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DIESEL AND BIODIESEL FUELS

Figure 68-1 (a) Regular diesel fuel on the left has a clear or greenish tint, whereas fuel for off-road use is tinted red for identification.

(a)

Figure 68-1 (b) A fuel pump in a farming area that clearly states the red diesel fuel is for off-road use only.

(b)

FREQUENTLY ASKED QUESTION

How Can You Tell If Gasoline Has Been Added to the Diesel Fuel by Mistake?

If gasoline has been accidentally added to diesel fuel and is burned in a diesel engine, the result can be very damaging to the engine. The gasoline can ignite faster than diesel fuel, which would tend to increase the temperature of combustion. This high temperature can harm injectors and glow plugs, as well as pistons, head gaskets, and other major diesel engine components. If contaminated fuel is suspected, first smell the fuel at the filler neck. If the fuel smells like gasoline, then the tank should be drained and refilled with diesel fuel. If the smell test does not indicate a gasoline smell (or any rancid smell), then test a sample for proper API gravity.

NOTE: Diesel fuel designed for on-road use should be green in color. Red diesel fuel (high sulfur) should be found only in off-road or farm equipment.

Figure 68-2 Testing the API viscosity of a diesel fuel sample using a hydrometer.

Figure 68-3 A fuel heater is part of the fuel filter and water separator located on the frame rail of a Ford pickup truck equipped with a PowerStroke 6.0 liter V-8 diesel engine.

CHART 68–1 The API gravity scale is based on the specific gravity of the fuel.

API GRAVITY COMPARISON CHART

Values for API Scale Oil

API GRAVITY SCALE	SPECIFIC GRAVITY	WEIGHT DENSITY, LB/FT	POUNDS PER GALLON
0			
2			
4			
6			
8			
10	1.0000	62.36	8.337
12	0.9861	61.50	8.221
14	0.9725	60.65	8.108
16	0.9593	59.83	7.998
18	0.9465	59.03	7.891
20	0.9340	58.25	7.787
22	0.9218	57.87	7.736
24	0.9100	56.75	7.587
26	0.8984	56.03	7.490
28	0.8871	55.32	7.396
30	0.8762	54.64	7.305

CHART 68–1 (continued) The API gravity scale is based on the specific gravity of the fuel.

32	0.8654	53.97	7.215
34	0.8550	53.32	7.128
36	0.8448	52.69	7.043
38	0.8348	51.06	6.960
40	0.8251	50.86	6.879
42	0.8155	50.86	6.799
44	0.8060	50.28	6.722
46	0.7972	49.72	6.646
48	0.7883	49.16	6.572
50	0.7796	48.62	6.499
52	0.7711	48.09	6.429
54	0.7628	47.57	6.359
56	0.7547	47.07	6.292
58	0.7467	46.57	6.225
60	0.7389	46.08	6.160
62	0.7313	45.61	6.097
64	0.7238	45.14	6.034
66	0.7165	44.68	5.973
68	0.7093	44.23	5.913
70	0.7022	43.79	5.854

CHART 68–1 (continued) The API gravity scale is based on the specific gravity of the fuel.

72	0.6953	43.36	5.797
74	0.6886	42.94	5.741
76	0.6819	42.53	5.685
78	0.6754	41.12	5.631
80	0.6690	41.72	5.577
82	0.6628	41.33	5.526
84	0.6566	40.95	5.474
86	0.6506	40.57	5.424
88	0.6446	40.20	5.374
90	0.6388	39.84	5.326
92	0.6331	39.48	5.278
94	0.6275	39.13	5.231
96	0.6220	38.79	5.186
98	0.6116	38.45	5.141
100	0.6112	38.12	5.096

CHART 68–1

Figure 68-4 A pump decal indicating that the biodiesel fuel is ultra-low-sulfur diesel (ULSD) and must be used in 2007 and newer diesel vehicles.

FREQUENTLY ASKED QUESTION

I Thought Biodiesel Was Vegetable Oil?

Biodiesel is vegetable oil with the glycerin component removed by means of reacting the vegetable oil with a catalyst. The resulting hydrocarbon esters are 16 to 18 carbon atoms in length, almost identical to the petroleum diesel fuel atoms. This allows the use of biodiesel fuel in a diesel engine with no modifications needed. Biodiesel-powered vehicles do not need a second fuel tank, whereas vegetable-oil-powered vehicles do. There are three main types of fuel used in diesel engines. These are:

- Petroleum diesel, a fossil hydrocarbon with a carbon chain length of about 16 carbon atoms.
- Biodiesel, a hydrocarbon with a carbon chain length of 16 to 18 carbon atoms.
- Vegetable oil is a triglyceride with a glycerin component joining three hydrocarbon chains of 16 to 18 carbon atoms each, called **straight vegetable oil (SVO).** Other terms used when describing vegetable oil include:

- **Pure plant oil (PPO)**—a term most often used in Europe to describe SVO
- **Waste vegetable oil (WVO)**—this oil could include animal or fish oils from cooking
- **Used cooking oil (UCO)**—a term used when the oil may or may not be pure vegetable oil

Vegetable oil is not liquid enough at common ambient temperatures for use in a diesel engine fuel delivery system designed for the lower-viscosity petroleum diesel fuel. Vegetable oil needs to be heated to obtain a similar viscosity to biodiesel and petroleum diesel. This means that a heat source needs to be provided before the fuel can be used in a diesel engine. This is achieved by starting on petroleum diesel or biodiesel fuel until the engine heat can be used to sufficiently warm a tank containing the vegetable oil. It also requires purging the fuel system of vegetable oil with petroleum diesel or biodiesel fuel prior to stopping the engine to avoid the vegetable oil's thickening and solidifying in the fuel system away from the heated tank. The use of vegetable oil in its natural state does, however, eliminate the need to remove the glycerin component. Many vehicle and diesel engine fuel system suppliers permit the use of biodiesel fuel that is certified as meeting testing standards. None permit the use of vegetable oil in its natural state.