WHAT DO CUSTOMERS WANT?

(After the last 10 years of emissions changes)

• Confidence
• Reliability
• Savings
• EARLY Demonstration Concept
• 23 units
• Volvo D12 with SCR/DPF
• Not EPA’10
• 9,000,000+ miles
EXTREME WEATHER SCR TESTING

- Winter - Northern Canada, Sweden, -36°F, bobtail
  - (light loading maximizes exhaust after-treatment system issues)
- Summer/Altitude - Colorado, Arizona, 100°F, 11,000 ft.
Volvo invested heavily in testing and validation
- 146 vehicles, 67 rigs, 46 million equivalent miles
- Unparalled development testing has proven our product performance, durability and reliability
- Initial production vehicle (CSVs) performance in the field has validated this commitment and investment
- Fuel economy savings AND clean air are delivered
- Following our vision, VOLVO was first to receive EPA and CARB 2010 emissions certification
SCR ENGINE SOLUTION
EMISSION SYSTEM DEVELOPMENT

EGR – Exhaust Gas Recirculation

• EPA ’02  Light EGR  Up to 10%
• EPA ’07  Heavy EGR  10% - 35%
• EPA ’10  Massive EGR  35% - 50%
D12D – LIGHT EGR

- NOx reduced from 4 to 2.5
- Light EGR added
D13F - HEAVY EGR

- NOx reduced from 2.5 to 1.2
- Soot reduced 90% to near zero
- DPF after-treatment added
D13H – EGR REDUCED, SCR ADDED

- NOx reduced from 1.2 to 0.2 (near zero)
- SCR after-treatment added
Diesel Exhaust Fluid (DEF) is injected into the post DPF exhaust stream.

Within Selective Catalytic Reduction (SCR) system, ammonia reacts with NOx to form nitrogen and water.

DEF converts to ammonia in exhaust heat.

Diesel Particulate Filter (DPF) traps soot which is passively regenerated during vehicle operation.

Near zero emissions exit the exhaust pipe.

Engine Exhaust
Volvo’s SCR Technology eliminates active regeneration for EPA 2010 highway trucks*
LARGER CATALYST MEANS GREATER EFFICIENCY

- Industry’s longest decomposition zone
- Three bricks instead of two
- No active regen
- More NOx
- Less EGR
- Greater fuel efficiency
- 5% over 2007
FUEL ECONOMY VALIDATION

• EPA’07 vs. EPA’10
• Back-to-back testing in engine dyno
  • Maximizing control of variables, simulating “real” road cycles
• “On-road” confirmation testing
  • Controlled and standardized road cycle, control of test variables
  • Tests performed by internal experts and professional drivers
• Real world conditions, Identically specified trucks, achieved up to 5% fuel savings for EPA’10 vs. EPA’07
Fuel Economy Elements

- Drivetrain efficiency
- Tires
- Aerodynamic aids
- Driver
- Tractor trailer configuration
- Engine programming
- Top speed gearing
- Idle technology
- Maintenance practices
- Terrain
- Weather
- Combination weight
- Management practices
WHAT HAS VOLVO DELIVERED FOR 2010?

- Same base engines as last EPA’07
- Less EGR – engines run healthier and deliver better fuel economy
- The No-Regen philosophy. *We’ve even taken off the inhibit switch!!*
- First one on the street. Only one with three winters of testing.
- 5% improvement in fuel economy from our already great 2007 D13

CONFIDENCE. RELIABILITY. SAVINGS.