

ADDITIVE

This disclosure relates to additives for fuels, to reduce emissions.

The reduction of undesirable exhaust emissions, such as carbon monoxide, unburnt hydrocarbons, oxides of nitrogen and particulate matter, from internal combustion engines is a major interest. In spite of the interest in, and advances in, electric cars, it is clear that internal combustion engines will be used for a considerable time yet – as yet, electrically-powered ships and aircraft with an appreciable carrying capacity are a long way in the future, if they are indeed feasible. One proposed solution is to use alternative fuels, such as bioethanol. These, however, bring their own problems, such as the fact that they are less energy-dense than the traditional petroleum-based fuels.

There is therefore a need to improve emissions of engines using petrochemical-derived fuels. A number of additives have been tried, many of them metal-based, and these have indeed lowered undesirable emissions. However, the emission of metallic compounds produced in the combustion process is never desirable.

It has now been found that it is possible to reduce emissions by the addition of an additive that is 100% vegetable based. There is therefore provided a method of preparing a liquid fuel additive comprising the partial transesterification with ethanol of a vegetable oil blend consisting of 58-64% palm oil, 12-18% soya oil, 16-22% peanut oil and 5-9% canola oil, all percentages being by weight.

There is additionally provided a liquid fuel additive adapted to reduce undesirable exhaust emissions in internal combustion engines and prepared by the method hereinabove described.

There is further provided a liquid fuel that delivers reduced emissions when burned, the fuel comprising a base fuel and a liquid fuel additive prepared by the method hereinabove described.

The addition of the additive prepared as hereinabove described (hereinafter referred to as “the additive”) can reduce undesirable exhaust emissions by up to 70% when compared with those of a fuel untreated by the additive.

In a particular embodiment, the proportions of oils are

Palm oil 60%

Soya oil 15%

Peanut oil 18%

Canola oil 7%

The transesterification reaction, by which natural triglycerides (the major constituent of vegetable oils) are partially converted to alkyl esters by reaction with a suitable alkanol, is well known and has been practised in many fields. By "partial transesterification" is meant that there is not complete conversion of the oil. This can vary over a wide range but, in a typical example, the conversion proportions by weight of the individual components are 50-70% palm, 10-20% soya, 15-25% peanut, 1-10% canola; these figures should not be regarded as limits.

The transesterification process is carried out using ethanol

It is important that the final product be a homogeneous liquid, that is, no gels or no multi-phase liquids. In order to achieve this, it is essential to adhere to certain parameters in the production process.

The basic process is as follows:

- (a) A mixture of oils is mixed sequentially with ethanol/potassium hydroxide and ethanol/phosphoric acid mixtures and the mixture maintained at 90°C with stirring at 300rpm.
- (b) Sulphuric acid is then added and the temperature and stirring rate maintained for 1 hour.
- (c) The mixture is pumped to a settlement tank and left there for 24 hours.
- (d) The upper layer is removed and pumped to a tank, where salt is added and the mixture heated for 100°C for one hour.
- (e) The product is pumped to a tank, where it is maintained at 150°C for 8-12 hours. This allows the water to evaporate.
- (f) The product is cooled and filtered.

The final product is liquid and has a density of in the region of from 0.9-1.2 Kg/L.

The proportion of the additive added to the fuel depends on the nature of the fuel, and will be different for, for example, automotive fuel on the one hand and ships' bunkering fuel on the other. However, the skilled person can easily find an optimum proportion by routine experimentation. As a rough guide, typical proportions of the additive vary from 1.25 L -1.75L per 1000L fuel, particularly from 1.4-1.6L per 1000L fuel.

The disclosure is now further described with reference to the following example.

The example describes a 10 litre scale production. 10L ethanol was mixed with 140g potassium hydroxide.

1. 10L ethanol was mixed with 500mL 5% phosphoric acid.
2. 10L of a mixture of oils (palm oil 60%, soya oil 15%, peanut oil 18% canola oil 7% by weight) was heated to 125°C.
3. The oil mixture was then added to a reaction vessel equipped with stirrer and maintained at 90°C
4. 47.5% of the mixture of step 1 was added to the oil mixture with stirring, followed by 1.9% of the mixture of step 2.
5. 200ml of conc. sulphuric acid was added and the mixture stirred at 300rpm for 1 hour.
6. The resulting blend is pumped to a settling tank and left there for 24 hours. There was a separation into an upper liquid layer and a lower gel layer.
7. The upper liquid layer was removed and added to a mixing vessel equipped with a paddle stirrer.
8. 1.5Kg of salt was added, the temperature was raised to 100°C and the resulting mixture stirred for 1 hour.
9. The mixture was then pumped to a tank where it is held at 150°C for 5-7 hours
10. The mixture was pumped to a storage tank and cooled.

The finished product is a liquid with a density of 0.9Kg/L