Ethanol VW Report 31 – First Surveillance **Gary W. Johnson 1-21-08**

Objective / Purpose

The overall objective of this experiment is to demonstrate that this type of equipment can successfully be operated on E-85 ethanol blend fuel instead of gasoline. The objective of this report is to document the materials compatibility observations of a carburetor repair, at 15 month's exposure. The repair was occasioned by a fuel leak, caused by old age, not exposure.

Equipment

The equipment was a 1973-vintage Volkswagen Type 1 standard "beetle" in more-or-less factory configuration. The vehicle is fitted with an intake manifold vacuum gage, and the trigger and power wires for a tachometer. It is an extremely high-time piece of equipment. Once the conversion efforts began to "gel", a Solex 30PICT-2 carburetor was selected for both the gasoline baseline and for E-85 documentation purposes. This carburetor required an adapter plate to fit the 34 mm manifold flange pattern, which in turn required the accelerator pump cover and linkage rod assembly off a Solex 30/31 carburetor in order to fit the adapter plate.

Theory

The 85% ethanol in commercial E-85 blend fuel dominates the fuel properties of the mixture. The gasoline component provides volatility for cold start, and flame coloration for safety in the event of a fuel fire.

Ethanol has the reputation of causing corrosion and dissolving rubber and plastics. Its cousin methanol is well-known and well-documented as causing exactly these effects. Yet some studies have shown that ethanol is far less corrosive and damaging than methanol.

The "ethanol VW" experiment established suitability and performance of a modified VW Type 1 ("beetle" or "bug") to run on E-85 fuel. No materials compatibility problems were observed during that experiment, but long-term surveillance was both recommended and prudent.

Items of concern include enhanced corrosion or deposits on the metallic components (steel, brass, and especially aluminum), solvent attack effects upon the rubber components, solvent attack upon the plastic components, and embrittlement of paper components (gaskets).

Since nearly all of these materials are present in, or in close proximity to, the carburetor, a carburetor repair is the natural time to inspect for such problems.

Procedure

A leak was noticed in the carburetor accelerator pump: a droplet or two of fuel was lost externally at each cycling of the pump. This carburetor had been cleaned with Berryman's B-9 "Chem-Dip" at the start of the "ethanol VW" experiment, but no new seals, gaskets, or parts were installed (none appeared to be needed). The parts themselves dated to the late '70's and the 80's, but were in good, serviceable shape, and so were used. There were also considerable gasoline varnish stains in the bowl that the "Chem-Dip" treatment did not remove.

The 30PICT-2 carburetor was removed, disassembled, and inspected closely. A kit was installed: new accelerator pump and choke diaphragms, new float valve, new gasket, new seals for the float valve and the bowl plug. The fuel line and fuel filter were also inspected.

Data collected

Data were collected by log entry and by photography. The carburetor was found to be startlingly clean: no "Chem-Dip" cleaning was required at all. In point of fact, the E-85 seems to do a better job as a cleaning agent, as the ancient varnish deposits were softened or completely removed. Those remaining were simply wiped away with a paper towel.

There were no deposits, pitting, or corrosion found on the castings or any of the brass jets, emulsion tubes, or other small parts. Left to dry out in the air, a soft white film appears on the brass parts, but is easily wiped away. There were no cracks or any other changes visible in the casting: it looked "new", for the first time in decades.

The paper gasket (already greased and re-used so many times before) was found cracked through one screw hole, athough otherwise still in fair shape. There were no deposits on it, and it was not embrittled any more than any other aged gasket this author has seen, and he has seen many.

All of the circuits functioned perfectly, and all of the jets were perfectly clean.

The accelerator pump diaphragm, a neoprene item, was in good shape, but the chromed steel parts that "clinch" it together had lost their grip. This opened up a leak path around the center shaft connecting the two metal disks. No corrosion or pitting was found, so this is presumed to be simple mechanical wear and tear on a part of considerable age.

The choke vacuum diaphragm was found to be worn, and had shed rubber on the side away from the casting. There was no fuel wetting in this area. This part is very old, and may in fact be the original from 1969 (the vintage of the vehicle from which this carburetor came).

The float valve was still fully functional, and was stored as a re-usable part, along with its seal.

The gasket between the carburetor and the manifold was still quite serviceable, and was also stored as a re-usable part.

The manifold gasket, the float valve, the carburetor gasket, the float valve seal, the bowl plug seal, and the two diaphragms were replaced with new items from a carburetor rebuild kit covering this model. The kit was quite old, but its parts were in very good shape.

There was no damage of any kind seen on the plastic float valve, or the plastic fuel filter.

The brass float pivot pin was pristine, as was its aluminum retainer. The steel accelerator pump spring was also pristine.

No debris of any kind was found in the carburetor bowl or the fuel filter (which was left in place).

It was noted that the fuel quantity gage still works repeatably, and that the fuel pump still delivers plenty of fuel.

Photos were taken of all the carburetor items, included below, with apologies for the quality.

Upon reassembly, the mismatched accelerator pump cover plate still leaked, this time out the top edge. This is due to the screws bottoming before the diaphragm can be clinched tight enough to seal. It was remedied by fashioning a thick card stock gasket to fit between the diaphragm and the cover plate. This shimmed-out the cover so that the screws did not bottom-out too soon.

Once the leak was fixed, the carburetor was re-installed, and it tested as fully functional again.

Calculations

None.

Presentation of Results

Photographs follow in 7 captioned figures:

Figure 1 – Top View of Carburetor Before Disassembly and Inspection: External Surfaces Are Cleaner Than Was Usual With Gasoline.

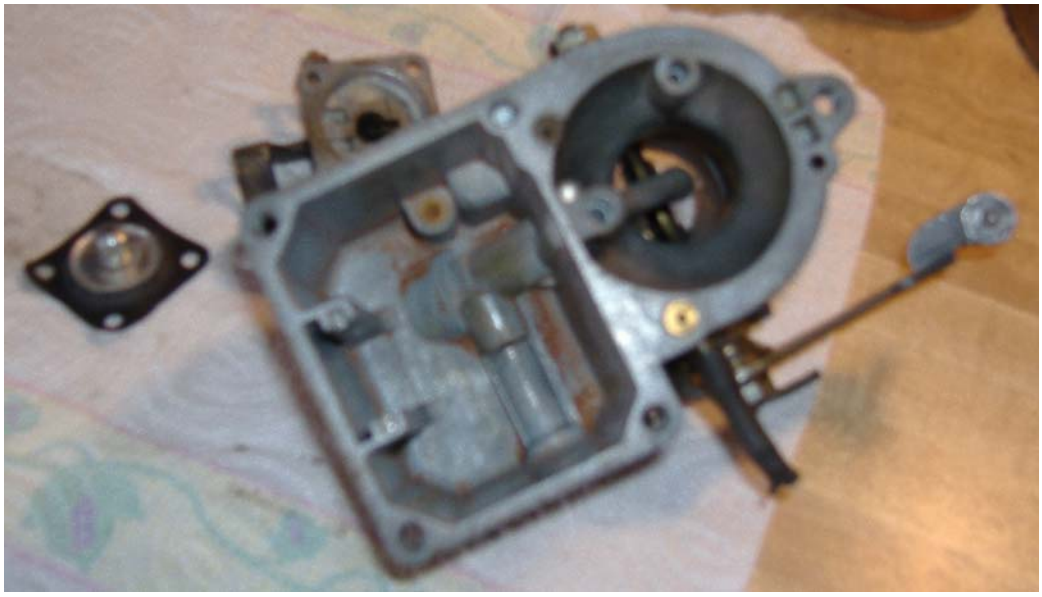

Figure 2 – Bowl View: Softened Red Varnish Deposit on the Left Came Out to the Touch. Note Just How Clean the Aluminum Casting Generally Is, Inside the Bowl.

Figure 3 – View Into Top Cover: Note Pristine Float Valve and Clean Casting.

Figure 4 – Top Cover Parts Were Not Immersed; the Vacuum Diaphragm Was Worn Due to Age, not Exposure.

Figure 5 – Float and Jet Parts Pristine, Gasket Cracked at Screw Hole (Nearest Idle Jet).

Figure 6 – Old Accelerator Pump Diaphragm is the Black Neoprene Part on the Left, Still Quite Pliable. The Metal Clinch Disks Were Loose, Causing the Leak. The New Red Neoprene Part is on the Right.

Figure 7 – View of the Engine with Carburetor Removed. Note the Pristine Fuel Filter, and the Excellent Condition of Black Neoprene Fuel Lines.

Conclusions / Recommendations

Other than a very effective cleaning action, there were no effects of the E-85 fuel upon the carburetor, fuel line, or fuel filter components after 15 months' exposure.

As the fuel pump is constructed of these very same materials, and still delivers fuel quite well, it is presumed there has been no effect of E-85 upon the fuel pump.

As no debris was seen in the fuel filter or the carburetor bowl, it is presumed there has been no effect of the E-85 fuel upon the steel fuel tank.

As the fuel quantity indicator still works repeatably, it is presumed there has been no effect of the E-85 fuel upon the steel and plastic sender in the tank.

Fears of corrosion and solvent attack with E-85 appear to be quite unfounded at this time.

Questions and comments should be directed to the author/experimenter:

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