

What Do We Really Know About DEF?



Maintaining DEF Dosing Valves

With Selective Catalytic Reduction, or SCR, now becoming widely used as a means of reducing NOx levels in diesel exhaust, we know that the spraying of Diesel Exhaust Fluid (DEF) urea solution into the exhaust is essential to the emission control process. That spraying function is accomplished through a dosing valve mounted onto a pipe known as the decomposition reactor which runs between the Diesel Particulate Filter (DPF) and the SCR catalytic chamber. How much do we know about that dosing valve and its maintenance?

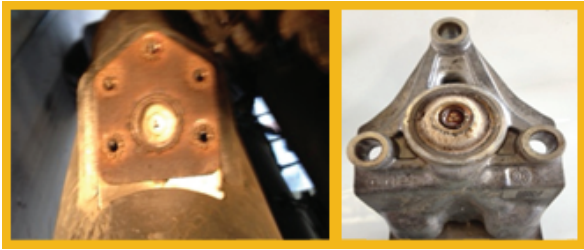
Some engine manufacturers might say that the valve needs no maintenance. Others provide extensive instructions for maintaining the valve right in their service manuals. Let's look at what pro-MECH has found.



Here are views of the dosing valve found in Pro-MECH's SCR and DEF courses. The two tube connectors on the base of the valve are where coolant is circulated to cool the valve and the upper center port is where the valve releases DEF into the decomposition reactor.

First of all, the angle of the spray coming out of the valve is critical to the function of NOx reduction. If the urea solution mist is not evenly distributed in the exhaust stream, the NOx sensor in the SCR catalytic chamber will signal the ECM that the NOx level is out of limits and will set a code. That spray angle and distribution pattern is preset in the valve. The OEM service manuals contain instructions for removing the valve and measuring the spray angle and distribution pattern.

Secondly, the valve tip can accumulate a white urea residue when the solution dries. Eventually, if the valve tip collects enough residue, the spray angle can be changed enough to change the spray angle. Therefore, there are OEM cleaning instructions included in Pro-MECH's courses.



Bulletin Update: **DEF System Air Contamination**

Be on the watch for DEF leakage problems in certain segments of the distribution system. A recent instruction advises that Diagnostic Trouble Codes (DTCs) 3596 and 3574 could be present together when the leakage occurs. Apparently, the main culprits are leaky o-rings in the multi-functional DEF distribution head and cracks in the distribution lines. A white residue accumulation at such points will indicate the leakage. Also, during a test procedure for air in the system, bubbles will show up at the leakage points. If the leaks are not corrected, the system will become contaminated with air incursion and the codes will be set.

These views show the condition of a dosing valve and its seat on the decomposition reactor after several hundred engine hours on a truck that experienced extensive stop and go driving. The OEM literature indicated that some white residue accumulation is normal. This valve had to be cleaned, and its seat was almost completely clogged.

As the vehicles on the road accumulate mileage with their new urea spray systems, we need to be on the watch for the effects of urea residue in SCR systems.

Tech Tester:

A trial of a Pro-MECH course will quickly reveal that little quizzes occur throughout the courses as a test of whether the lesson material is understood. Let's have some fun and see how you would answer a few of these quizzes. The answers are upside down on the bottom of this newsletter

Question 1: DEF turns to slush in the storage tank around what temperature?

- a. 32F
- b. 0F
- c. -12F
- d. 12F

Question 2: When the DEF warning lamp on the instrument panel turns amber, the engine will:

- a. Stall out.
- b. Misfire.
- c. Begin to derate.

Question 3: In an SCR system, warm coolant flows through:

- a. The DEF dosing control unit.
- b. The DEF dosing valve.
- c. The DEF storage tank.
- d. All of the above.
- e. Some of the above.

Answers: Question 1 12F; Question 2 Begin to derate; Question 3 All of the above.