



Technical Bulletin - ITT Conoflow HPNGV Regulator Pressure Relief Device (PRD) Discharge

Scope: When the vehicle is off or the ignition key is turned to the "on" position.

The HPNGV Regulator is equipped with a fast acting pressure relief device (PRD) to slowly bleed downstream pressure when the pressure exceeds the PRD setting. Downstream natural gas pressure can exceed the PRD crack (opening) pressure for two reasons:

1. The regulator is worn, or damaged. An internal leak would permit high pressure gas to continuously flow downstream. A damaged PRD would permit downstream pressure to continuously flow out of the PRD. Steady discharge of gas from the PRD would indicate a damaged regulator. These problems are very rare, as the regulator and PRD have been designed and validated for high cycle use.
2. The downstream pressure is significantly lower than the regulator setting. This condition exists any time the system is commissioned and the CNG cylinder solenoids are first energized (the cylinders are filled and the vehicle is "keyed on"). This condition also exists if there is a system leak, which causes the downstream pressure to decay when the vehicle is shut off and the high pressure is isolated from the regulator. Under these conditions, the PRD can "burp" a small amount of gas through the PRD discharge port when the operator turns the key to the on position.

These are two system conditions that the regulator cannot control, and an explanation of the physics may help the fuel system designer or technician better understand this phenomenon.

Downstream pressure will decay when the vehicle is off, if there is a system or component leak. When this occurs, the regulator valve opens in an attempt to charge the low pressure side to the set point of the regulator. When the high pressure gas in the regulator is consumed, the internal valve of the regulator opens fully.

When the vehicle is "keyed on", energizing the high pressure gas cylinder solenoid(s), CNG rapidly flows into and through the regulator, charging the system with pressure. CNG will flow tremendously fast (near the speed of sound) to charge the system. The regulator contains a mechanical valve, which is tied to a diaphragm and controlled by a large spring. These components will quickly move the valve to a closed position, once the diaphragm experiences downstream pressure.

Although these regulator valve components move very quickly, the CNG can move even faster, overcharging the downstream fuel system volume. The PRD responds to this "pressure overshoot", opens and bleeds off some of the excessive pressure.

To eliminate this phenomenon, the fuel system has to be leak free, both internally (fuel injectors, lock off valves, etc) and externally (lines, fittings, filters, heat exchangers, etc). A leak free system will insure that the regulator will not discharge to an empty or low pressure downstream system, and overshoot the set point. It is this overshoot of pressure that causes the PRD to activate (or "burp").