# Emulsifier package with a short-chained and optionally with a long-chained surfactant for fuel emulsion

## Description

The present invention relates to a method for powering a diesel engine with a fuel emulsion comprising the step of preparing the fuel emulsion by emulsifying a fuel and water in the presence of an emulsifier package which comprises a short-chained surfactant of the formula (I) as defined below and optionally a long-chained surfactant of the formula (II) as defined below. It further relates to a fuel emulsion for powering a diesel engine.

Aqueous fuel emulsions are known for powering diesel engines.

Object of the present ~~invention~~disclosure was to find an emulsifier package for fuel emulsions, which is cheap, easy to prepare, storage stable, based on commercial available emulsifiers, based only on carbon, hydrogen, nitrogen and oxygen, and allow for fast and easy emulsification even with low shear forces. The emulsifier package should result in a low foaming fuel emulsion, it should have a low cloud point, provide corrosion protection, have low foaming, improve filterability of the emulsion, and reduce precipitate when mixing the fuel with water. The emulsifier package should stabilize the fuel emulsion at high water concentrations, at various temperatures and pressures, with various types of water.

The object was achieved by a method for powering a diesel engine with a fuel emulsion comprising the step of preparing the fuel emulsion by emulsifying a fuel and water in the presence of an emulsifier package which comprises a short-chained surfactant of the formula (I)

$$R^a\text{-}O\text{-}(AO^a)_m\text{-}R^{a'} \qquad (I)$$

in which

- $R^a$ is a linear or branched $C_{6\text{-}14}$ alkyl,
- $AO^a$ is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical, styrene oxide radical or mixtures thereof,
- m is a number from 1 to 100, and
- $R^{a'}$ is hydrogen or $C_{1\text{-}4}$ alkyl.

In an aspect, there is provided a method for powering a diesel engine with a fuel emulsion comprising the step of preparing the fuel emulsion by emulsifying a fuel and water in the presence of an emulsifier package which comprises a short-chained surfactant of the formula (I)

$$R^a\text{-}O\text{-}(AO^a)_m\text{-}R^{a'} \quad (I)$$

in which

$R^a$ is a branched $C_{8\text{-}14}$ alkyl ,

$AO^a$ is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

m is a number from 1 to 100, and

$R^{a'}$ is hydrogen or $C_{1\text{-}4}$ alkyl; and

additionally comprises a long-chained surfactant of the formula (II)

$$R^b\text{-}O\text{-}(AO^b)_n\text{-}R^{b'} \quad (II)$$

in which

$R^b$ is a linear or branched $C_{16\text{-}32}$ alkyl,

$AO^b$ is an ethylene oxide radical, propylene oxide radical, butylene oxide radical, pentylene oxide radical or mixtures thereof,

n is a number from 1 to 100 and

$R^{b'}$ is hydrogen or $C_{1\text{-}4}$ alkyl.

In another aspect, ~~T~~the object was also achieved by the fuel emulsion for powering a diesel engine as defined above.