Heavy-duty OBD is coming

The latest onboard diagnostics will monitor emission systems on 2010 engines

Last December, the Environmental Protection Agency (EPA) issued its final rule to require onboard diagnostic (OBD) systems on heavy-duty engines used in highway vehicles weighing over 14,000 lbs. beginning with model year 2010. While OBD is not new (these computer systems have been compulsory in cars and light trucks since 1996), their requirement in highway heavy-duty applications is the next step in verifying the lower levels of nitrogen oxides (NOx) and particulate matter mandated for heavy-duty 2010 engines. The EPA's ruling requires that all major emissions control systems be monitored and malfunctions be detected prior to emissions exceeding the thresholds. To comply with the new emissions standards, aftertreatment devices (diesel particulate filters and NOx-reducing catalysts) used on highway diesel engines will be monitored and their failure will be detected and noted to the driver. In such cases, while the vehicle operator will see a malfunction indicator light (MIL) on the dashboard, it will be up to the repair and maintenance technicians to diagnose and correct any problems. In most cases, the vehicle will continue to operate, but perhaps with reduced performance. Just as in trucks now, an illuminated MIL means something needs to be investigated, and the vehicle should be brought in for service.

For fleet technicians, OBD assists in the service and repair of vehicles by providing a way to pinpoint problems by retrieving vital diagnostic information from the vehicle's systems.

The latest standard, heavy-duty OBD (HD OBD), is really just more electronics, sensors and actuators similar to those already part of the engine's electronic control unit, but in this case dedicated to monitoring exhaust emissions. For those manufacturers opting to use selective catalytic reduction (SCR) to meet emissions goals in 2010, HD OBD will also monitor the performance and status of those systems (such as the quantity of the catalytic urea solution onboard).

"It's more of the same thing we already have — just more connections and sensors that we've been dealing with since we started with electronically controlled engines," says Kevin Tomlinson, current chair of the Technology and Maintenance Council's S.12 Onboard Vehicle Electronics Study Group.

At first, the EPA is requiring that just one engine family per manufacturer be certified to the OBD requirements in the 2010 through 2012 model years for Class 4 and above highway applications. But, beginning in 2013, all highway engines for all manufacturers will have to be certified to the OBD requirements. (Visit EPA's Office of Transportation and Air Quality website at: www.epa.gov/obd to access the rule and related documents.)

The EPA considers OBD to be a critical element in its program to improve air quality. It's not new to the heavy-duty world. When estimating emission reductions associated with the 2007 highway rule, the EPA assumed OBD requirements as a way to help ensure that the projected health benefits from cleaner air would be realized.

While OBD is necessary for complying with emission controls, the devil is in the details.

Engine maker compliance

"The regulators are pushing very hard to introduce OBD in the heavy-duty industry as rapidly as possible, and with this comes many challenges and continuous negotiations," says Miguel Soetaert, group leader component optimization, Detroit Diesel Corp. "The trucking industry has learned from the automotive industry that OBD takes time to introduce properly."

From an engine manufacturer's perspective, Soetaert notes that all EPA '10 vehicles equipped with Detroit Diesel engines will have BlueTec SCR technology, which will use diesel exhaust fluid (DEF), a SCR catalyst and a MIL. "With OBD, sensors will need to monitor the condition of everything from EGR valves to NOx-reducing catalysts," he explains. Detroit Diesel has had to add a sensor in the crankcase ventilation system specifically for OBD. All other OBD strategies use existing temperature and pressure signals or other inputs existing in the system, he adds. The process has not been easy.

"Calibrating and demonstrating to a threshold for both DPF conversion efficiency and SCR conversion efficiency have required the most effort to insure that only true failures are identified." He explains that there could be cases where the MIL is illuminated with no performance impact recognized by the driver. "Detroit Diesel engineers are working to do as much as practical within the design to be able to pinpoint the root cause of a fault," Soetaert continues. Determining what is going wrong may be a maintenance challenge. "While the troubleshooting process will not be significantly different due to the introduction of OBD, dealing with these faults and ensuring that the issue has been resolved may be considered new to some technicians," he notes. "In some cases the technician may be required to perform additional tests or procedures to confirm root cause and ensure proper diagnosis." Detroit Diesel has already started training technicians for EPA '10 products and will continue throughout this year.

There is some good news concerning diagnostic tools. Detroit Diesel uses laptop computers with Microsoft's Windows operating systems as the platform for its service tools, and while they'll need an updated configuration file to display the new 2010 information, no new hardware or communication adapter is required for EPA '10 engines.

The current service tool, Detroit Diesel Diagnostic Link (DDDL), will have more displays to support OBD functions such as diagnostic trouble code (DTC) identification, instrumentation and service-routine screens. In addition, Soetaert says DDEC Reports will have DEF consumption information in its trip activity, daily engine usage and life-to-date reports. Existing users of DDDL only need to upgrade the software, according to Soetaert. New users can purchase DDDL with software only or software with a communication adapter kit.

There are some possible extra benefits to having access to the OBD's data, says Soetaert. "Each fleet could use OBD data differently depending on its business model, similar to how fleets manage diagnostic trouble codes or trip data."

Similar assurances about heavy-duty OBD's introduction also come from PACCAR, which designs and manufactures engines (DAF) and makes Kenworth and Peterbilt trucks. "A standardization of fault codes is part of the OBD regulations," says Tom Sloane, technology development manager at the PACCAR Technical Center. "This means every fault code that can be detected by the engine computer has to be reported in a common, standard format so a single scan tool can get diagnostic codes from all engines." Sloane explains that new tools will be introduced for the shop floor — both from OEMs and independent providers. "Because of standardized fault codes, we anticipate a variety of scan tools will be available. The tools will be comprehensive in their ability to collect and accurately report all of the engine-related faults."

He adds, "Although there will be a new generation of tools evolving, most current tools will continue to support most of the fault codes in the short term."

Sloane also believes that technicians will need to be savvy on electrical and electronics troubleshooting as this task becomes more a regular part of engine maintenance. He points out that both Kenworth and Peterbilt have comprehensive dealer training programs to assist service technicians with understanding and using OBD for the 2010 engines that will have it.

OBD is not new to Cummins Inc. In fact, Cummins has had experience with onboard diagnostics with the Cummins Turbo Diesel engine product since 1997, says Christy Nycz, Cummins' on-highway communications manager. Cummins service tools plan to support all of the diagnostic and troubleshooting needs associated with the introduction of HD OBD, Nycz adds. Cummins service tools, such as Insite, will be designed to read fault codes and support troubleshooting and repair procedures on any Cummins engine.

Scan tools will be ready
Scan tool manufacturers are also well prepared for heavy-duty OBD. Ed Lipscomb, senior product manager — diagnostic systems for SPX Service Solutions (the makers of OTC scan tools), says regarding OBD changes for fleets, "I am not aware of any issues from this. Our tools are OEM-enhanced as well as OBD II (used in automotive and medium-duty applications), and therefore we support many protocols, data item quantities and variants from around the globe." He adds, "In my initial read of the document and earlier correspondence I saw nothing that is different than we do now for the light- and medium-duty OBD II vehicles. There are some minor differences, I am sure, but in essence it is the same." Since the company's professional tools already support J1708/J1587, J1939 and CAN protocols, Lipscomb expects OBD to be a non-issue. SPX Solutions/OTC sells heavy-duty standard specific scan tools as well.

Noregon Systems is a supplier of diagnostic
solutions (Panasonic Toughbook laptops loaded with their software have been coveted prizes for work station winners at TMC's SuperTech competition). Lee Lackey, Noregon Systems' technical sales director, says fleets should prepare for HD OBD with some training from the OEM or engine maker. "If your technicians haven't had a refresher course on engine diagnostics in the last few years, you might want to consider sending them back to a class," says Lackey, "so they can get the latest in changes to both the engine equipment as well as the diagnostics involved." Noregon's JPRO Fleet product line includes diagnostic software, data link adapters and even fleet service kits complete with Panasonic Toughbooks. Lackey says they'll be ready for the new OBD. "We're waiting on the 2010 regulations to be finalized later this year before we implement any new HD OBD functions, but we should start supporting the basic 2010 emission diagnostics in Q1 of 2010." Due to its newness, Lackey expects that most fleets will go to the dealer if any emissions issues crop up early on. Eventually, fleets will learn how to do their own diagnosis, and they should be able to update or upgrade existing tools. "HD OBD uses the standard diagnostic connector and works with J1939, which is supported by all major RP1210A/B adapters," Lackey advises.

HD OBD's new features
There is a new feature in the upcoming OBD called a pending fault — received when the unit suspects there is a problem with the emissions system, but the vehicle hasn't been driven enough to confirm the problem. When the truck is brought in, the technician will try to fix it. After the repair, the technician can check to verify that the emission fault appears to be fixed. However, to fully confirm that the emission fault is gone the technician will need to perform a driving-cycle test. This means the fleet shop may have to allocate the extra 20 minutes and a driver with CDL to complete an on-road test. Another new feature in HD OBD is the permanent fault, which stays in the system. It was added to make it harder to cheat on an emissions test

by just clearing the fault without fixing the problem, Lackey explains. To pass an emissions test when a permanent fault is indicated, a fleet should be ready to provide proof of repair.

Currently there are no mandates that would require fleets to collect, manage or maintain OBD data, says Cummins' Nycz. However, by collecting and monitoring the data, a fleet maintainer could stay aware of potential service needs for specific vehicles.

Another aftermarket diagnostic solutions provider, Zonar Systems, hopes that the OEMs will keep their fault codes open, not proprietary or encrypted. Mike McQuade, Zonar System's chief technology officer, says their format is completely open. "All this data belongs to you and we have a published API to get it all out, so your maintenance and back office software can use it. That openness is desirable to fleet guys who have lived with closed, proprietary systems for so long," he continues.

OBD will be able to move out of the shop, via telematics, to pinpoint in real-time the condition and location of a vehicle on the road. When a fault code comes up, a product such as Zonar Systems' new J3 engine diagnostics module can wirelessly transmit fault codes and other data combined with spatially encoded location information. Fleets can then instantly inform a driver what action should be taken to protect the vehicle or cargo, including rerouting to the nearest repair facility.