SCR | Selective Catalytic Reduction

ROAD TESTED, INDUSTRY APPROVED.

5-9% fuel economy advantage

Industry-proven technology

Reliable engine architecture

The 2010

Environmental Protection Agency emissions standards require all medium- and heavy-duty vehicles to run cleaner. A lot cleaner. Nitrogen Oxide (NOx) exhaust emissions must be reduced to 0.2g/bhp-hr, an **83% reduction** from 2007 levels.

Thomas BUILT BUSES®

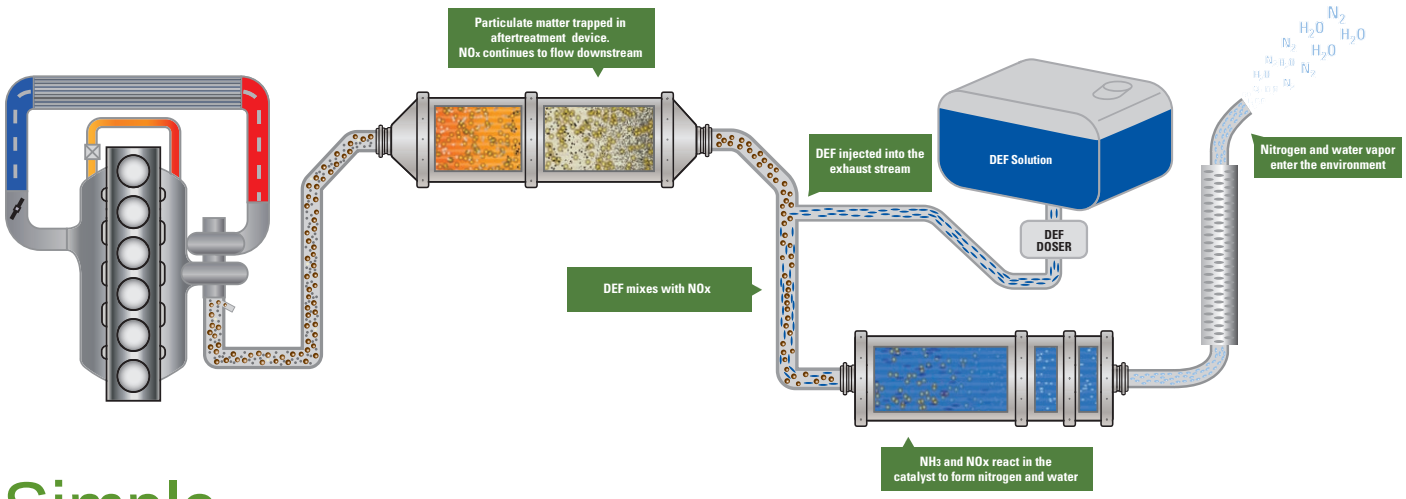
Because every mile matters.℠

SCR Selective Catalytic Reduction

What is SCR?

Thomas Built Buses and its engine partner, Cummins Inc., have worked hard to meet the Environmental Protection Agency (EPA) 2010 emission requirements while still maintaining maximum fuel efficiency and engine performance. Our proven technology, Selective Catalytic Reduction (SCR), not only reduces NOx emissions to near zero, but Cummins testing shows a 5-9% fuel economy advantage compared to In-cylinder EGR. By using the existing engine architecture, diesel oxidation catalyst and diesel particulate filter, plus the SCR hardware, SCR technology allows the engine to function at higher, more optimal combustion temperatures, which increases fuel efficiency and reliability. This proven, road-tested technology provides significant advantages for the environment, and your bottom line.

THINK OF SCR AS SIMPLE, COST-EFFECTIVE AND READY.



Simple

No matter what your role in transportation, SCR is a simple, cost-effective and ready NOx reduction technology that delivers engine reliability, increases fuel economy and requires fewer regenerations.

PURCHASER BENEFITS

- Offers 5-9% fuel economy advantage vs. In-cylinder EGR technology
- Saves fuel for every eliminated regeneration
- Maintains all the options you expect, from A/C condensers and roomy luggage compartments to wheelchair lifts
- Tested by millions of miles and years of experience worldwide
- Trusted by nearly all of the world's leading engine manufacturing companies
- CO_2 emissions decrease as fuel economy improves

DRIVER BENEFITS

- Maintains daily ease of use. Requires only a glance at the dash-mounted Diesel Exhaust Fluid (DEF) gauge.

  - Low-level warning is as easy as reading a fuel gauge
  - Yellow gauge warning indicates approximately 450 miles to go
- Preserves passenger safety. Engine will not shut down if DEF tank is empty.
- Allows adherence to schedule. Empty tank will not cause the bus to shut down while driving. Five mph de-rate only occurs after bus has been turned off and restarted. Full power will resume once DEF tank is filled.
- Eliminates driver fill ups. DEF tank fill intervals allow for fill at regular technician servicing.

TECHNICIAN BENEFITS

- Provides a reliable and durable technology
- Offers greater component reliability due to less EGR, higher oxygen levels, less heat rejection and fewer changes to moving engine parts
- No complex changes to the engine
- DEF filter replacement required approximately every 200,000 miles/6,500 hours
- DEF refill will be approximately 3 fills per year
- Uses DEF, a safe solution that is less toxic than other shop fluids such as windshield washer and antifreeze

Cost-effective

With a reliable and proven engine architecture, SCR is a clean-air technology that pays you back over the life of your bus.

Testing of SCR vs. In-cylinder EGR by Cummins has proven that:

- In-cylinder EGR reduces engine life by 20-25%
- SCR has greater component reliability
- SCR technology achieves a 5-9% fuel economy advantage over In-cylinder EGR

A 9% increase in fuel efficiency saves $270 per bus per year (based on assumptions below).*

SCHOOL BUS USAGE ASSUMPTIONS

- Average yearly mileage: 14,500 miles
- Fuel economy (with DEF): 8.5 mpg
- Local diesel price: $2.22
- Yearly diesel usage: 1,700 gallons
- Yearly diesel expenditure: $3,774

DEF CONSUMPTION ASSUMPTIONS

- Percentage of DEF to diesel usage: 1.5%
- Number of DEF fills (11.5 gallon tank): 3
- Number of DEF fills (10 gallon tank): 3
- Yearly DEF usage: 25 gallons
- DEF price target: $2.61
- Yearly DEF expenditure: $67

* Fuel economy and DEF usage will vary by driver.

Ready

Thomas Built's SCR emission technology is ready. Depend on it.

SCR is the mainstream technology that 90% of all North American on-highway engine and vehicle manufacturers chose to meet 2010 emission standards: Daimler Trucks, Cummins, Detroit Diesel, GM, Isuzu, Volvo, Paccar, Hino and Mack. It's proven.

Since 1978, many different exhaust systems in Europe have incorporated SCR technology. SCR has emerged as the best EPA 2010 technology based on environmental advantages and payback.

SCR is proven to reach the EPA 2010 NOx requirement of 0.2g/bhp-hr. Add to that the reliable engine architecture you know and trust.

The technology backed by millions of miles.

Daimler Trucks alone logged more than 30 million SCR testing miles and 2.5 million customer miles in North America. More than 600,000 SCR vehicles operate in Europe, from Scandinavia to the Mediterranean, and more than 250,000 of them are Daimler and/or Cummins SCR vehicles.

SCR vs. In-cylinder EGR AFTER RESEARCHING THE TWO AVAILABLE EMISSION TECHNOLOGIES, THOMAS BUILT DETERMINED THAT SCR WAS THE MORE RELIABLE AND FUEL-EFFICIENT OPTION.

SCR

Advantages of SCR

- Lowers need for Exhaust Gas Recirculation (EGR)
- Permits engine to operate under optimized combustion conditions, including increased temperature, increased pressure and excess oxygen
- Less heat rejection
- Cleaner available tailpipe emissions
- Proven technology across the globe
- Mainstream choice for 2010 solution

Customer Benefits

- Better fuel efficiency
- Less component stress
- Fewer regenerations relative to In-cylinder EGR
- Improved durability
- Expected lower total cost, which includes maintenance and fuel
- End emission products are nitrogen, water and carbon dioxide
- Decreased CO_2 emissions

IN-CYLINDER EGR

Disadvantages of In-cylinder EGR

- Less efficient combustion process requires lower temperatures
- Increased heat rejection causes the engine to produce more heat
- Higher injection pressures
- Decreased power density with same displacement size
- Increased diesel particulate matter (soot)
- Increased air flow and cooling capacity

Customer Impact

- Decreased fuel efficiency
- Increase in regenerations and fuel burned
- Increased complexity in turbo chargers, vehicle coolers, pistons and injectors
- Decreased engine durability
- Oil degradation