FACT SHEET

Ford F250

Dedicated CNG Pickup

The U.S. Department of Energy (DOE) is promoting the use of alternative fuels and alternative fuel vehicles (AFVs). To support this activity, DOE has directed the National Renewable Energy Laboratory (NREL) to conduct projects to evaluate the performance and acceptability of light-duty AFVs. In this study, we tested a pair of 1998 F250 pickups: one dedicated CNG and a gasoline model as closely matched as possible. Each vehicle was run through a series of tests, explained briefly below. The procedures are described in detail on the vehicle evaluation Web site at *http://www.ott.doe.gov/otu/field_ops/nve/*

Acceleration: Three tests performed: (1) elapsed time from a standstill to 60 mph at wide open throttle, loaded and unloaded; (2) elapsed time from 40 to 60 mph at wide open throttle (passing simulation); (3) elapsed time and maximum speed at a quarter mile. Values are the average of six measurements.

Braking: Dry surface is concrete, wet surface is low friction Jennite pad. Minimum stopping distance from 62 mph on dry surface, and from 31 mph on wet surface with no wheels locked. Panic stops are minimum measured distance from 31 mph on wet and dry surfaces at maximum pedal pressure with no attempt to steer. Values are the average of six stops.

Fuel Economy: City fuel economy determined using an urban driving cycle—a distance of 2 miles with 8 stops. Highway fuel economy used a 70-mph average driving cycle with no stops. The 150-mile trip alternated between urban and highway cycles until 150 miles was reached. Results are reported in 70% highway driving for total trip.

Cold Start: Vehicle placed in a temperature-controlled room at -20°F for first test (minimum soak time 12 hr*). Crank time and idle rating recorded. If start successful, procedure repeated at -20°F for confirmation. If start unsuccessful, procedure repeated at higher temperature until minimum temperature is determined.

Driveability and Handling: Four different drivers rated each aspect of the vehicles; final rating is average of the four.

Emissions: Duplicate tests were performed on each vehicle using EPA's Federal Test Procedure. The CNG F250 was tested on CNG, and the gasoline F250 was tested on RF-A (industry average gasoline).

*Soak time allows the vehicle to stabilize at a given temperature.

Since 1997, Ford has offered its F-series pickups with a dedicated natural gas engine option. For this project, we tested a 1998 F250 with a 5.4L V8 Triton CNG engine. The term "dedicated" means that the vehicle operates on only one fuel, and can be optimized to run most efficiently on that fuel. The engine has been modified for durability when it is operating on gaseous fuels. Design changes include a specially tuned aluminum intake manifold assembly, intake valve seat inserts, and hard-faced exhaust valves. The standard model has two CNG tanks in the truck bed that hold 13.7 gge (gasoline gallon equivalent). An optional CNG tank package adds an underbody tank that increases the volume of CNG to 18.9 gge. The pickup's estimated range is 150–200 miles for the standard tank package, which increases to 200–300 miles with the optional tank. This vehicle meets California's super ultra low emissions vehicle (SULEV) criteria, as well as federal ultra low emission vehicle/inherently low emission vehicle (ULEV/ILEV) standards. An internal solenoid valve, which will stop the fuel flow in case of an emergency, is an added safety feature in the CNG tanks.

General Description

	CNG F250 XL	Gasoline F250 XLT
Engine:		
Displacement	5.4 liter	5.4 liter
Configuration	V8	V8
Transmission	4-speed automatic OD	4-speed automatic OD
Fuel System	Sequential EFI	Sequential EFI
Engine Family Code	WFMXT05.5RP5	WFMXT05.46BG
Compression Ratio	9.0:1	9.0:1
Capacities:		
Fuel	18.9 equivalent gal (@3,000psi)	30 gal
Passengers	3 front	3 front
Cargo (cu ft)	46.7	72.6
Dimensions:		
Length	220.8 in.	220.8 in.
Width	78.4 in.	78.4 in.
Curb Weight	7650 lb	7700 lb

Other features:
Both vehicles were rear wheel drive, 4x2, regular cab trucks equipped with air conditioning, power steering, power brakes, tilt wheel, antilock brake system, and cruise control. The CNG F250 featured front and rear disk brakes and was equipped with the optional CNG tank package. The gasoline F250 was also equipped with power windows and door locks.

Performance

Acceleration	CNG	Gasoline
0-60 mph loaded (sec)	16.03	13.35
0-60 mph unloaded (sec)	12.02	9.53
40 to 60 mph (sec)	6.03	4.70
1/4 mile time (sec)	18.76	17.28
1/4 mile speed (mph)	72.90	81.55
Fuel Economy (mpg)		
City	11.6	12.6
Highway	15.3	15.5
Combined City/Highway	14.6	14.5

Braking	CNG (with ABS)		Gasoline (rear ABS only)	
Effectiveness stops:	meters	feet	meters	feet
62 mph (100 kph) dry pavement	51.8	169.9	63.8	209.3
31 mph (50 kph) wet jennite	40.0	131.1	42.5	139.5
Panic stop				
31 mph (50 kph) dry pavement	13.9	45.5	15.4	50.6
31 mph (50 kph) wet jennite	39.1	128.2	55.8	183.0

Cold Start Temperature °F	CNG crank time	CNG idle rating	Gasoline crank time	Gasoline idle rating
-20	8.5	5	3	6

Idle ratings from 1 to 9, 1 being lowest rating

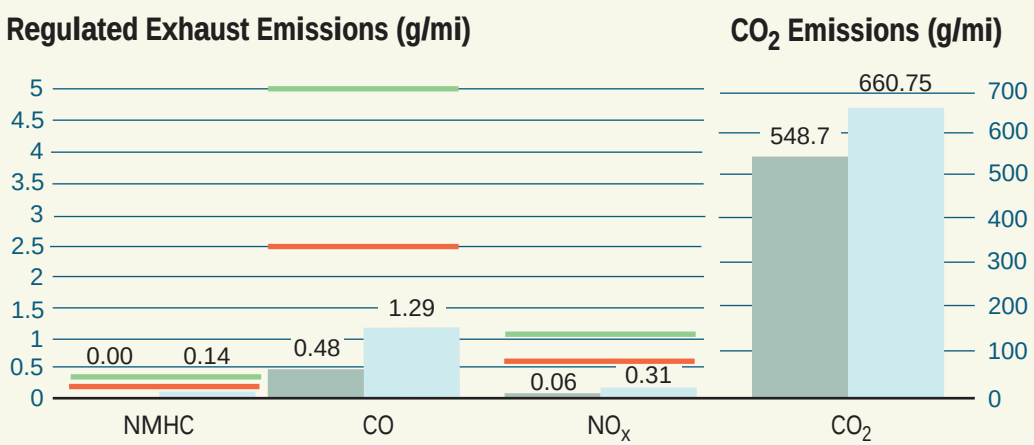
Subjective Ratings:

	CNG	Gasoline
Routine handling	★	★
Emergency handling	★	★
Acceleration	■	★
Braking	★	■
Ride; fully loaded	★	★
Ride; lightly loaded	■	■
Noise	★	★
Driving position	★	★
Front seat comfort	★	★
Climate control	★	★
Access	★	★
Controls & displays	★	★
Cargo area	■	★

★= Excellent ■ = Good ● = Fair ❍= Poor ❒= Very Poor

Emissions

CNG Gasoline Tier 1 ULEV



Evaluation Summary

Evaluation results for a dedicated CNG F250 and a conventional gasoline F250 pickup show little difference in cold start capability, or driveability and handling. There was a slight difference in city fuel economy (the CNG pickup was about 8% lower), no significant difference was revealed in highway or combined city/highway fuel economy. During cold start tests, both vehicles started at -20°F, with similar idle ratings. Acceleration of the gasoline F250 was 9% to 28% faster than the CNG F250. Braking test results showed that the CNG F250 was from 6% to 30% quicker than the gasoline model. This was to be expected because the CNG vehicle was equipped with four wheel disc brakes. During the cold effectiveness stops, the drivers had some difficulty stopping the gasoline F250 (rear wheel ABS only) without locking the front wheels. Evaluators for the driveability and handling test gave high marks to both pickups. The CNG F250 received lower marks for cargo space because of the fuel cylinder in the bed, and the gasoline F250 received lower marks for braking. The benefits of using CNG as an automotive fuel show up in the emissions results for the two vehicles. Measured values for both the CNG and gasoline tests not only meet, but exceed federal ULEV standards. However, all of the regulated compounds, along with CO_2 were much lower for the CNG F250. NMHC were 97% lower, CO was 62.6% lower, NO_x were 80.6% lower, and CO_2 emissions were 17% lower than those from the gasoline F250. Emissions of total potency weighted toxics (including benzene, 1,3-butadiene, formaldehyde, and acetaldehyde)* for the CNG pickup were 99% lower than those from the gasoline pickup.

* For more information on the calculation of potency weighted toxic emissions, see the emissions section on the Web site (http://www.ott.doe.gov/otu/field_ops/nve/).