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## FLT LPG Powered Engine Operations

### Scope

This guidance provides information to assist in maintaining the operation of LPG powered engines fitted to Fork Lift Trucks (FLT); The general principles also apply to LPG powered engines used in other applications e.g. grass cutters.

### Operation

Equipment must be operated in accordance with the instructions from the manufacturer. For units that do not have direct fuel injection this may include allowing the engine to reach a suitable operating temperature before being put under load.

### Fuel Standard

In the UK the fuel will be "Commercial Propane" that meet the requirements of British Standard 'BS 4250 Specification of commercial propane and commercial butane'; the Standard mirrors or is more demanding than the international Standard ISO 9162 Petroleum products - Fuels (class F) — Liquefied Petroleum Gases - Specifications; Fuel supplied into the UK market to BS4250 which also meets the requirements of BSEN589 Automotive Fuels - LPG requirements and test methods.

The LPG used for engine fuel in the UK is the same to that used for heating and other applications. Liquid LPG when delivered does not contain a significant quantity of particles in suspension, and one of the tests for compliance with BS4250 measures this.

### Hose assemblies

Many types of hose, that may appear to be suitable for LPG use, are manufactured using plasticisers that will leach out when exposed to liquid LPG; these plasticisers can build up in the fuel system and cause malfunctioning of the engine. Hoses on the equipment used to fill the cylinder/container from a static installation should be in accordance with BS EN 1762 which have linings that cannot be affected by the action of liquid LPG.

### Note: In Section 7 of BS EN589, it says:

"Remarks concerning vehicle application issues like residues in vaporisers or injectors - The presence of plasticizer additives (e.g. phthalates) in elastomer hoses or other materials which can come into contact with LPG can lead to increased contamination of LPG by high molecular substances. Therefore, great care should be taken by the automotive industry and LPG retailers to avoid such contacts, e.g. by internal coating or introducing materials which do not release those plasticizers".

Therefore, it is essential that hose assemblies fitted to FLTs from new, plus any replacements, are suitable for use with liquid LPG to BS4250 and correctly installed.

- The assemblies are suitable LPG in liquid phase for an operating pressure of not less than the container design pressure;
- The internal lining constituents cannot leach out or deteriorate over time;
- The hose covering is resistant to oils;
- The assembly is not subject to tight bends or twists;
- The assembly is routed away from heat. e.g. exhaust pipes, radiators etc;
- The hose is positioned to prevent, or protected from, mechanical damage.

If there is any doubt if the correct standard of hose is being used then confirmation should be obtained from the supplier.

## **Maintenance**

There needs to be a maintenance system in place for all engine systems based on manufacturing instructions, which in addition to the mechanical maintenance covers at least:

LPG removable cylinder/fixed container:

- Cylinder/container restraints;
- Cylinder/container fill coupling, gauges and valves;
- Hose connections and assemblies;

And where fitted:

- Fuel filter;
- Fuel injection system;
- Vapouriser;
- Carburettor system.

Records for maintenance activities should be kept for future reference.

## **Removable cylinders/fixed containers**

These need to be designed to an appropriate standard and when new or refurbished have been internally inspected to ensure they have dried out and contain no debris to prevent moisture entrapment/rust. The maintenance of removable cylinders is the responsibility of the cylinder owner. Maintenance of a container fixed to the unit is the responsibility of the FLT owner/operator.

Some cylinders may be fitted with internal magnets in the cylinder to reduce the probability of ferrous particles passing into the engine. Others may be fitted with a valve assembly incorporating a filter.

## **Filters**

Filters only remove solid contaminants so as with all types of vehicle the manufactures of the equipment are recommended to fit appropriate filters in the fuel supply system before the engine. For units with vaporisers this should be between the container and the vaporiser.

Some small bulk installations are also often fitted with fine filters (e.g. 25µ micron) after the transfer pump.

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