

School Bus Fuel Economy Test

Comparing a Thomas Saf-T-Liner C2 and an International CE Compares SCR / DEF Technology (Diesel Exhaust Fluid) to Advanced EGR

Vehicle Stats		
	Thomas C2 (SCR Technology)	International CE (Advanced EGR)
Wheelbase	23'2"	23'
Bus Measurements	Length=40'1", Width=96", Height=10'	Length=39'9", Width=96", Height=10'6"
Engine	Cummins ISB 6.7 L	MaxxForce DT 7.6L
Rated HP	220 HP @ 2300 RPM	215HP @ 2200 RPM
Emission Technology	SCR (Diesel Exhaust Fluid)	Advanced EGR
Front Axle GVW	10,000	10,000
Rear Axle GVW	21,000	19,800
GVWR	31,000	29,800
*77 passenger payload 125# per passenger	9610#	9600#
Engine Belt Driven Accessories	Alternator, Engine Fan, Water Pump	Alternator, Engine Fan, Water Pump
Engine Gear Driven Accessories	Air compressor, Power Steering Pump	Air compressor, Power Steering Pump
Fan Drive on Engine	Viscous	Viscous
Transmission	Allison 2500 PTS w/ Economy and Performance Modes	Allison 2500 PTS w/ Economy and Performance Modes
Rear End Ratio	5.71	5.86
Tires	Goodyear G662RSA 11R22.5 G	Goodyear G662RSA 11R22.5 G
Tire Pressure	105psi	105psi
Tread depth on tires	22/32"	22/32"

Test Facts

- Tests conducted on both the Thomas and the International entirely by independent third party at test track in New Carlisle, Indiana.
- Multiple test runs performed with the same driver's that rotated between each different vehicles to eliminate the effect of drivers. Speed and Time Data were displayed live to the driver's and along the routes at all times so they could run the routes as close to exact as possible.
- Stop and Go, Urban route and Steady highway routes tested with transmission in economy and performance mode for each.
- SAE J1526, Type III methods of calculating fuel consumptions utilized.
- Vehicles tested were verified by OEM dealer that they were operating properly and that there were no fault codes stored and no diagnostic messages.

Test Facts - continued

- Vehicles were serviced including oil and filter change, air filter changed, fuel filter changed, and vehicle alignment adjusted to specs.
- Instruments installed on vehicles: Fuel flow meters (to determine fuel consumption), GPS units (speed and distance), thermocouple at flow meter (fuel temperature), thermocouple at exhaust outlet (exhaust temperature), DEF measurement device (pre-weighed container for exact DEF usage).
- The testing of vehicles lasted several weeks and both vehicles experienced active regenerations during the running of the test routes.
- A “test” was considered valid for either bus if when compared to other tests if its results were within 2% or two other valid runs.

Routes Tested

1. Stop and Go / Urban Route – Transmission in Economy Mode
 - a. Steady state speeds of 25mph, 30mph, and 40pmh with 2.33 stops/mile with deceleration at 8 fpsps. 27 miles were logged for each test.
2. Stop and Go / Urban Route – Transmission in Performance Mode
 - a. Steady state speeds of 25mph, 30mph, and 40pmh with 2.33 stops/mile with deceleration at 8 fpsps. 27 miles were logged for each test.
3. Steady / Highway Route - Transmission in Economy Mode (Activity Bus Route)
 - a. One 3 mile drive (simulating leaving the bus yard and driving to highway) and then 54 miles at a steady speed of 58mph and then a 3 mile drive (simulating leaving the highway and getting the bus back to bus yard.)
4. Steady / Highway Route - Transmission in Performance Mode (Activity Bus Route)
 - a. One 3 mile drive (simulating leaving the bus yard and driving to highway) and then 54 miles at a steady speed of 58mph and then a 3 mile drive (simulating leaving the highway and getting the bus back to bus yard.)

Conclusions

1. Stop and Go / Urban Route – Transmission in Economy Mode

The Thomas Bus with SCR/DEF Technology had a 10.0% fuel improvement over the International Bus with Advanced EGR Technology. With DEF considered into the calculations **the Thomas Bus had a 7.2% fuel improvement over the International Bus.**

2. Stop and Go / Urban Route – Transmission in Performance Mode

The Thomas Bus with SCR/DEF Technology had a 7.0% fuel improvement over the International Bus with Advanced EGR Technology. With DEF considered into the calculations **the Thomas Bus had a 4.3% fuel improvement over the International Bus.**

3. Steady / Highway Route - Transmission in Economy Mode – (Activity Bus Route)

The Thomas Bus with SCR/DEF Technology had a 26.8% fuel improvement over the International Bus with Advanced EGR Technology. With DEF considered into the calculations **the Thomas Bus had a 23.6% fuel improvement over the International Bus.**

4. Steady / Highway Route - Transmission in Performance Mode (Activity Bus Route)

The Thomas Bus with SCR/DEF Technology had a 27.4% fuel improvement over the International Bus with Advanced EGR Technology. With DEF considered into the calculations **the Thomas Bus had a 24.8% fuel improvement over the International Bus.**

Summary

The Thomas Bus with SCR/DEF Technology provides the lowest cost of ownership when compared to an International Bus with Advanced EGR Technology in every situation tested. On stop and go routes with the transmission in the economy mode the Thomas Bus is 7.2% better. On highway routes the Thomas Bus is exponentially better at 24.8% with the transmission set to performance mode.

Notes: The Thomas Bus with SCR/DEF Technology only required one active regeneration during these tests over several weeks. The International with Advanced EGR required four regenerations as a result of the same tests over the same period. The inherent design and intent of EGR is to reduce the combustion temperatures inside the engine cylinder thereby producing more particulate matter that has to be burnt off in the exhaust system. This is performed by regenerations. Additional tests are now being performed as to the comparative back-pressures on the engine from the after-treatment-device (ATD) and the life span of the ATD due to more frequent required regenerations.

North Carolina Example

School Bus				Activity Bus	
Brand X Fuel mileage w/ Excessive EGR	7	mpg		8	mpg
Proven SCR Technology Improvement on Thomas School Bus is 7% (24% better on activity buses.)	1.07	%		1.24	%
Thomas Bus Fuel mileage with SCR / DEF included in expense	7.49	mpg		9.92	mpg
Miles traveled per bus per year	14000			14000	
Gallons of fuel used by brand X with Advance EGR	2000	gallon s		1750	gallon s
Gallons of fuel used by Thomas Bus with SCR / DEF	1869.15887 9	gallon s		1411.29032 3	gallon s
Cost of diesel fuel per gallon by district	\$3.25			\$3.25	
Cost of fuel used by brand X with Advanced EGR	\$6,500.00			\$5,687.50	
Cost of fuel used by Thomas Bus with SCR / DEF	\$6,074.77			\$4,586.69	
Advantage of 1 Thomas Bus every year	\$425.23	1	bus	\$1,100.81	
Advantage of 10 Thomas Buses every year	\$4,252.34	10	buses	\$11,008.06	
Advantage of 100 Thomas Buses every year	\$42,523.36	100	buses	\$110,080.65	

Roy Parks or Phil Loflin can share this exact spreadsheet with you and help you calculate your actual saving for your fleet. By plugging in your actual fleet numbers into the yellow boxes this will give you specific county information.