The Ceryx QuadCAT Converter for Retrofit Applications

presented to

The DEER Workshop

San Diego, CA
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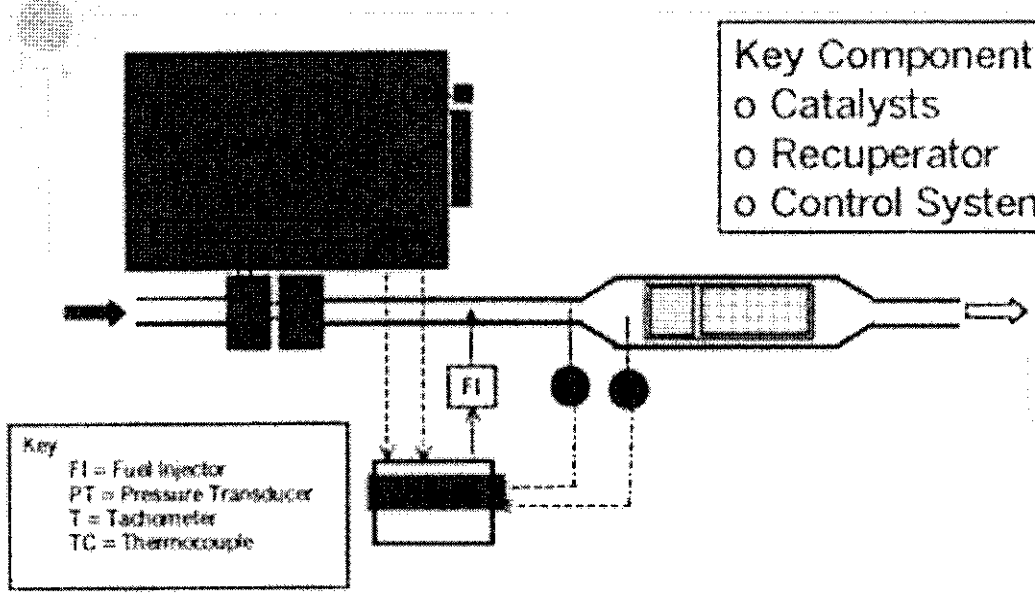
Ceryx Incorporated

Ceryx is a technology company focused on the development, production, and marketing of advanced emissions control systems for diesel and other combustion engines.

The QuadCAT System



Key Components
- o Catalysts
- o Recuperator
- o Control System

Integration Makes Full Use of Resources

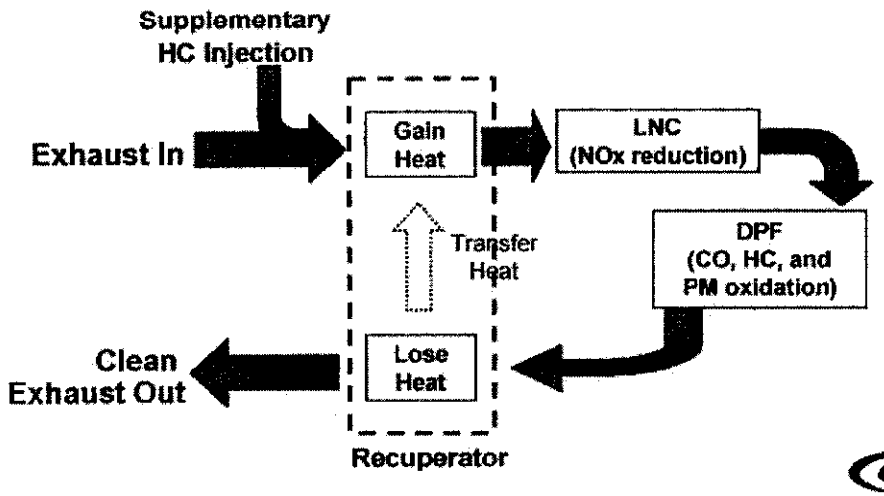
Injecting supplementary HC provides:

Energy source for DPF regeneration
$HC + O_2 \rightarrow Heat$

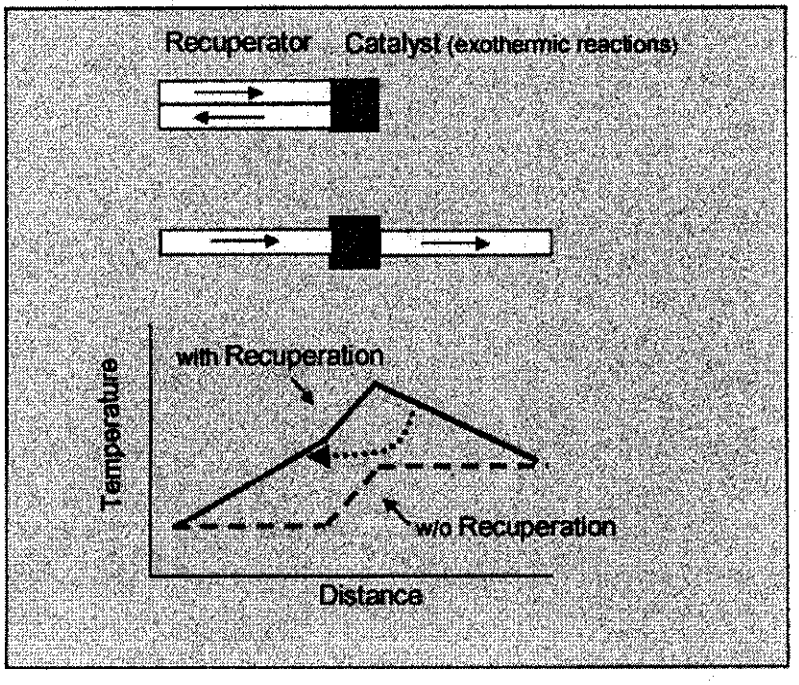
Reducing agent for NOx catalyst
$HC + NOx + O_2 \rightarrow CO_2 + H_2O + N_2$

QuadCAT Flow Schematic

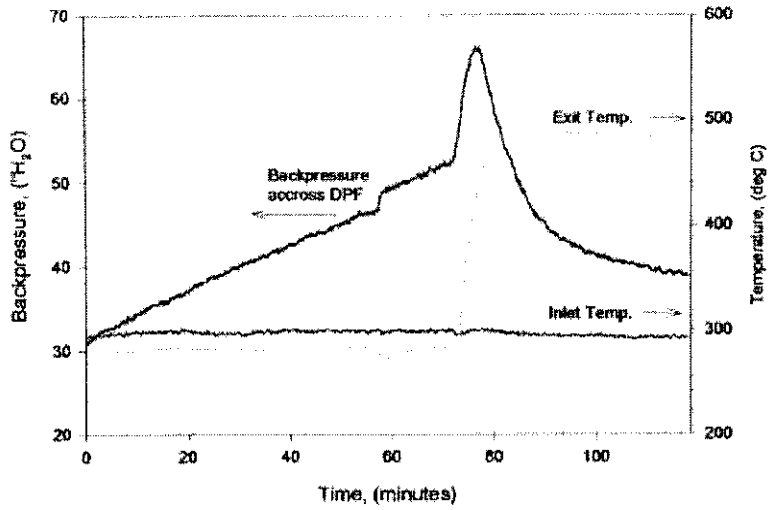
- Integrate heat transfer and chemistry for simultaneous reduction of NOx, CO, HC, & PM



Heat Recuperation Elevates Catalyst Temperatures



Active Filter Regeneration with Fuel Injection



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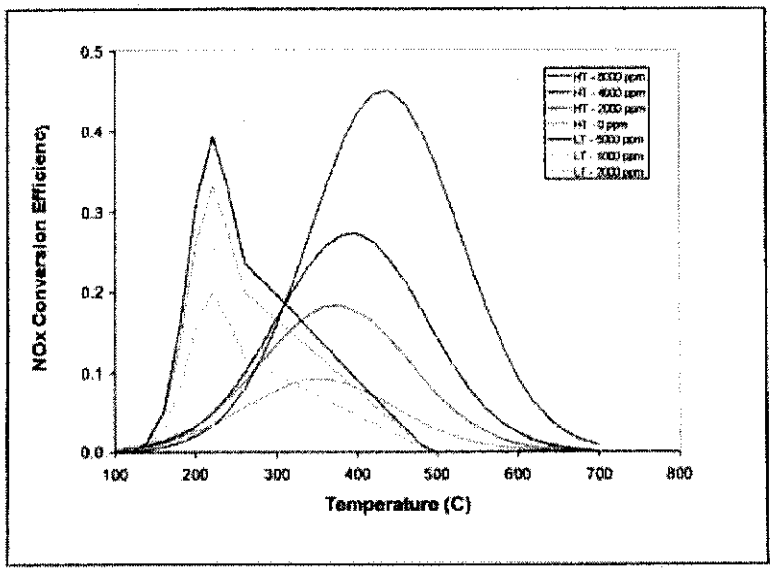
NOx conversion with Lean NOx Catalyst



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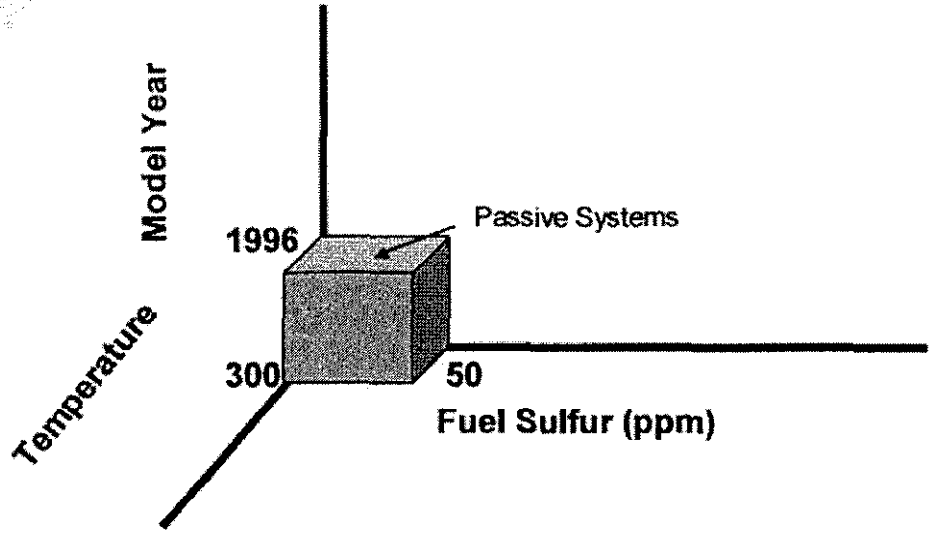
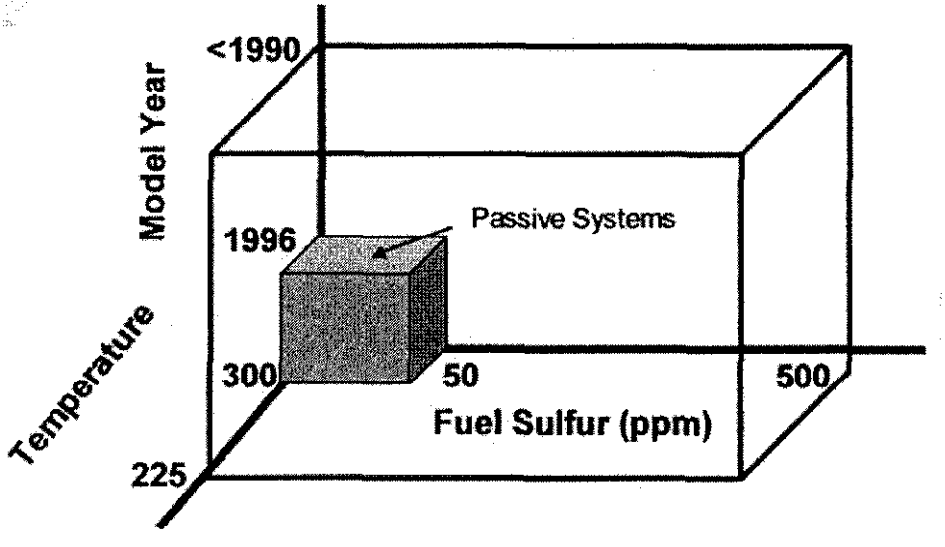
Passive DPF Systems



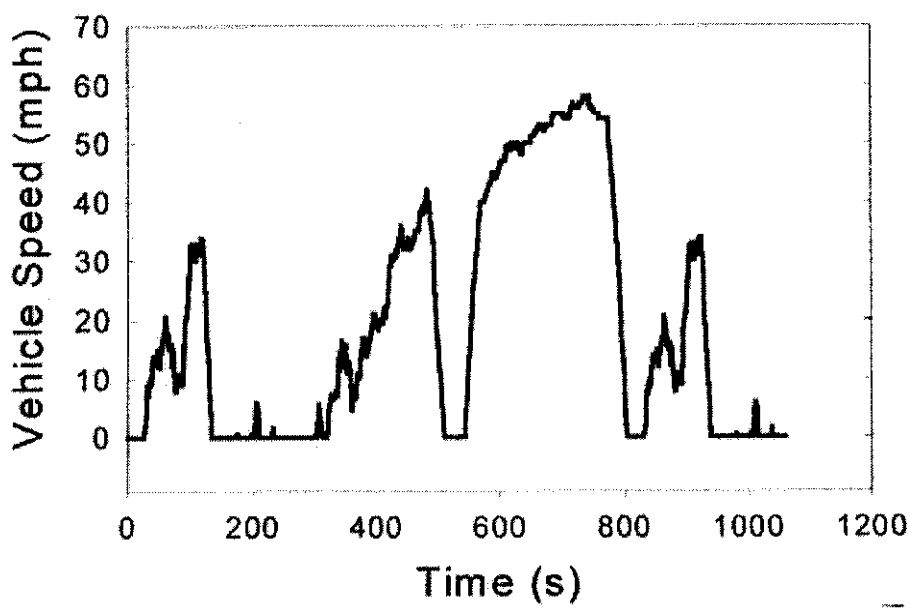
Benefits of Active Regeneration



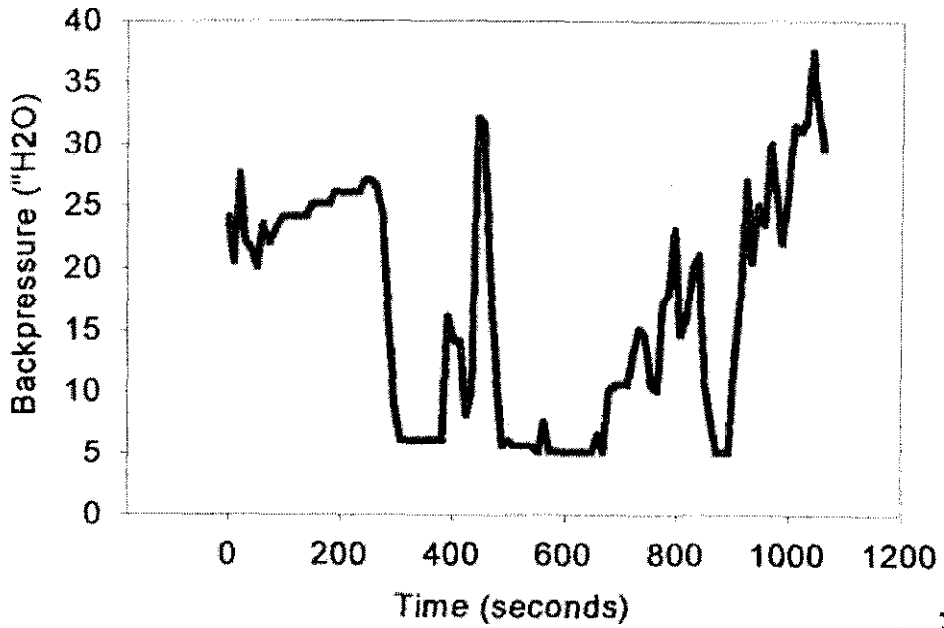
Transient Testing

- 2 school buses (1986 and 1999)
- 2 transient test cycles (UDDS, CBD)
- CARB approved HD chassis dyno facility
- Fuel: CARB diesel #2 (150-160 ppm)

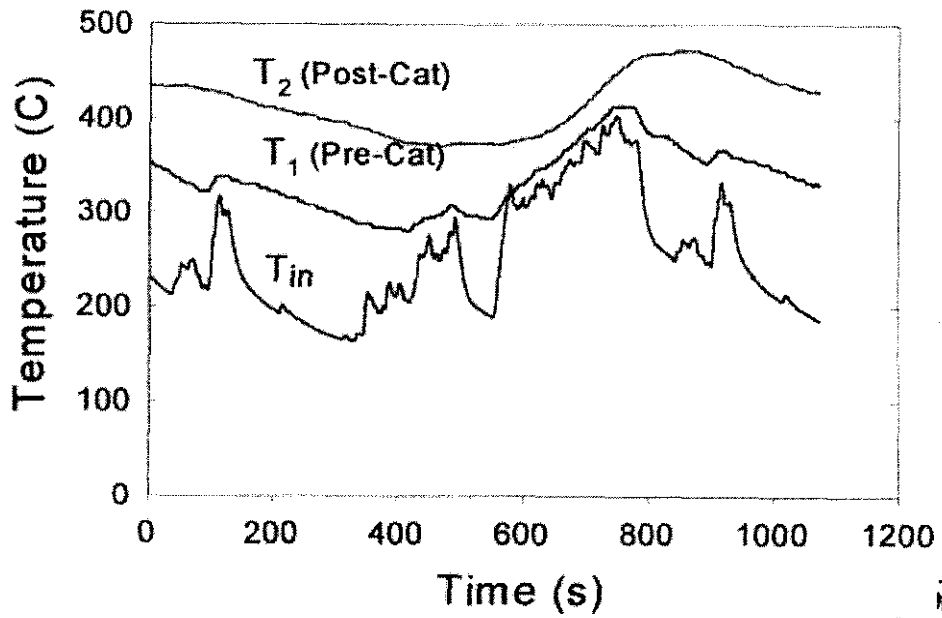
UDDS (Urban Dynamometer Driving Schedule) Test



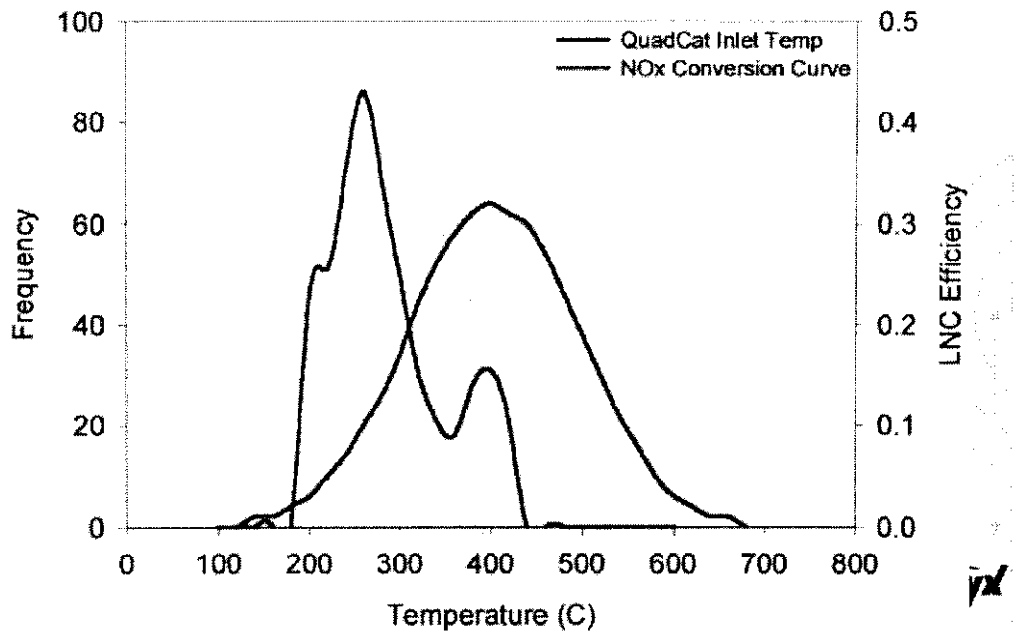
Exhaust System Backpressure



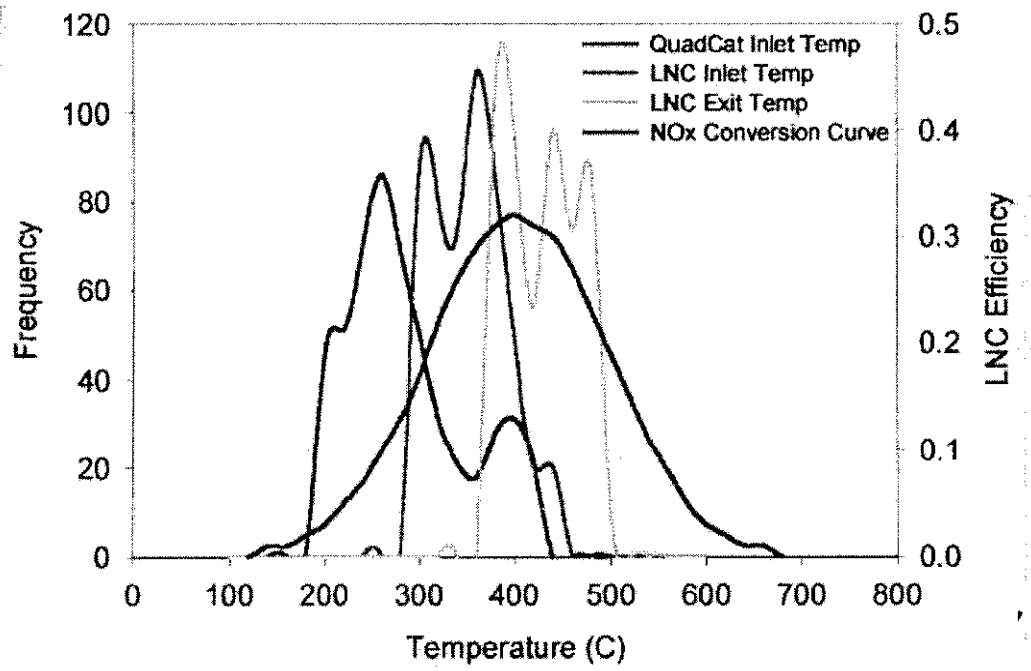
QuadCAT Temperature over UDDS Cycle



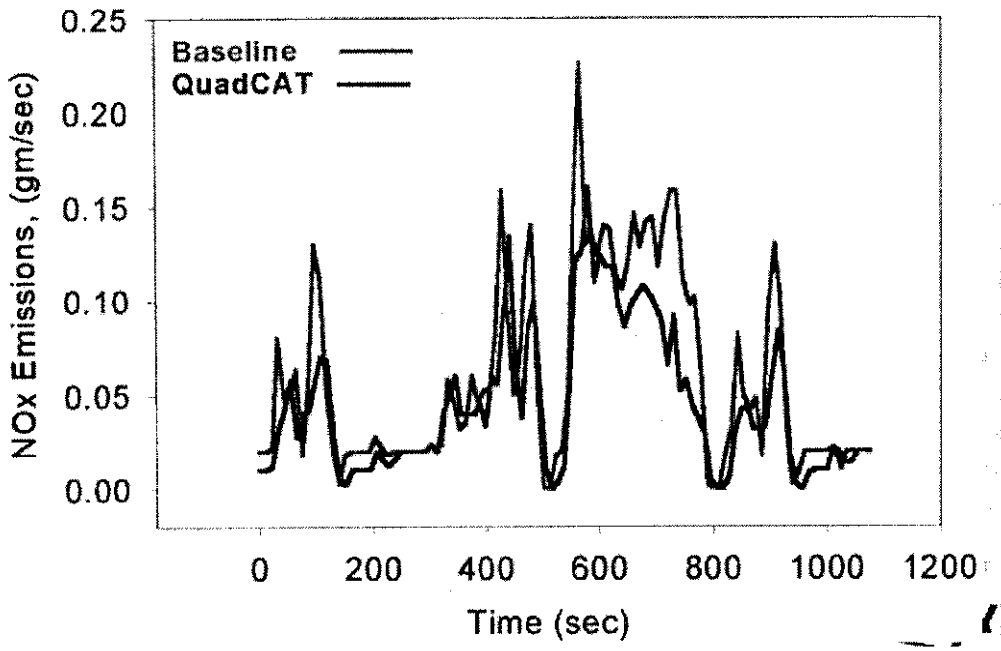
Exhaust Temperatures and LNC Conversion Window



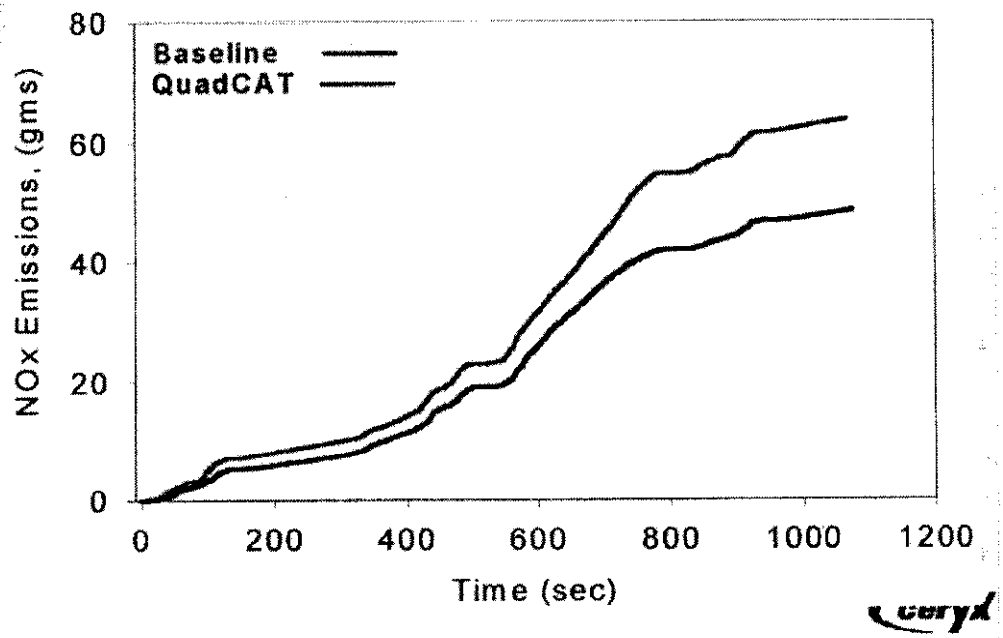
Exhaust Temperature Profiles



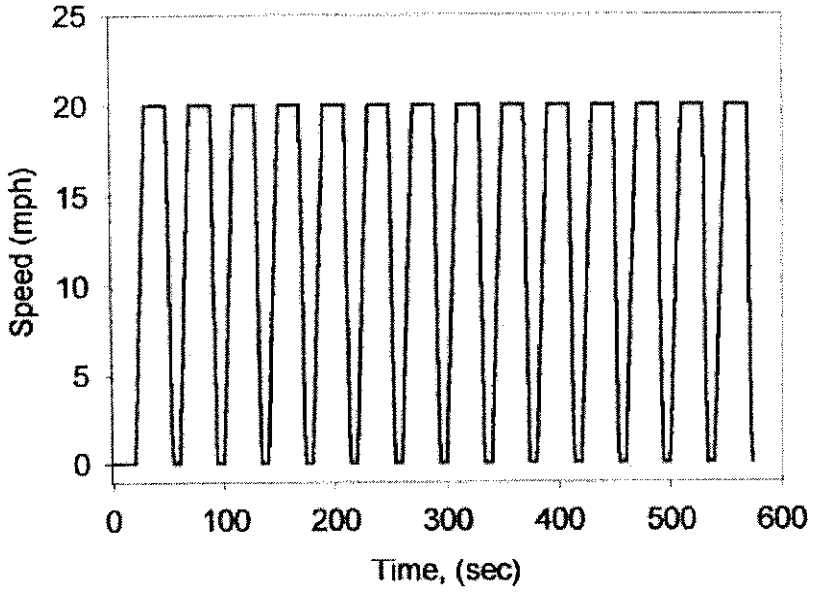
Real Time NOx Emission Rate



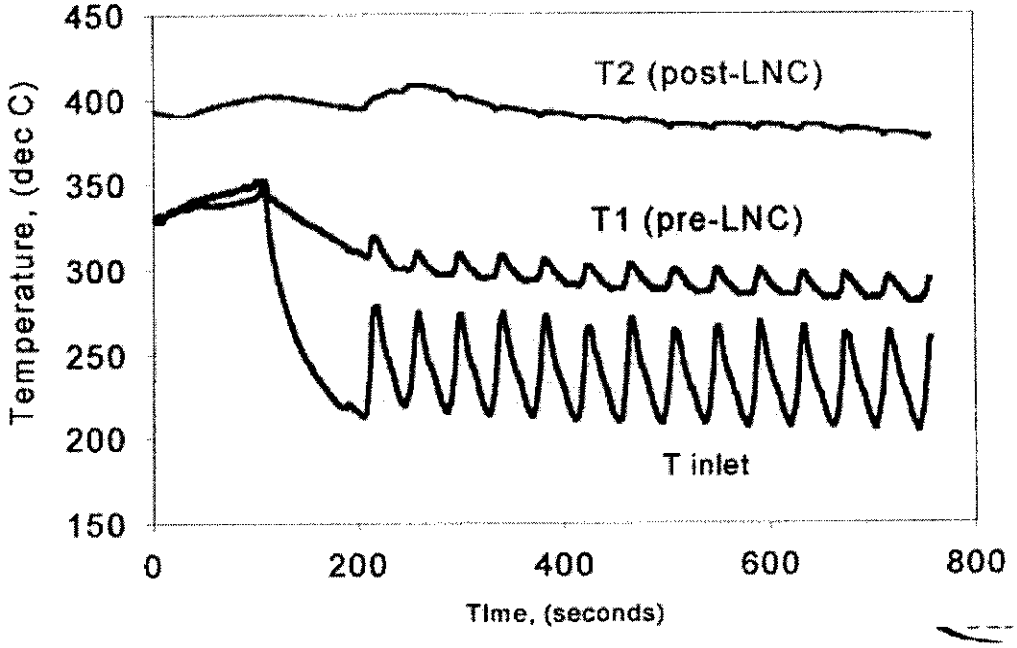
Integrated NOx Emissions



Central Business District (CBD) Transient Cycle



CBD Cycle Temperatures



Transient Chassis Dyno Testing-Summary

	HC	CO	PM	NOx
UDDS	94	100*	92	28
CBD	89	100*	96	29
Average	92	100*	94	29

* - Emissions

Aftermarket Demonstration and Certification Activity

Stockholm, Sweden – MTC Certified under Braunschweig transient driving cycle test

- >95% CO, HC, PM, and 19% NOx with no DeNOx fueling

- CARB/CEC Testing, Richmond, CA – up to38% NOx reduction over UDDS transient cycle, 29% NOx reduction over CBD transient cycle with active fueling
- GM Future Truck Challenge, Tempe, AZ – Ceryx equipped West Virginia University vehicle wins DOE sponsored emissions and performance competition
- Odense, Denmark – 3 units installed for 6 month field trial
- Hong Kong – 3 units installed for field study
- California – up to 200 units in field for testing

Durability Testing

- Stationary Generator Set (Cummins ISC 8.3L)

  hours = miles

  Goal: 3,000 hours = 150,000 miles

  Current: 250 hours = 12,500 miles

- Mobile Vehicle Installations: School Buses, Garbage Trucks, and Long Haul Trucks

- Continued Chassis Dyno Testing under CEC Carl Moyer Funded Program

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