



Pump Pressure Governors for Electronic Engines

"A New Twist to a Proven System!"

It's been said that today's electronic technology will bring us more changes in industry and the way we do things in the next five years, than all those we have seen since the turn of the century. The emergency vehicle and equipment industry is moving rapidly to take advantage of the opportunities brought about by this phenomenon.

The NFPA Apparatus Standard (1901) states that, "A means shall be provided for controlling the discharge pressure of the pump either through an automatic relief valve or a pressure regulator that controls the speed of the pump." In other words, to protect your firefighters from surges in hose lines, you need a relief valve or engine/pump governor on any apparatus equipped with a pump.

Along with high maintenance requirements, mechanical pressure governors for diesel engines have had some inherent design limitations, consequently many users have opted to use relief valves in lieu of governors. With electronic engines, mechanically operate pump pressure governors are out and a new generation of electronic governors are "communicating" directly with the diesel engine fuel management system. Moving parts, mechanical cables, diaphragms, springs and water carrying tubes are eliminated. Electronic governors offer many more "user friendly" features and more importantly, the engine/pump control is much more precise and the operational reaction time is much faster!

The Real Story

Pump pressure governors are a prime example of how engineers are blending government requirements for cleaner engines with the fire service needs for a more versatile pressure control system for pumping apparatus. By pushing one or more buttons, the pump operator can communicate directly to the engine's fuel management system via an electronic pathway.

A Little History

Since the advent of steam pumping apparatus, builders have been providing a method of controlling excess pressure. When gasoline powered pumpers arrived, a modification of the steam valve (non-adjustable) was initially used on the fire pump.

Let's keep in mind that the purpose of either a relief valve or a governor is to prevent an uncontrolled increase in pressure in the discharge lines. The way they do it is different, but the desired results are the same.

Sometime prior to the 1940's, adjustable mechanical relief valves were developed and they became the standard device used on most of the pump-equipped apparatus to minimize surges in the hose lines. Functionally, the relief valves relieve excess pressure from the discharge to the suction side of the pump.

To offer more flexibility and a form of automatic pump operation, manufacturers then developed mechanical engine governors to control pump speed and, therefore, pump pressure.

Older pump governors for gasoline engines and then later, diesels, utilized water in small tubes, reference springs, and diaphragms. Very small orifices and air reference tanks were also used to maintain a set discharge pressure by controlling the fuel to the engines --- all of these parts added up to a maintenance nightmare!



What's Changed?

Detroit Diesel's change to electronic controlled engines has been the most significant "push" to integrate electronics into the fire service. It literally told all of us, "Electronics are here to stay and we had better learn how to deal with them!"

Recently, Cummins and Caterpillar have joined Detroit Diesel in offering diesels with full electronic fuel systems. It's interesting to note that the reason for the electronic fuel control has nothing to do with what we need or do in the fire service. Actually, the E.P.A. requirement for reduced emissions was the driving force for the shift to electronically controlled engines and the fire service is fortunate to be able to benefit from the changes.

Along with the advantage of significantly more precise control with the electronic fuel systems, we are also seeing improved fuel economy, better starting, especially in cold weather, and reduced smoking on start-up. There is also the capability of reducing available torque or horsepower when a problem is sensed. This feature could prevent the destruction of an engine by slowing it down, while still providing sufficient power to keep the hose lines charged.

The New Governor Systems and How They Work

The primary component of the new pump governors is the microprocessor based panel display that the operators use to control the pump/engine package. It includes many of the engine controls that were scattered about the pump panel. Push buttons to increase or decrease engine speed replace the familiar Vernier throttle. For fast shutdowns in an emergency, and "Idle" push-button to return the engine to idle replaces the familiar red button in the center of the Vernier throttle control. Another button selects whether PSI or RPM is being used to determine engine speed. A tachometer has been designed into the packages.

On the Class 1 and Fire Research versions, a pre-set feature allows operators to push one button to increase the engine to a pre-determined pressure or RPM. Both offer as an option, a cab-mounted fast idle switch. A bonus feature on the Class 1 unit is an integral alpha-numeric display to indicate errors such as cavitation or when the engine is at idle. Thru a series of arrows, the operator is advised when the engine is increasing fuel flow to meet increased demand.

The reference input used when the PS mode is chosen is a pressure transducer mounted on the discharge of the pump. It monitors pump pressure and sends a signal to either the pump panel control display or the ECM (electronic control module) on the engine.

Separate from the governors, but tied to them as a safety feature, are a set of interlocks provided by the apparatus manufacturer. They prevent operation of the governor control until the certain operations are completed. For pump operation, the pump must be in gear, the parking brake set and the truck transmission placed in the appropriate drive positions. While in a stand-by-mode, the interlock system will also allow operation of the governors if the truck transmission is in neutral and the brakes are set. This would be used to increase the engine/alternator speed to keep the batteries charged.

Another component of the governor system is the engine manufacturers "brain" or ECM. One of the ECM's many functions is to govern fuel flow much the same as a carburetor does on a gasoline engine. When used in the pumping mode, the ECM assimilates engine and pump governor control data (inputs) and then regulates the amount of fuel and air that is directed into the engine. The new governor control systems "talk" to the ECM's through a series of 3 to 7 wires, depending on which engine is being used.



So, What's the Point?

Through the magic of electronics, and because of the need to reduce engine emissions, the fire service now has available a more reliable and versatile pump/engine governor system. Today's electronic governors have so much more to offer the fire service than a relief valve. They are much simpler to install, maintain and service than the older, mechanical governor systems.

On your next pumping apparatus, before you specify a relief valve, you really need to check out what's new in governors. For more information of governors for Cummins or Cat engines, call Class 1 (800-533-3569). For details on the Detroit Diesel governor system, call Detroit Diesel, (810-231-2913).