DIESEL

GUIDELINES AND RECOMMENDATIONS FOR THE GOOD USE OF FUEL.

COMMERCIAL FUEL

Diesel has been undergoing several changes along the years, with the reduction of the sulfur level and more biodiesel added, increasing the need of good handling and storage practices.

The traditional care that has always been required for diesel still apply, but currently even more rigorous practices are needed.

Biodiesel is added to all automotive diesel and is not sold in its pure state. In terms of sulfur content level, two versions of commercial diesel are available, as a function of amount added: S500 (red) and S10 (light yellow).


S500


S10

Basically, the main degradation focuses are:

- **Aging (or oxidation);**
- **Microbiological contamination;**
- **Water contamination;**
- **Compatibility with materials;**
- **Corrosion of materials;**

These problems may arise in an isolated or joint fashion and will lead to the formation of deposits or sludge, due to the precipitation of the product of fuel degradation and bacterial growth, usually associated to the presence of water in the tanks.

Other common types of diesel-related occurrences that will lead to non-compliance with specifications: formation of resin or varnish, leading to clogging and restriction of movement in moving parts; formation of acids, leading to corrosion and, finally, formation of sludges that will clog fuel filters and form deposits in the injectors.

Parts with contaminated surfaces.Common contamination in untreated diesel.

DEGRADATION TYPES

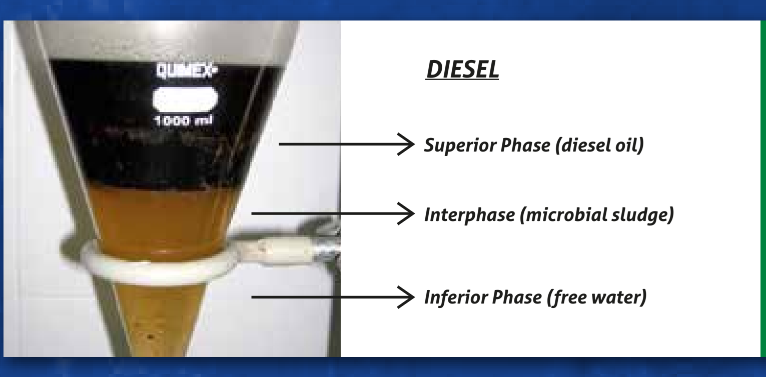
1. Stability to Oxidation

The presence of atmospheric oxygen in the tank empty spaces tends to oxidize the fuel and initiate the degradation process. Oxidation is a chemical process that affects the composition of fuel, changing its physical-chemical characteristics, generating sludge and adhesive sediments. Heat, sunlight and materials that work as catalyst (copper, bronze, brass, steel, tin) will accelerate this process even more. In addition, these materials may acidify the media, leading to corrosion in tanks, injection systems and injectors, as in the examples below:



In the absence of lab tests, a visual analysis of the fuel may help to detect potential problems. Increased turbidity is a sign of alert and may be considered as an indication of problems, not only related to instability, but also to the presence of dissolved water.

2. Presence of Water



Fuel tanks accumulate water on a daily basis through the process of condensation (variation of the room temperature). Fuel absorbs water (hygroscopic effect) and its presence should be avoided as much as possible (periodic drainage) and constantly checked (water finding paste).

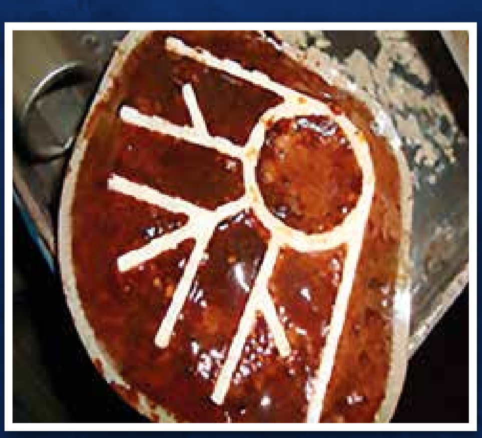
The presence of water in fuels occurs in two ways: free water (when accumulated at the bottom of the tank) or dissolved water (when it mixes with fuel) and can initiate a sequence of problems, such as engine failure, microorganism development, corrosion, components wear of the injection system. The presence of water is one of the major fuel problems.

3. Microbial Contamination

Microorganisms are present everywhere, including in fuel. In contact with water, they find ideal conditions to prosper. A tank contaminated with microorganisms is easily identified by the presence of the biological sludge that concentrates in the oil-water interface. Therefore, one of the most effective forms of avoiding microbial development is by controlling the presence of water in the tank.

Among the physical control measures, the establishment of weekly drainage routines is a simple and effective procedure, as well as keeping the tank as full as possible. This measure will decrease the contact area between the fuel and the humidity present in air.





4. Compatibility with Materials

In addition to the above-mentioned metals, some types of rubbers may present adverse reactions with fuel. They are: nitrile rubbers, polypropylene, polyvinyl and Tygon. In general, Teflon, Viton and nylon are quite resistant. Carbon steel, stainless steel and aluminum are compatible with diesel. In case of doubt, check the manufacturer´s manual or with the component provider.

SPECIFIC SITUATIONS

1. Equipment with long downtime

For some specific uses, the equipment is subject to long periods of downtime, as in the case of the first filling (manufacture of new engines and vehicles/machinery), emergency generators, harvesters (between crops), equipment in repair, school buses during vacations, etc.

In these cases, it is recommended to fill up the tank completely to reduce the contact of fuel with oxygen and air humidity. When the fuel is compromised, it is often recommended to carry out regular fuel analyses, to clean the tank and to replace the fuel as soon as the degradation is identified. For some applications, such as emergency generators, it is recommended to start the engine periodically.

Some equipment manufacturers recommend the use of additives to avoid fuel degradation. Check the manufacturer's recommendations for your equipment. This measure will not exclude the constant care to be taken with the fuel.

2. Storage Tanks

It is recommended to use tanks made of materials compatible with the fuel and avoid the reuse of drums and containers (IBC).

Fuel storage tanks should be covered and located in well-ventilated areas. They should be regularly drained (removal of water and sediments), and in the case of underground tanks, drainage pumps will be required.

In addition to appropriate drainage, it is recommended that the tanks are regularly cleaned and that filters are used to avoid the transfer of impurities to the diesel equipment.

It is important to monitor the process of receiving fuel. Two points should be checked: the fuel must be clear and transparent, without suspended solids. This analysis may be complemented by a density test.

RECOMMENDATIONS

The equipment life (and its full operability) depends directly on the care provided to it. As such, fuel needs constant attention. Preventive actions are always less costly than repairs, not only because of the costs, but also due to the equipment downtime.

In general, rigid maintenance routines, such as frequent drainage, are necessary. The frequency of such routines will depend on the conditions and incidence of problems but should never be less frequent than on a weekly basis. Indications of non-compliance with specifications, such as color alteration or turbidity, sludge or sediments, should be reason of concern and may lead to potential tank replacement and cleaning, filter replacement and injection system evaluation.

In case of doubt, consult with a professional or specialized company.

The recommendations contained herein are based on best practices and experience acquired by the members of the AEA Diesel/Biofuel Technical Committee with the technical support of universities, the ANP and related institutes.

SUPPORT

anp — Agência Nacional do Petróleo, Gás Natural e Biocombustíveis

AEA — Associação Brasileira de Engenharia Automotiva