



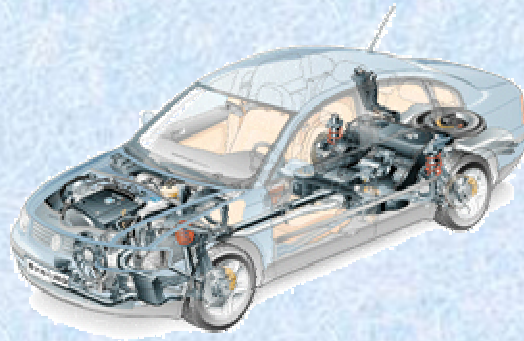
Alcohol Fueled Vehicles

Ethanol application as vehicular fuel in Brazil.

Volkswagen do Brasil

Henry Joseph, Jr.

Up to 5% Ethanol blended with gasoline



No modifications

From 5% up to 10% blend

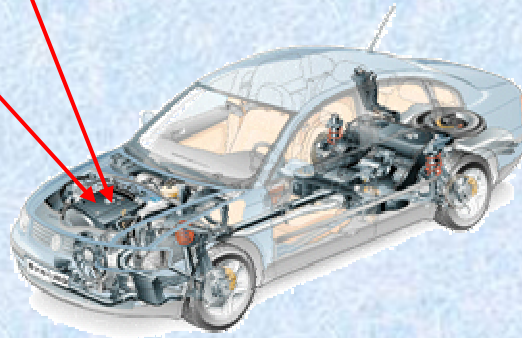


Carburetor

The material of the carburetor body or carburetor cover cannot be aluminum exposed; if it is, must be substituted, protect with surface treatment or anodize.

Electronic Fuel Injection

It is not necessary modifications.



From 10% up to 25% blend



Carburetor

The material of the carburetor body or carburetor cover can not be aluminum or exposed Zamak; if it is, must be substituted, protect with surface treatment or anodize;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Electronic Fuel Injection

Substitution of fuel injector material by stainless steel;

New fuel injector design to improve the "fuel spray";

New calibration of air-fuel ratio control and new Lambda Sensor working range;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Fuel Pump

The internal surface of pump body and winding must be protected and the connectors sealed;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Fuel Pressure Device

The internal surface of the fuel pressure device must be protected;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Fuel Filter

The internal surface of the filter must be protected;

The adhesive of the filter element must be appropriated.

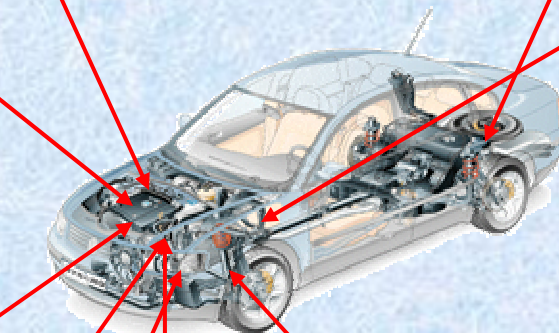
Fuel Tank

If the vehicle fuel tank is metallic, the internal surface of tank must be protected (coated);

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Catalytic Converter

It is possible to change the kind and amount of noble metal present in the loading and wash coating.



Ignition System

New calibration of ignition advance control.

Evaporative Emission System

The purge airflow of canister (activate charcoal filter) must be higher.

From 25% up to 85% blend



Carburetor

The material of the carburetor body or carburetor cover cannot be aluminum or exposed Zamak; if it is, must be substituted, protect with surface treatment or anodize;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected;

The material of buoy, nozzle, metering jet, floating axle, seals, gaskets and o-rings must be appropriated.

Electronic Fuel Injection

Substitution of fuel injector material by stainless steel;

New fuel injector design to improve the "fuel spray";

New calibration of air-fuel ratio control and new Lambda Sensor working range;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Fuel Pump

The internal surface of pump body and winding must be protected and the connectors sealed;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

The pump working pressure must be increased.

Fuel Pressure Device

The internal surface of the fuel pressure device must be protected;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

The fuel pressure must be increased.

Fuel Filter

The internal surface of the filter must be protected;

The adhesive of the filter element must be appropriated;

The filter element porosity must be adjusted.

Engine

The engine compression ratio should be higher;

Camshaft with new cam profile and new phase;

New surface material of valves (intake and exhaust) and valve seats.

Intake Manifold

With new profile and less internal rugosity, to increase the air flow;

Must provide higher intake air temperature.

Fuel Tank

If the vehicle fuel tank is metallic, the internal surface of tank must be protected (coated);

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Catalytic Converter

It is possible to change the kind and amount of noble metal present in the loading and wash coating.

Exhaust Pipe

The internal surface of pipe must be protected (coated);

The exhaust design must be compatible with higher amount vapor.

Suspension

Adjusted to the higher vehicle weight.

Motor Oil

New additive package.

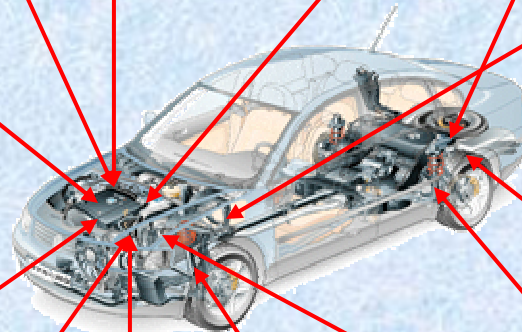
Ignition System

New calibration of advance control;

Colder heat rating spark plugs.

Evaporative Emission System

The purge airflow of canister (activate charcoal filter) must be higher.



Above 85% (including 100%)



Carburetor

The material of the carburetor body or carburetor cover cannot be aluminum or exposed Zamak; if it is, must be substituted, protect with surface treatment or anodize;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected;

The material of buoy, nozzle, metering jet, floating axle, seals, gaskets and o-rings must be appropriated.

Electronic Fuel Injection

Substitution of fuel injector material by stainless steel;

New fuel injector design to improve the "fuel spray";

New calibration of air-fuel ratio control and new Lambda Sensor working range;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Fuel Pump

The internal surface of pump body and winding must be protected and the connectors sealed;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

The pump working pressure must be increased.

Fuel Pressure Device

The internal surface of the fuel pressure device must be protected;

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

The fuel pressure must be increased.

Fuel Filter

The internal surface of the filter must be protected;

The adhesive of the filter element must be appropriated;

The filter element porosity must be adjusted.

Engine

The engine compression ratio should be higher;

Camshaft with new cam profile and new phase;

New surface material of valves (intake and exhaust) and valve seats.

Intake Manifold

With new profile and less internal rugosity, to increase the air flow;

Must provide higher intake air temperature.

Fuel Tank

If the vehicle fuel tank is metallic, the internal surface of tank must be protected (coated);

Any component in polyamide 6.6 (Nylon) that has contact with the fuel must be substituted by other material or protected.

Higher fuel tank capacity, due to the higher fuel consumption.

Catalytic Converter

It is possible to change the kind and amount of noble metal present in the loading and wash-coating of catalytic converter;

The catalyst converter must be placed closer to the exhaust manifold, in order to speed up the working temperature achievement (light-off).

Exhaust Pipe

The internal surface of pipe must be protected (coated);

The exhaust design must be compatible with higher amount vapor.

Suspension

Adjusted to the higher vehicle weight.

Motor Oil

New additive package.

Cold Start System

Auxiliary gasoline assisted start system, with temperature sensor, gasoline reservoir, extra fuel injector and fuel pump;

The vehicle battery must have higher capacity.

Ignition System

New calibration of advance control;

Colder heat rating spark plugs.

Evaporative Emission System

Due to the lower fuel vapor pressure, it is not necessary evaporative emission control.

