

DIESEL FUEL PURIFIER

Field of the Invention:

- 5 The present invention relates to fuel purifiers for diesel engines.

Background of the invention:

10 Diesel Fuel is used for operation of almost all types of light and heavy equipment including vehicles, road construction equipment, tractors, farming equipment, metallurgy equipment, oil prospecting equipment, electrical generators, trains, boats, ships, and military equipment, etc. Diesel contamination is one of the most factors that have an adverse effect on engine performance. For that specific reason, primary filters are used for solid waste as well as secondary filters for the fine contaminants, and traps
15 may be used for separation of water from the fuel. However, these filters are still ineffective and cannot cope with the frequent contamination of the fuel.

Such filters and traps may be the only solution available at present for purification of the diesel fuel, but the problem about such devices is that they have to be periodically replaced and need periodical maintenance.

20 These conventional filters and water traps are capable to a certain extent to produce relatively clean fuel free from water and contaminants, but still they may be not able to remove the solid waste of less than 5 micron, and wax build-up especially during cold weather, which in most cases causes a total or partial blockage of such filters, which interferes with the fuel flow and
25 ultimately negatively reflected on the engine itself due to lack of proper combustion.

To cope with this problem, the diesel engine employs electrical heating elements inside the combustion chamber for heating of air prior to starting of the engine, and another heating element is used in the purifier to improve fuel
30 and generate load currents that contribute towards precipitation and

separation of contaminants and eliminate wax build-up, which is positively reflected on ignition process and performance of the engine.

Summary of the invention:

5 The idea behind this invention is tackle the problems associated with the diesel fuel contaminants, to reduce pollution and maintenance to the minimum, and to maximize engine performance thanks to the relatively full ignition inside the combustion chamber.

10 The idea behind this invention also is to produce fuel of high purity, and make available a fuel purifier that is relatively maintenance free compared to conventional filters and traps currently in use.

 The invention is mainly designed for use at the cold countries because it does not need two heating elements (inside the combustion chamber and in fuel filter system).

15 According to the first aspect of the invention there is provided a diesel purifier unit comprising a purification chamber encapsulated by an external body of the unit wherein, the purification chamber has a barrier with conical and cylindrical parts

20 Surrounded by a wire filter, such that fuel flows from the unit inlet through a pipe to the conical part, further wherein the upper part of the unit has a relief valve, the lower part has a heating element, and a water sensor connectable to sound and light indicators at a cabin dash board, and at the bottom there is a drain valve and filter, which is secured at the outlet of the unit.

25 According to the second aspect of the invention there is provided a Diesel Purifier according to claim 1, wherein the external body and the fuel inlet pipe and cylindrical and conical parts and are made by forming black steel sheet, and upper and lower covers are formed by moulding, and place for relief valve (9), heating element, water cock and drain valve are formed by hydraulic devices.

Preferred aspects and features of the invention may be defined in the claims, attached hereto, which claims are hereby made part of the disclosure of the invention.

Further insight into the advantage and characteristics of the claimed invention can be gained from the following description of preferred embodiments.

Brief description of the drawings:

The herewith attached diagrams demonstrate features and characteristics of the diesel purifier, by way of example only.

Figure (1) a longitudinal cross section of the subject matter purifier.

Figure (2) a diagram showing where to install the purifier in the fuel system.

Figure (3) section taken along the line A-A in figure (2) above, shows how to fix the purifier by a bracket on the main frame of the vehicle.

Figure (4-A) and (4-B) a sketch showing the wire filters in use.

Detailed Description:

The invention is for a diesel purifier that produces a fuel of high purity that meets the full ignition requirements at the combustion chamber of the engine.

It should be noted that any reference to unit or purifier shall mean in this text a preferred device according to this invention.

The invention is demonstrated in details on the attached drawings, and figure (1) is a longitudinal section of the subject matter purifier. The device is consisted mainly of a purification chamber (1) which is encapsulated by the external body of the device (2), the purification chamber (1) has a cylindrical tapered section (3) at (4) which is encapsulated by a wire filter (7) (shown in figures (4-A, 4-B).

Fuel goes through pipe (6) to fuel inlet (5) up to the conical part shown in figure (4) where it is warmed by the heating element (10) up to a certain temperature, which makes warm fuel to escape to the wire filter (7) then to the outlet (8) through the final filter (22) which exists just before the outlet. The

upper part of the device has a relief valve (9), the lower part has a heating element (10) and a water cock (11) which is connected to sound and light indicators (12) at the vehicle dash board, and the bottom of the device has a drain valve (13).

- 5 The cylindrical body (2) and fuel inlet pipe (6) and other cylindrical conical parts (3) and (4) are made of black steel sheet, upper and lower covers and holes and the space for the relief valve (9) the heating element (10), water cock (11) and drain valve (13) is formed by a hydraulic device.

- 10 Once cylindrical parts are formulated and the above valves are at place, grinding shall take place to the connected parts, and the device shall be cleaned by the appropriate solvents, tightness and leaking tests for the device shall be conducted by using pressurized air at 7 bar, then the successful unit shall be treated with the appropriate paint, and the units which are intended for marine use shall be coated with marine grade humidity and corrosion proof
15 paint.

Relief valve (9), heating element (10), drain valve (13) and water cock (11) are all secured by a clamp. To eliminate any leaking a gasket (not shown in the diagram) is used for installation of these valves. These parts can be installed also by pressing or riveting or any generally accepted method.

- 20 Figure (2) shows in detail how to install the unit in the fuel system of the vehicle. Fuel flows from the fuel tank (14) in the direction of the arrow (15) to the unit inlet (5) which has a relief valve (9), heating element (10) and water cock (11) which is connected to sound and light indicators at the dash board (12) and drain valve (13). The unit is secured by band (16).

- 25 The diesel fuel is purified in the unit and the pure diesel goes out of the outlet (8) through the primary filter (17), then to the injection pump (18) then to the engine (not shown on the diagram).

- 30 Figure (3) shows how the unit is installed at the vehicle. It is secured by a steel clamp (16) fixed by screws (19) on the U-shaped bracket (20) at the vehicle frame (21).

Using a purifier according to the invention will result in many advantages including for example:

- 1- Reduces carbon black to minimum thanks to full fuel combustion.
- 2- Protects the sensitive parts of the fuel system including injectors,
5 injection devices, thanks to improvement of the warm fuel lubrication characteristics (which is optimum at 36°C).
- 3- It eliminates build-up of sulphuric acid thanks to separation of water from the fuel.

Figure (4) shows the best place for installation of the unit, which is the fuel
10 supply line, and after the main fuel tank which allows direct flow to the purifier.

Fuel is totally purified in the subject matter unit, fuel flows into the unit through the inlet (5) then down to the conical part (4) where it is affected by the heating element (10) which generates load currents due to fluctuation of temperature, which consequently affect the density of solid waste and fuel,
15 which contributes towards settling of water and solid waste at the bottom, nearby the drain valve (13). Warm fuel is directed to the wire filters (7), which separate light contaminants, and fuel continues to flow towards the outlet (8) where a final filtration takes place through filter (22), which is fixed at the unit outlet. The result is a pure fuel free from water and contaminants.

20 The above purification process depends on causing of some differences in the density of contaminants which contributes towards settling of heavy impurities and the light contaminants are separated by the wire filter assembly. Such difference in density is created by heating of fuel at a confined area at the lower part of the unit. Once the appropriate temperature
25 is reached, heavy contaminants and water precipitate, warm fuel flows towards the outlet through the wire filters that separate light contaminants.

Separated contaminants build-up at the bottom of the unit close to drain valve (13) where they accumulate up to certain level which is detected by sensor (11), at that point the sensor operates triggering out a warning light
30 and an alert system declaring the time for drain of contaminants.

Contaminants are easily drained on opening of the upper relief valve (9), and the lower valve (13). Once drain is completed, relief valve and drain valve shall be tightly closed.

5 Drain mechanism can be modified to operate automatically by replacing it with solenoid valve.

It should be noted that many changes and modifications can be made to this invention without affecting the main concept of this invention.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprising", will be understood to
10 imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

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CLAIMS:

1. A diesel purifier unit comprising a purification chamber encapsulated by an external body of the unit wherein, the purification chamber has a barrier with conical and cylindrical parts surrounded by a filter, such that fuel flows from the unit inlet through a pipe to the conical part, further wherein the upper part of the unit has a relief valve, the lower part has a heating element, and a water sensor connectable to sound and light indicators at a cabin dash board, and at the bottom there is a drain valve and filter, which is secured at the outlet of the unit.
2. A diesel purifier unit according to claim 1, wherein the external body and the fuel inlet pipe and cylindrical and conical parts are made by forming black steel sheet, and upper and lower covers are formed by moulding, and place for relief valve, heating element, water cock and drain valve are formed by hydraulic devices.
3. A diesel purifier unit according to claim 1 or 2, wherein connected parts are subject to grinding, and then the unit is cleaned by ordinary solvents; further wherein tightness against leaking is tested under pressurized air of 7 bars, and then the unit is coated by an appropriate paint.
4. A diesel purifier unit according to claim 3, wherein unit intended for marine use is coated with anti-corrosion.
5. A diesel purifier unit according to any of the above claims, wherein the relief valve, the heating element, drain valve, and water sensor are secured by a clamp, and to ensure tightness and a gasket is used for installation of any these valves.

6. A diesel purifier unit according to claim 5, wherein relief valve, heating element, drain valve, and water cock are secured by riveting or any appropriate method.
- 5 7. A diesel purifier unit according to claim 1, wherein wire filters are made of aluminium wires.
8. A process for purifying diesel fuel using purifier according to any of claims 1-6 characterized in that fuel flows into the purifier through the
10 inlet then down to the conical part where it will be under the effect of the heating element, which warms up diesel fuel found at this site, generating load currents that contribute towards separation and setting of heavy contaminants at the bottom, in the direction of the drain valve, and warmed fuel up flow in the direction of the wire filters, which
15 separates fine contaminants, and pure fuel continues flowing towards the outlet, where it is finally purified by filter, which is installed at the outlet and flows out pure and free from water, heavy and light contaminants, then it goes towards the primary convention filter.
- 20 9. A process according to claim 8, wherein diesel fuel in the conical part is heated to temperature in the range from 25°C up to 55°C.
10. A process according to claim 8 or 9, characterized in that water and heavy contaminants build-up at the lower part of the unit in the
25 direction of drain valve.
11. A process according to claim 8, 9 or 10, characterized in that warning light and sound alert is triggered out once contaminants go to a pre-determined level, declaring time for drain of contaminants.

12. A process according to any one of claims 8 to 11, characterized in that contaminants are drained by opening the upper relief valve and the lower drain valve, to start drain of water and heavy contaminants, and once drain is completed, relief and drain pipes are closed.

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13. A diesel purifier unit substantially as herein described with reference to at least one of the accompanying figures.

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14. A process substantially as herein described with reference to at least one of the accompanying figures.