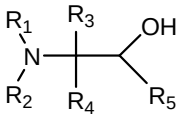
CLAIMS

1. A method of reducing low-speed pre-ignition events in an engine comprising

providing a fuel composition to the engine, wherein the fuel composition comprises

(1) greater than 50 wt % of a hydrocarbon fuel boiling in the gasoline range and (2) a minor amount of a low-speed pre-ignition (LSPI)-reducing additive comprising one or more of:

a triazole, an amidine, a beta-amino alkanol having the structure



,

wherein R_1, R_2, R_3, and R_4 are each independently selected from hydrogen, aromatic and a C_1-C_{20} alkyl group and R_5 is hydrogen or an alcohol having the structure –(CH)R_6-OH wherein R_6 is hydrogen, a C_1-C_{10} alkyl group, or a C_1-C_{10} alkenyl group, or a salt thereof, and

wherein the engine is a direct-injected, spark-ignited, internal combustion engine that, in operation, generates a brake mean effect pressure level of greater than 1000 kPa at an engine speed of from 1500 to 2500 rotations per minute.

2. The method of claim 1, wherein the triazole is a benzotriazole.

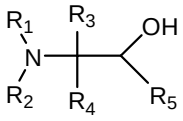
3. The method of claim 1, wherein LSPI-reducing additive is an amino alcohol.

4. The method of claim 1, wherein the amino alcohol is an aminoheptyl propanediol, an aminooctyl propanediol, or an aminododecyl ethanol,

5. The method of claim 1, wherein the LSPI-reducing additive is 3-(heptan-2-ylamino)propane-1,2-diol, 3-(methyl(octyl)amino)propane-1,2-diol, or 2-(methyl(dodecyl)amino)ethan-1-ol.

6. The method of claim 1, wherein the LSPI-reducing additive is DBU 2-methylquinolin-8-olate, or DBU C24-salicylate.

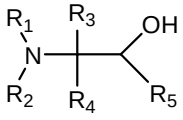
7. Use of a fuel composition comprising (1) greater than 50 wt % of a hydrocarbon fuel boiling in the gasoline range and (2) a minor amount of a low-speed pre-ignition (LSPI)-reducing additive comprising one or more of an amidine, or a beta-amino alkanol having the structure



wherein R_1, R_2, R_3, and R_4 are each independently selected from hydrogen, aromatic ring, and a C_1-C_{20} alkyl group and R_5 is hydrogen or an alcohol having the structure –(CH)R_6OH wherein R_6 is hydrogen, a C_1-C_{10} alkyl group, or a C_1-C_{10} alkenyl group, or a salt thereof, to reduce LSPI activity in an engine fueled with the fuel composition,

wherein the engine is a direct-injected, spark-ignited, internal combustion engine that, in operation, generates a brake mean effect pressure level of greater than 1000 kPa at an engine speed of from 1500 to 2500 rotations per minute.

8. Use of a low-speed pre-ignition (LSPI)-reducing additive comprising one or more of an amidine, or a beta-amino alkanol having the structure



wherein R_1, R_2, R_3, and R_4 are each independently selected from hydrogen, aromatic ring, and a C_1-C_{20} alkyl group and R_5 is hydrogen or an alcohol having the structure ––(CH)R_6OH wherein R_6 is hydrogen, a C_1-C_{10} alkyl group, or a C_1-C_{10} alkenyl group, or a salt thereof, in a fuel composition, to reduce LSPI events in a direct-injected, boosted, spark-ignited, internal combustion engine, that, in operation, generates a brake mean effect pressure level of greater than 1000 kPa at an engine speed of from 1500 to 2500 rotations per minute, wherein the direct-injected, boosted, spark-ignited, internal combustion engine is fueled with the fuel composition, and wherein the fuel composition comprises (1) greater than 50 wt % of a hydrocarbon fuel boiling in the gasoline range and (2) a minor amount of said low-speed pre-ignition (LSPI)-reducing additive.