Common Fuel Delivery Mistakes and How to Correct Them.

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(Text reprinted courtesy of *Circle Track* Magazine. Further images added)

The Race Demon with *ConcentraCast* venturii, removable boosters, billet metering blocks, large capacity fuel chambers, and billet aluminum baseplate strives to achieve higher levels of consistent performance than conventional designs. *Concentracast* is a new die-casting technology employed by Demon Carburetion. It is the most repeatable method of producing concentric venturii without misalignment or core shift.

Fuel lines, filters, pumps, and regulating devices exist to deliver gasoline or alcohol from the fuel cell to the carburetor, and in a bypassing system return it to the fuel cell. Pressures and volumes vary depending upon the kind of fuel used (gasoline or alcohol) and the type of fuel system employed. With routine maintenance, a good fuel system will pay dividends; yet many cars are fitted with systems that fall below the necessary standards. With a little help from BG Fuel Systems of Dahlonega, Georgia, here is a list of the most common mistakes in competition fuel systems and a guide as to how to correct them:

1. Incorrect fuel lines

BG belt-driven fuel pump – a high-output pump that is light in weight, compact, and easily serviced. Designed for engines with high-volume fuel demands (especially methanol), the BG belt-driven pump should be used in conjunction with a diaphragm bypass.

Do not use ¼" or even 3/8" O.D. lines on a racing fuel system between the fuel cell and the pump. Racers often joke about their first racecar and how the fuel line was so small it functioned as the main jet. Ensure the fuel is supplied through lines that are of the correct size for the application. Remember the fuel line size is matched to the fuel system (pump/regulator, etc) and the fuel system matched to the application. Push-Lok hoses, stainless steel braided hoses, and aluminum tubing are the most common fuel lines used on race cars.

2. Right-angle hose-end fittings from the pump to carburetor

Avoid forged 90°elbow fuel fittings if possible. Although they are inexpensive and readily available, they are restrictive and frequently cause fuel-flow troubles. Hose ends with angles of 90° & 45° should also be avoided. Nonetheless, should their use become necessary, use radiused hose ends (90° bends, not elbows) as they have better

The BG diaphragm bypass is designed primarily for use with a belt-driven fuel pump. It responds quicker and main-ains the desired pressure settings with greater accuracy than a poppet-style bypass. Manufactured of billet alum-num, this bypass can be easily serviced in the field.

rates of flow. They're manufactured from aluminum, equipped with swivel ends for a positive seal, and are easy to install.

3. Fuel pumps unsuitable for methanol

A methanol fuel system differs from the gasoline alternative in several crucial respects. Fuel pressures in a gasoline system are typically maintained between 7- and 9-psi throughout the rpm range, whereas methanol carburetors require lower pressures of around 4- to 6-psi at idle and 9- to 11-psi at fully open throttle. This is necessary to prevent the carburetor from flooding at idle and under light engine load, yet maintain the extra volume necessary for maximum acceleration. Engines producing around 500-hp can be fueled with a 15-psi mechanical pump in conjunction with a throttle bypass valve. However, for engines of over 500-horsepower, a belt-driven system with a diaphragm bypass or a poppet bypass should be considered. For overall reliability and performance, a belt-driven fuel system is usually the better choice. When using a diaphragm bypass, install it near the carburetor for faster response.

This Six-valve mechanical pump is available in two versions: 9-psi for gasoline or 15-psi for methanol. With a capacity to deliver up to 130-gallons-per-hour, the six-valve pump requires a diaphragm bypass when used with gasoline and a throttle bypass for methanol.

Throttle Bypass – the most effective way of regulating the fuel pressure of a 15-psi mechanical fuel pump. Linkage controlled and with plate mountings under carburetor, the throttle bypass provides a positive response returning surplus fuel to the cell.

4. Incompatibility between bypass and pump

Throttle bypasses were designed to operate with block-mounted pumps and, similarly, diaphragm bypasses with belt-driven pumps. Never use a throttle bypass with a belt-driven pump - they must function in pairs and are not to be mismatched.

The BG-5000 fuel filter is of billet aluminum con-tructon and is compatible with gasoline or methanol

5. Unsuitable fuel filter

Fuel filters with conventional paper elements must not be used with methanol. Because methanol absorbs water, the

paper and the bonding materials deteriorate quickly. As a consequence, particles can enter the float bowls, or get stuck in the needle-and-seat assemblies and main jets. Further, it's equally important on methanol applications to avoid filters with inadequate flow rates and inlet and outlet sizes that are too restrictive.

6. Neglecting routine maintenance on an methanol system

In-line fuel filter – billet aluminum construction with stainless steel element for gasoline or methanol

Although methanol fuel additives can help prevent corrosion and provide lubrication for pumps and other components, methanol can severely corrode metal objects, especially aluminum if allowed to remain in contact too long. There is no substitute for a strict maintenance program. It will not only prolong the life of the carburetor and fuel system but also keep them trouble-free. Methanol naturally absorbs moisture from the air. This not only dilutes the fuel but also adds to the corrosive effects of the methanol. After every race, the methanol should be drained from the racecar and stored in airtight containers; a vented fuel cell is not considered an appropriate storage container. The fuel system and carburetor should also be thoroughly drained and flushed of any residual methanol. Some racers will add gasoline to the empty fuel cell and run the engine until they are certain the carburetor is filled with gasoline. Other methods include removing the carburetor and flushing it with a cleaning solvent or lubricating aerosol sprays. Removing inlet and outlet fittings from the pumps and the bypassing regulators, etc., and lubricating the internals is also an acceptable practice. Whatever the method, maintenance on a methanol system is crucial; ignore it and the system will fail.

Easy and safe to inspect and change, this dry-break fuel filter has high flow rates and an eight-micron stainless steel filtering element.

7. Failing to use a high-flow air cleaner

Rush high-flow air cleaner

Race engines need approximately 1.5 CFM of air per horsepower: a 500 HP engine will use about 750 CFM. However, they are frequently starved by the use of thin, small-diameter air filters. If possible, use a good quality filter that is at least 14” diameter x 4” tall. If clearance is at a premium, get one with a recessed pan, which allows for a deeper filter element. If you’re constantly cleaning dust and dirt from the surface of your racecar, your air cleaner is probably struggling to filter dirt and debris from your engine.

8. Deterioration of foam-filled fuel cells

Modern military-spec foam-filled fuel cells are compatible with conventional fuels, racing fuels, and methanol. However, methanol can cause the foam to deteriorate and it must be renewed once a year. To check the condition of the foam, simply remove the cap and pinch it between finger and thumb. If pieces come away, the foam must be replaced.

9. Not having proper linkage travel and return springs

When at fully open throttle, ensure the butterflies of the carburetor are also fully open. Use a minimum of two high-quality return springs, preferably of stainless steel, and employ them, if possible, at two different places on the linkage. Ensure the linkage and the return springs operate without interference throughout the full range of throttle travel.

Anodized billet fuel logs adjust to suit different size carburetors, accept diaphragm or poppet-style fuel pressure regulators, and a fuel pressure gauge.

10 Failure to use an adjustable pedal stop

It's amazing to learn of the number of racecars that have no form of throttle-pedal stop, and inexcusable that so many are permitted to compete. Excessive loadings on the linkage and carburetor shafts can cause the mechanisms to distort and jam, and the consequences are usually grim. To avoid the inevitable, use an adjustable pedal stop and, at the fully open throttle position, synchronize the stop on the carburetor with the stop on the pedal.

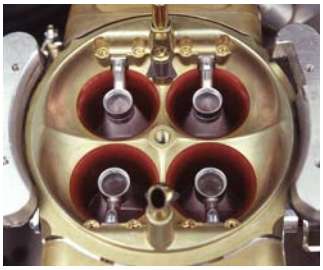
Electric flow-through-style fuel pumps, like the Mighty Enduro (carbureted) or Sumo (EFI) are constant-duty pumps designed for gasoline-only applications of up to 750 hp. These gravity-fed devices need to be mounted adjacent to the tank or cell, level with or below the fuel outlet, and in a source of cool air. Because they are constantly pumping and, therefore, producing voluminous amounts of fuel, they generate heat. This heat is dissipated by continuously returning the unused fuel to the tank. The return line of the Enduro pump should discharge its fuel into the upper regions around the front face of the fuel tank, while the return line of the Sumo should discharge into the lower regions (near tank bottom) around the front face. The fuel outlet should be located at the lowest rearmost point of the fuel tank, preferably in a recessed sump. To avoid aeration of the fuel, the return lines of either system should be positioned as far as possible from the fuel outlet. Do not use methanol in flow-through fuel pumps.

11. Not having the proper size of carburetor for the application

Having the proper venturi sizes for a given application ensures the carburetor generates sufficient air speed. Air speed creates the necessary depression (low pressure) in the constricted area of the boost venturii to draw fuel through the metering systems and into the air stream to be atomized. The Race Demon, which is equipped with interchangeable venturi sleeves, boosters, baseplate, etc., achieves optimum airspeed and, therefore, the finest atomization.

12. Inadequate fuel cell venting

When the fuel-cell vent is too small, the fuel system can malfunction. In extreme cases, inadequate ventilation can cause permanent damage. As the pump draws fuel from the cell, it needs to be replaced by air. If the vent on the cell is too small, the pump will try to draw the fuel from the cell faster than the air replaces it. This can create a vacuum in the cell, distort its shape, and starve the pump and engine of the fuel it requires.



Complete atomization is the key to the search for more power. Here a Race Demon RS carburetor demonstrates its authority in atomizing fuel.

13. Unfiltered fuel cell vents

Just as an undersized vent will adversely affect the performance of the fuel system, not having a filter on the vent will allow dirt and debris to enter the fuel cell. As air replaces the fuel consumed, the vent hose will attract anything that's in the air, including dirt, sand, or debris. These particles will eventually destroy a fuel system as well as an engine.

14. Fuel filter location

To protect the fuel pump and carburetor, use a premium fuel filter and position it before the pump. Use filtered fittings at the carburetor.

15. Inspections

Steel braided hoses and aluminum fittings have a life cycle. Over a period of time, the rubber bores will deteriorate, causing the lines to collapse and starve the engine of fuel or to disintegrate and possibly block the passages. Radiator hoses and fan belts are routinely replaced and so, too, should fuel system components. Aluminum fittings will also degrade over a period of time and fail to seal properly. For safety and performance, regularly check the lines and fittings. Try to detect soft or weak spots in the fuel lines by squeezing them by hand and visually inspect the internals of the fittings each season. Keep the connections tight.

16. Relays for electric fuel pumps

On a car equipped with an electric fuel pump, use a relay to ensure the pump is provided with adequate voltage in order to maintain proper fuel flow.