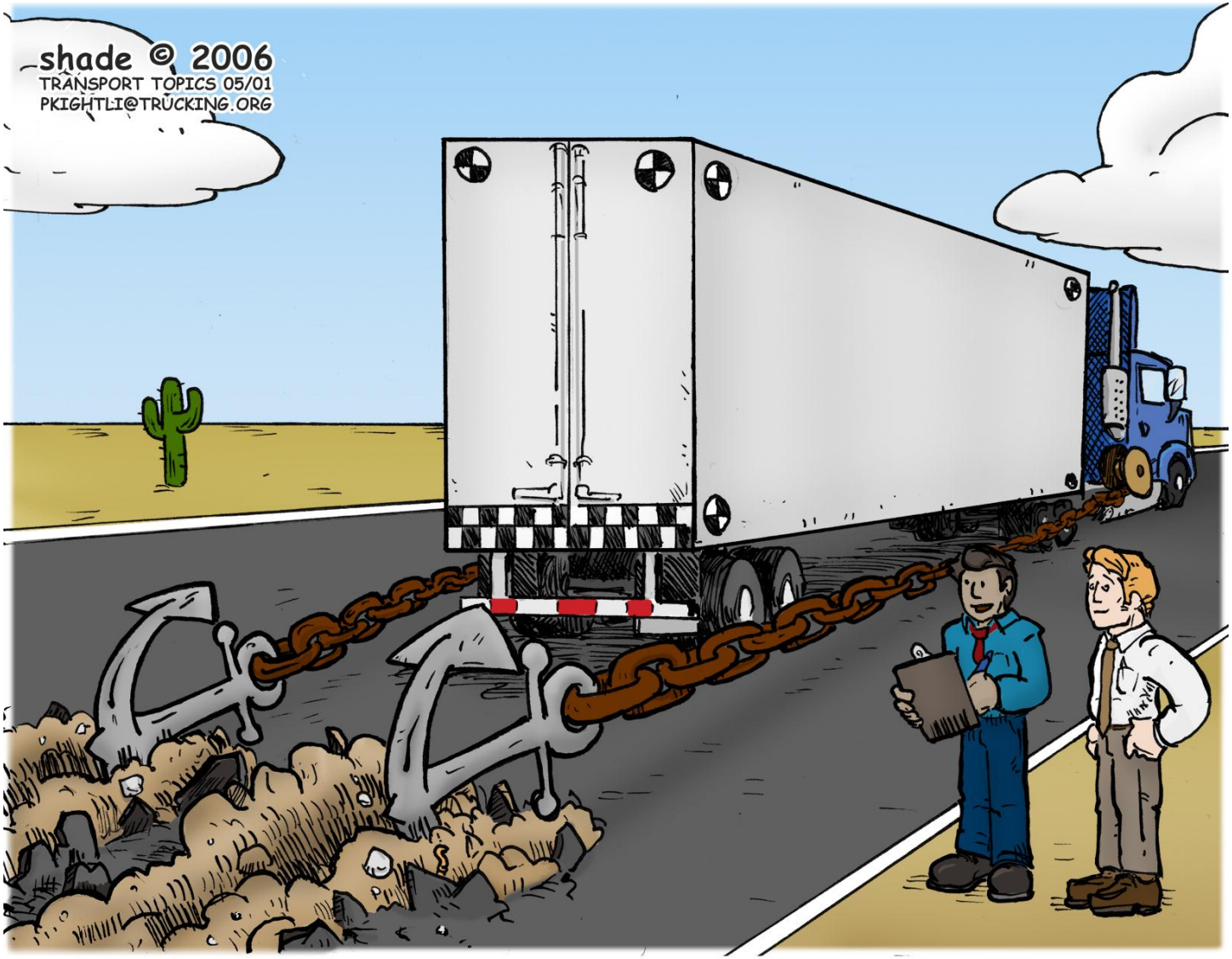
DAIMLER

Daimler Trucks North America
FMVSS 121 / GHG14 Update

June 26, 2012



"DRUMS ARE GOOD AND DISCS ARE BETTER, BUT THESE BABIES REALLY DO THE TRICK."

FMVSS -121 (Reduced Stopping Distance Regulation)

- What vehicles are impacted,
  - ALL air braked tractors in 2 phases:
    - Phase 1, implemented August 1, 2011
    - Phase 2, implementation August 1, 2013

- Vehicles that are not impacted
  - Trailers
  - Trucks
  - Chassis cabs
  - Bus, school bus and RV
  - Hydraulic braked vehicles

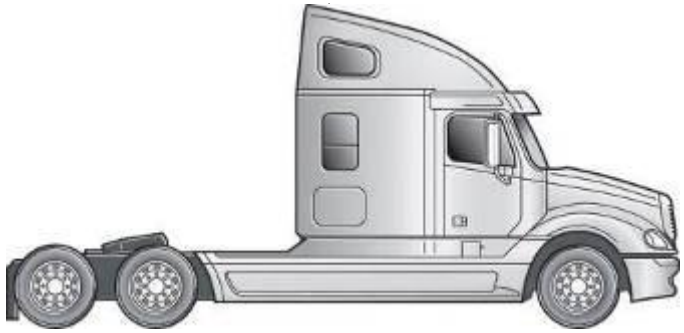
Phase 1 of the shorter stopping distance rule implemented August 1, 2011

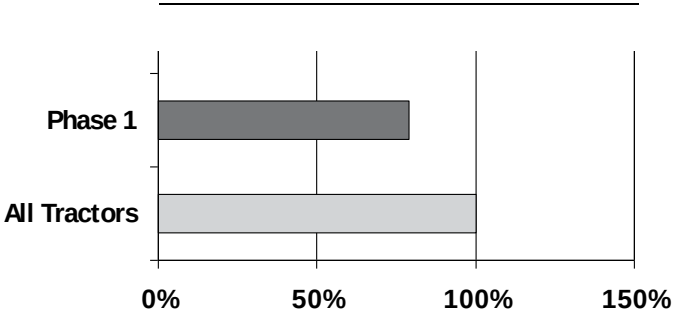
- 3 axle tractors (6x4) as defined within the new rules as:
  - A vehicle with a steer axle GAWR of 14,600 lbs or less

    AND
  - 2 rear drive axles with a combined GAWR of 45,000 lbs or less

- GVWR of 59,600 or less

- This classification represents majority of tractors produced.

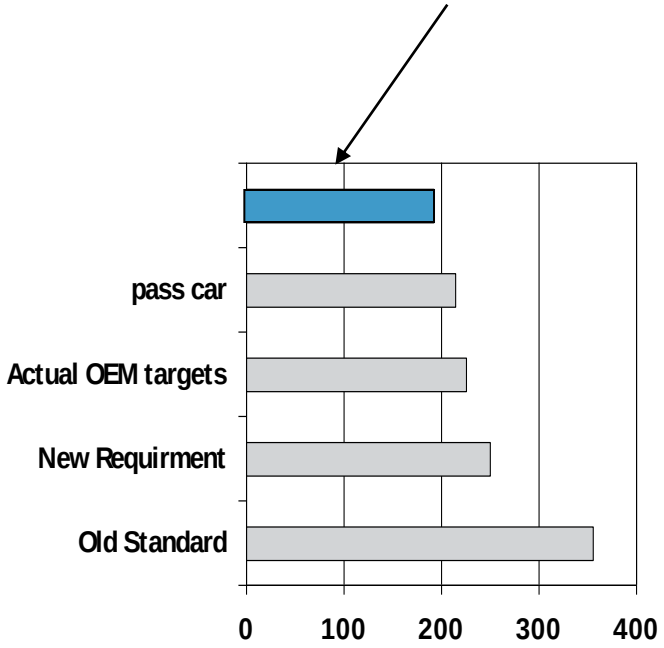




Phase 1, what did we do?

- The new rules called for shortening the stopping distance by 30% for this population of vehicles.
  - From 355 feet down to 250 feet effective August 1, 2011
  - DTNA added in a 10% margin making our target stopping distance 225 feet.
  - Stopping in the new requirements generates a peak deceleration of 0.6g. This drove additional changes to the vehicle suspensions.
  - By comparison many pass cars are allowed 214 feet from 60 mph.

- As a point of reference, FMVSS 121 specifies an unbraked or "standardized" trailer.
- In real world operation with a braked trailer the stopping distance is closer to 200 feet.



Steer Axle Brake Package Solution

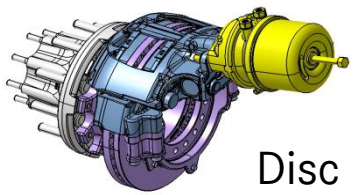
- We refer to our new brake package as our **Reduced Stopping Distance** or (**RSD**) package.
- The RSD package for the steer axle consisted of:
  - Replaced the 15x4 steer axle brakes with a larger 16.5 x 5 brake
  - A completely new brake lining material
    - Capable of generating higher friction and improved “green” performance
    - To achieve this, significant friction formulation changes are required.
    - Combinations of organic and semi-metallic brake blocks are one alternative
  - Increased front brake chambers from volume to increase the input power to the brake
  - Slack adjuster remained a 5.5 inch lever arm
  - Increased the 7 brake mounting bolts from 0.625 to 0.750 inch diameter

Rear Brake Package Solution


RSD Brake

- Our RSD rear brake package consists of:
  - Replaced the16.5 x 7 brake with a wider 16.5 x 8.625 brake
  - New brake lining materials at 40K and 45K GAWR tandems
  - Friction characteristic changes
    - Improvements in “green” performance
    - Measures taken to reduce potential for brake squeal
  - We maintained our current 30 inch brake chamber
  - Standard slack adjuster will stay at 5.5 inch lever arm
  - Stayed with same mounting fasteners but increase the number of fasteners as application warrants.

Optional air disk brake packages available



Disc Brake

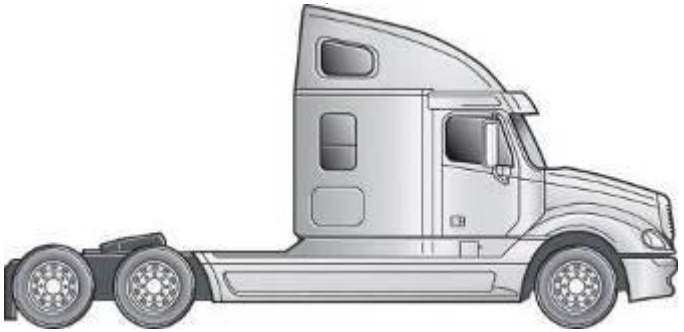
- Bendix ADB22X-V air disc brake both front and and rear.
  - This gives us the shortest stopping distance, approx. 5% less than all drum brakes.
  - This brake is designed specially for DTNA with vertical carrier mounting arrangement and a unique inset that provides us wheel/valve stem clearance for all known 22.5 inch wheels in this market.
- WABCO Maxxus air disk brake packages currently being released

Why we chose this direction

- We set out with multiple objectives as we designed our brake packages to meet the upcoming rule.
  - First not only will we meet the requirements of the rule, we plan to exceed them by a 10% margin.
    - Because we want this level of performance from our vehicles and we felt we could achieve it with the new designs.
    - We recognize braking performance as a critical vehicle function and we want the safest vehicles on the highway.
  - Next and just as critical, we need to maintain the current level of tractor to trailer brake compatibility with regards to:
    - Pneumatic balance
    - Brake timing
    - Temperature balance
    - Wear balance

Phase 2 of the shorter stopping distance rule goes into effect August 1, 2013

- (All) 2 axle tractors new stopping distance of **250 feet** from 355 feet
- 3 axle tractors 59,601 GVWR to 70,000 new stopping distance of **250 feet** from 355 feet
- 3 axle tractors above 70,000 GVWR new stopping distance of **310 feet** from 355 feet
- 4 or more axles up to 85,000 GVWR new stopping distance of **250 feet** from 355 feet
- 4 or more axles over 85,000 GVWR new stopping distance of **310 feet** from 355 feet



What else is affected by the brake changes?

- ABS configurations – increased use of 6 sensor systems to better control tandem drive axle wheel lock.
- Front Axle/Suspension – Due to load transfer, front axle/suspension will see increased vertical loading.
  - New front springs, support castings clamp groups
  - Changes to the steer axle brake mounting flange
  - New family of axles to accept air disc brake
- Rear Suspension – Due to increased load transfer rear axles/suspensions are actually being unloaded.
  - Must efficiently utilize all available traction
  - Due to brake dive or suspension characteristics, we may require ABS sensors in each wheel-end on some vehicle configurations.

Summary

- FMVSS 121 is a panic brake stop, not something that is done everyday in the real world. So we also identified the need to create a brake package that improves life under normal operation.
  - By using larger brakes we gain greater surface area. This helps to achieve the higher torques demanded by the new regulation and at the same time we increase the surface area of the brake block we also add to the total volume of lining material.
    - Less in stop brake fade under hard applications
    - Brakes operate at a lower temperature due to greater heat transfer
    - The combination of lower temperature and greater wearable volume increase the brake life.

Future Considerations to Braking Standards???.....

- Increase in allowed loads
  - What happens if GVWR limit is raised to 90k lbs. or ???
- Trailer brake performance
  - Increased tractor brake torque requires increased trailer brake torque to avoid temperature imbalance
    - Is a new trailer brake performance standards needed?
    - Impacts of poor trailer brake maintenance will grow
    - More enforcement of brake maintenance requirements?
  - Stability control systems apply trailer brakes to stabilize the combination vehicle, putting even more emphasis on trailer brake performance
- Potential for further rulemaking
  - Will there be a future rule for stopping distance on the remaining air braked vehicles?
  - Could a new rule for Stability Control impact the foundation brakes through changes to the ABS system performance?

Overview of GHG Regs

Regulated Classes and model inputs

Class 7-8 Line haul (Tractor/Trailer)

- **Required inputs**
  - Aerodynamic vehicles + devices
  - Low rolling resistance tires
  - Weight reduction
  - *Improved engines*
  - Idle reduction
  - Speed limiters (VSL)
- **Optional (can offset required reductions)**
  - Eco-features

- **Class 3–8 Vocational**
  - **Required inputs**
    - *Improved engines*
    - Low rolling resistance tires
  - **Optional (can offset required reductions)**
    - Hybridization
- **Class 2b-3 Heavy pick-ups and vans (not addressed here)**

	Day Cab		Sleeper
	Class 7	Class 8	Class8
Low Roof			
Mid Roof			
High Roof			

The model inputs will determine the Family Emission Limit (FEL) for that vehicle configuration

Each truck will be compared to a "standard"

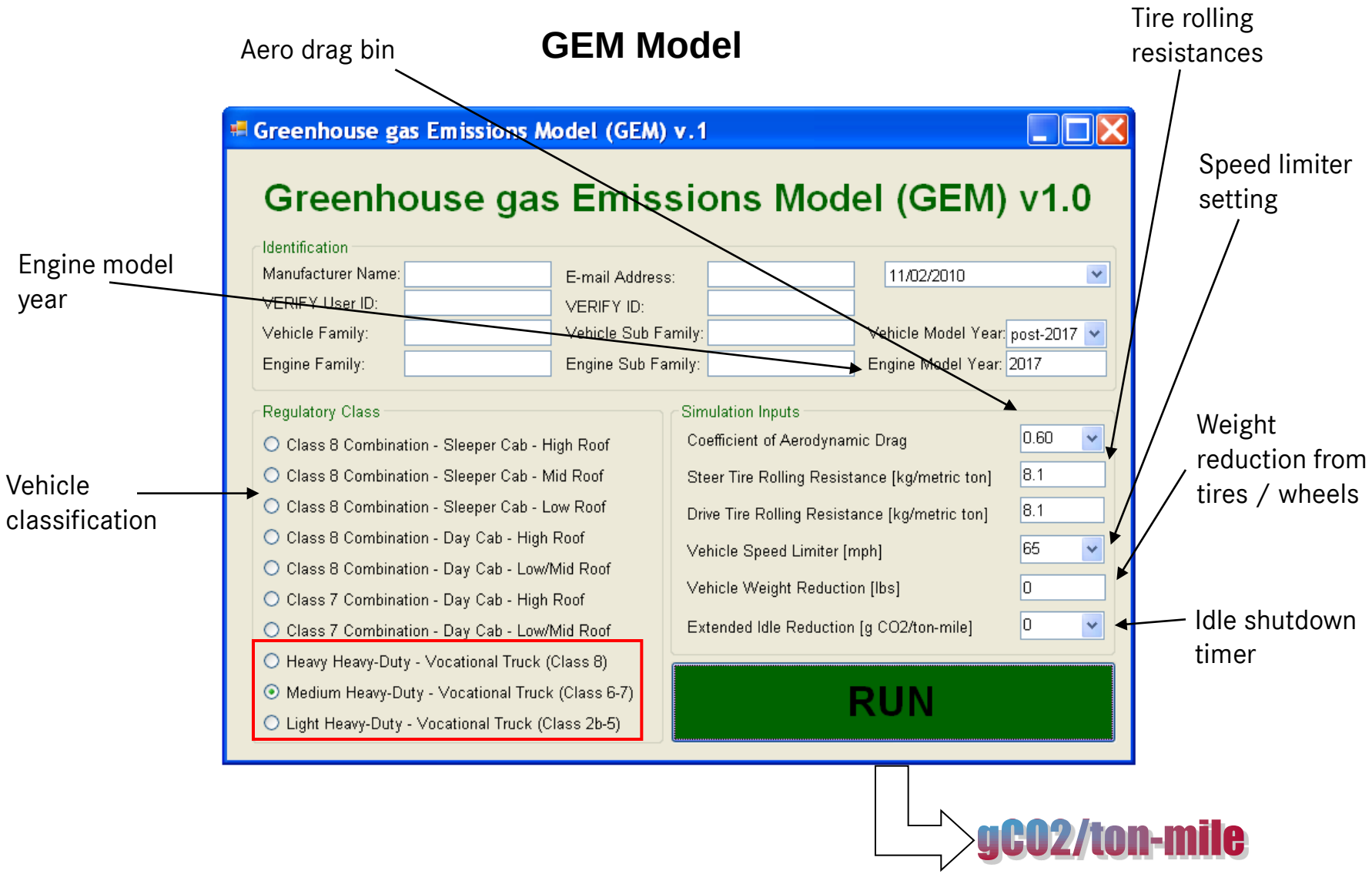
GHG Regs - Vocational Vehicles

- What is a Vocational Vehicle
- Class 5 and 6 – automatically considered Vocational
- Class 7 and 8 – if no 5th Wheel, or if equipped with PTO, then Vocational
- Who is Responsible – Chassis OEM, not Truck Equipment Manufacturer
- Compliance Approach
- Greenhouse gas Emissions Model (GEM).
  - KEY inputs are based on:
    - Weight Reductions
    - Tire Rolling Resistance
- Credits will be given for use of Hybrid technologies.

GHG Regs - Engines

- Engine will be regulated separately from vehicles
- Standards will vary based on the truck class the engine is installed into.
  - EPA – CO2 Standard
  - EPA – N2O & CH4 Standard (cap)
  - NHTSA – Fuel Economy Standard
- Modest initial engine CO2 targets consistent with agreements to expedite the rule
  - 3% improvement in 2014 from 2010 baseline
  - 5% in 2017
  - 2020 and beyond = Phase 2
- Tested on existing EPA test cycles
  - RMC (13 mode) Steady state test for line-haul
  - FTP for vocational certification
  - **Not always correlated with real in-use engine operation**

Vehicle CO_2 Emission Model

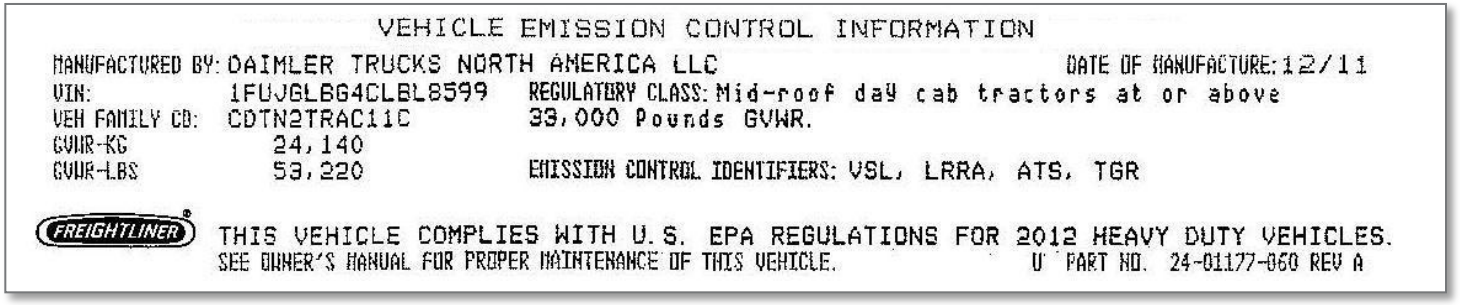


Impact On Vehicle Operators

- More fuel efficient engines
- Same vehicle options as today, but a shift toward more fuel saving components
- Greater use of 5 minute idle shutdown timers
- No need for radical new technologies – SCR is here to stay
- Potential for significant fuel savings

GHG14 requires few changes to your vehicle

•We've added an emissions label (found on the inside edge of the driver-side door or inside the driver-side door jamb on most vehicles). **The label displays that your DTNA vehicle meets GHG efficiency requirements, as designed**.



VEHICLE EMISSION CONTROL INFORMATION

MANUFACTURED BY: DAIMLER TRUCKS NORTH AMERICA LLC — DATE OF MANUFACTURE: 12/11

VIN: 1FUJGLBG4CLBL8599 — REGULATORY CLASS: Mid-roof day cab tractors at or above 33,000 Pounds GVWR.

VEH FAMILY CD: CDTN2TRAC11C

GVWR-KG 24,140

GVWR-LBS 53,220

EMISSION CONTROL IDENTIFIERS: VSL, LRRA, ATS, TGR

FREIGHTLINER

THIS VEHICLE COMPLIES WITH U.S. EPA REGULATIONS FOR 2012 HEAVY DUTY VEHICLES.
SEE OWNER'S MANUAL FOR PROPER MAINTENANCE OF THIS VEHICLE. U PART NO. 24-01177-060 REV A

Do not remove or tamper with this label. It's part of the vehicle's certification.

THANK YOU!