

The event is stored in the electronic system memory. Before that unit goes back into service, the mechanic has access to all of the sensor data related to the event. If the yellow, check engine light comes on and stays on, the driver can push the engine check button and a defect code will be transmitted to the driver. With a pocket card, the driver can determine the exact nature of the problem and determine if it is safe to continue operating the vehicle.

There are certain events where the engine protection system will shut down the engine. These events include loss of coolant, low oil pressure, or engine overheating. If any of these conditions exist, both the yellow and the red light will come on, indicating that a major problem exists. In the engine shut down mode, the driver has thirty seconds to move the vehicle to a safe position. If additional time is needed, there is an override button. All that does is start the shut down sequence over.

A diagnostic data reader is used to extract the event date from the electronic system memory. The reader is similar to the General Motors or Chrysler electronic cards introduced a few years ago. The reader has some programming capabilities. If a vehicle comes in with a problem, data is recorded just prior and just after the incident. This information will be available for the mechanics and technicians to determine what has happened. It records not only the fuel consumption, but also the number of engine hours, how many times it has been set at idle, and how much time in PTO mode. There is also a printer interfaced. The capabilities of the diagnostic data reader to provide information are extensive.

Electronic System Programming

Programming, modifying, or calibrating the electronic system may involve changing the password security, modifying the idle time or PTO setting, modifying the shut down criteria, or changing the governor procedures. Changing the PTO settings could involve selecting the initial speed, the minimum speed, and the maximum speed. Historical trail codes or audit codes are recorded in memory to describe the time of the event and conditions monitored by sensors. The electronic system can also record when an operator has tampered with the vehicle to make it go faster. It can record at what engine hour an event occurred. The data can be fed into personal computer or transmitted by modem to the home office to assist in diagnosing problems.

Programming security

There are three levels of security which can be programmed into the electronic system. The first is no security. The ID code is set to four zeros. Anyone can gain access to the system. The second level is when the ID code is left blank for operators to program in their own four digit number. Anyone with the four digit code can have access to make system changes. The third level is what is called lock out. This is typically used when a customer has exact specifications. The customer then controls who has access to program. Note that no ID code is needed to obtain data for diagnostics. Programming is a separate function from the diagnostic portion in the reader.

Summary

The use of electronics will continue to increase in the future. The software for the electronics system can be changed for specific customer applications. Diagnostics with an electronic system is similar to investigating why one of the trail lights does not work. The system is checked out one wire or one circuit at a time. The electronic system appears to be complicated but it is no different from any other trouble shooting on any other electrical component on the vehicle.

1990-93 ENGINE TECHNOLOGY

Jeff D. Jones, *Cummins Engines*

The trucking industry is facing a new set of challenges as the 1990s begin: rising operating and equipment costs, increasing competition, more complex systems requirements, driver shortages, and safety and environmental concerns. There is an innovative new lineup of engines to address many of these challenges.

The first step in the process of introducing advanced technology engines began several years ago with a simple goal: to create a new truck engine designed from a customer point of view. This goal led to an extensive 18-month market research effort which laid the foundation for the new generation of diesel engines. During this period, countless truck owners, drivers, dealers and other industry personnel were interviewed to define new products based on customer needs. One point became crystal clear: every truck operator has unique requirements.

Based on this research and the customer-led philosophy, Cummins decided to design and develop heavy-duty truck engines for the 1990s. These new products provide truck owners and operators the choice in engine weight and size to match closely their particular equipment, trade cycles, and business needs. Another important part of the customer-led strategy was the decision to offer customers the choice between the new electronic fuel system or the familiar mechanical fuel system with optional electronic controls.

Electronic Choices

Cummins adds a new dimension for customers with a new electronic fuel system. As more and more owner operators and fleet owners request electronic technology to cover their individual needs. The fuel system is a proven technology featuring electronically controlled unit injectors. It lets truck owners select many performance-improving options.

- Cruise control for increased driving comfort and fuel efficiency. In-cab switches area available for setting and maintaining road speed above 30 mph and 1000 rpm.
- Adjustable low idle speed that can be set up or down in 25 rpm increments.
- Power take-off (PTO) control switches, which provide a convenient method to set and maintain a precise engine speed for a PTO operation.
- Road speed governing which allows you to fix maximum road speed within a range for improved tank mileage. Test results show that for every mile per hour that road speed is lowered, up to one-tenth of a mile per gallon can be saved.
- Gear-down protection that limits maximum road speed to the top gear for greater fuel efficiency.
- An idle shutdown feature that can be adjusted to shut automatically the engine off after a specified amount of idle time between three and 60 minutes.
- A choice of automotive or variable speed engine governors to match driver preference or application.

Standard features on the fuel system include an engine protection system and self diagnostics. The engine protection system monitors coolant temperature, oil temperature, intake manifold temperature, oil pressure and coolant level. This investment protection feature will also alert the driver with a visual and audio alarm when critical conditions appear. Operators will see improved fuel economy through the electronic control of fuel injection timing and metering, excellent cold starting

capabilities, reduced cold smoke and improved driveability.

Keeping individual needs in mind, mechanical fuel systems are available on new engines so customers can choose the most appropriate system for their operation. The mechanical PT fuel system, with it's high injection pressure capabilities, is very efficient at the 1991 emission levels. A wide range of models equipped with the PT system will be offered in 1991, from 260 to 410 horsepower. We anticipate that these mechanical engines will remain the preferred choice of many vocational applications such as dump trucks, refuse trucks, mixers and local pick up and delivery operation. A road speed governor is available and will be popular among line-haul fleets that favor the familiar mechanical fuel system, and value the benefits of electronics in controlling the top speed of their trucks.

COMMAND Performance

We've paid special attention to the driver as we developed these truck engines. As a result, Cummins is introducing a revolutionary concept in performance which puts the maximum horsepower output in the rpm range where most of the driving gets done. These engines offer a wider operating range than ever before. Maximum power is generated below governed speed, where drivers often cruise and the engine delivers the best fuel economy. At the lower rpm, when in a hard pull, these engines deliver constant peak torque over a wide rpm range, resulting in fewer downshifts and stronger driveability.

TRAINING REQUIREMENTS FOR MECHANICS WHEN ELECTRONIC DIESEL ENGINES ENTER THE FLEET

Mike Wilinski, Robert Bosch Corporation

What happened to the simple engines and systems of yesterday? In the past twenty-plus years we have advanced to what we call total engine management systems - not just fuel injections. Electronics in the motor vehicle has evolved into ignition and timing control, knock control, ABS, ASR, air bags and more. Just switch on your on-board computer and it will give you your average fuel usage, speed, distance traveled and more.

In a typical diesel fuel injection system a low pressure feed pump draws fuel from the tank and supplies it to the injection pump. The injection pump supplies high pressure fuel to the engine mounted injectors. The injectors atomize the fuel directly into the combustion