

KINSLER VAPOR SEPARATOR TANK (VST) SYSTEM

Also know as a *pressurized pump inlet system*.

THE PROBLEM

For a constant flow fuel injection system to meter the fuel repeatably, the mechanical pump must deliver a precise amount of fuel at any given RPM. In many installations, however, the pump delivers varying amounts of fuel, sometimes very erratically, due to plumbing of the vehicle, or operation at high altitude and/or hot conditions.

THE CAUSE

The main problem is caused by pump inlet cavitation, a form of "vapor lock". Because gasoline almost boils at room temperature, if the temperature of the fuel is raised, or a vacuum is pulled on it, it will start to boil. This is what causes the pump delivery problem...as the pump tries to draw the fuel into it's inlet, it pulls a slight vacuum on the fuel. The higher the pump speed, the higher the vacuum. This vacuum, combined with hot temperatures found in most race cars, causes at least some of the fuel in the inlet hose to flash to vapor (boil). Thus the pump draws in a mixture of liquid and vapor and therefore delivers less fuel per revolution. This causes an erratic lean condition and sometimes premature pump failure due to a lack of pump lubrication.

Conditions that aggravate pump inlet cavitation :

HEAT Hot weather; hot fuel in the fuel tank; vehicle parked on hot black pavement on a sunny summer day (which heats up the whole car); exhaust pipes near fuel hoses, pump, tank, etc.; radiator heat coming back across fuel pump, hoses, tank, etc.; fuel pump not isolated from engine block heat (use phenolic isolator see MECHANICAL FUEL PUMPS on Page #104 and #176)

VACUUM Pump inlet hose too long, such as in vehicles that have a fuel tank in the rear; pump inlet hose too small in diameter; fittings in pump inlet hose with too small of an inside diameter; angle drilled fittings, (see Pg. #112); low mounted fuel tank; high mounted fuel pump

THE CURE

In our VST system, more fuel than the engine will consume is pumped from the main tank by an electric fuel pump to the VST. The excess fuel flows back to the main tank through the Backpressure Valve, which holds 2-6 PSI in the VST, thus pressurizing the mechanical pump inlet with about that same pressure. This helps prevent the fuel from boiling at the inlet of the pump.

The VST is specially built to act as a low pressure reservoir and as a vapor separator. The fuel coming from the electric fuel pump, main bypass, secondary bypass, and high speed bypass has vapor in it. The tank is SPECIALLY BAFFLED to separate the vapor and feed it to the top center fitting on the tank, then back to the main tank, where it can escape out of the main tank vent. The pressure in the tank is very dependant on the flow through the Backpressure Valve, so this flow curve is an important part of the system's calibrations. Since the electric fuel pump provides the flow through the valve, it is important to use only the specified model electric fuel pump; a pump that flows more or less would alter the calibration. The poppet in this valve is designed not to seal perfectly, so any residual pressure can be bled back to the main tank when the system is shut off. It is best to install a pressure gauge in the hose between the VST and the Backpressure Valve. If the system does not have about 3 PSI when the electric pump is switched on, the engine should not be started. Check to see that the electric pump is working and the Backpressure Valve is functioning properly. Under racing conditions, a pressure reading below 1 PSI could cause a lean condition. Any deviation from the required 2.5-4 PSI should be closely monitored.

The Economizer Valve (Econ) is used to reduce the pump output pressure back closer to what it would have been if the pump were not pressurized at it's inlet. The system would be quite rich at an idle and low speeds if this valve was not used. The poppet in this valve has an orifice, sized to flow the proper amount of fuel for cranking and idling. Above idle, the poppet moves off it's seat and maintains a pressure drop of about 3 PSI across it to counterbalance the pressure being applied to the inlet side of the fuel pump. It should be installed after the filter to protect it from dirt.



4" diameter by 12" tall tank



Mounting clamp

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