeycomb channels.
11. Repeat steps 8 through 10.
12. Immerse the catalyst element horizontally in a tank containing 10% acetic acid. If dilution of the acetic acid is required, only de-ionized water should be used. Sufficient 10% acetic acid is needed to completely submerge the catalyst element. Two (2) liters of 10% acetic acid per liter of catalyst block is required.
13. Allow catalyst elements to soak in 10% acetic acid solution for 30 minutes.
14. After 30 minutes, remove the catalyst element from the tank and shake several times until excess solution is drained from channels.
15. It is essential that the sodium remaining on the catalyst be removed by through rinsing after every wash. This is most easily accomplished by repeated soakings of the catalyst element in clean de-ionized water, following steps 8-10 above. The water rinse should be repeated a minimum of three times using fresh de-ionized water (two liters of de-ionized water for each liter of catalyst element) each time and allowing a 30-minute soak for each rinse cycle. The final rinse solution should be essentially sodium free at the end, i.e., the concentration of sodium should be no more than 4 ppm greater than the concentration in the clean rinse water and in no event greater than 20 ppm total. If this is not achieved after three rinse cycles, additional rinse cycles will be necessary.
16. Using an air gun, blow clean, oil-free compressed air or nitrogen through the honeycomb channels. The air gun should be swept slowly across the face of the catalyst element so as to direct the air flow through each individual channel. The pressure should be adjusted to provide cleaning of the fluid from the channels. Excessive pressure may damage the catalyst coating.

**Use only clean, oil-free compressed air or nitrogen.**

**Do not** touch the catalyst element face with the tip of the air gun while it is in motion as this may distort the stainless steel substrate foil.

You will not be able to completely dry the catalyst element by this method. The purpose is just to remove the bulk of the water from the catalyst channels. If the catalyst is not to be installed in the converter immediately after wash (within two days), it must be oven dried at 250-300°F (121-149°C) for four hours to remove residual moisture before storage.

17. Reinstall the catalyst element into the converter.
18. Start the engine and hold the exhaust temperature to approximately 250-300°F (121-149°C) for one hour in order to dry the catalyst element.
19. Resume normal operation.