



CLEERS Workshop on Urea/Ammonia Selective Catalytic Reduction of NO_x

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(DOE Office of Heavy Vehicle Technology)
for CLEERS

(Diesel Cross-Cut Lean Exhaust
Emissions Reduction Simulation)

April 30-May2, 2002
Ann Arbor, MI

CLEERS Overall Goal



Promote development of improved computational tools for simulating realistic full-system performance of lean-burn engines and the associated emissions control systems

CLEERS is sponsored by the DOE Diesel Cross-Cut Team



**Diesel Cross-Cut Team collaborates in
combustion, aftertreatment, fuels challenges
common to heavy and light-duty diesels**

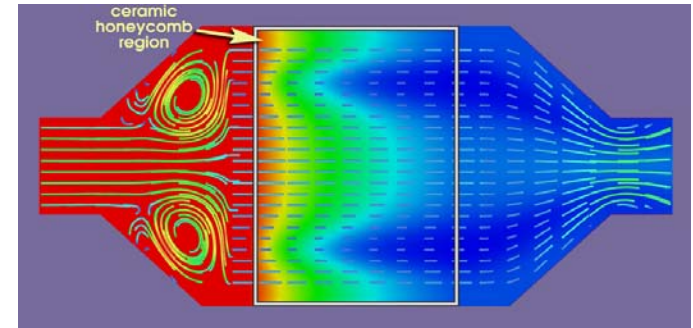
- ❑ Meets bi-monthly: 3 diesel engine companies, 3 automotive OEMs, EPA, Army, and DOE
- ❑ Chaired by Gurpreet Singh since 1999.
- ❑ Has guided, mentored projects in combustion, aftertreatment, sensors, other challenges in emissions
- ❑ Informal sharing of data, discussion forum of issues
- ❑ Provided critical input to health effects project at National Environmental Respiratory Center
- ❑ Developed a “short list” of key collaborative projects

Diesel Cross-Cut Lean Exhaust Emissions Reduction Simulation (CLEERS)



Objectives:

- ❑ Accelerate meeting emission standards by providing new simulation capability for integrated engine+aftertreatment
- ❑ Improve tools/basic data for aftertreatment development



Approach:

- ❑ Promote tools for simulating realistic full-system performance (engine to tailpipe)
- ❑ Support OEM's, DOE labs, universities in developing aftertreatment component performance models
- ❑ Define consistent framework for sharing experimental data, model information, comparing new emissions control technologies

CLEERS is coordinated by a subcommittee appointed by the Diesel Cross-Cut Team



CLEERS subcommittee:

- R. Blint, General Motors
- N. Hakim, Detroit Diesel
- G. Singh, U.S.-DOE/HQ
- S. Daw, Oak Ridge National Lab
- C. Rutland, Wisconsin
- H. Kung, Northwestern

Website:

- General information about emissions control simulation
- Technical information and benchmark data base
- Data and model exchange forum

Feedback to CC Team:

- Identification of R&D Priorities
- Recommendations for action
- Policies for data/model exchange

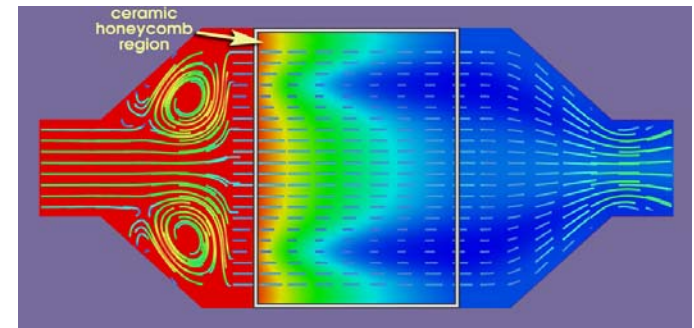
Workshops:

- Focused meetings on emissions control topics
- Invited and contributed technical presentations on specific topics
- Overview presentations and panel discussions

Diesel Cross-Cut Lean Exhaust Emissions Reduction Simulation (CLEERS)--status



- ❑ Workshops identified state of art for aftertreatment- and systems-simulations, major gaps, priorities



- Report for 1st workshop on global systems context finalized & issued, presentations and summary available on website. Covered first principles to full systems.
- Report for 2nd & 3rd workshops on LNT's and DPF's held Oct. 16-18 at Ford SRL; report, presentations and summary available on website
- 4th & 5th workshops on urea/ammonia SCR and HC/non-ammonia SCR planned for UM (Ann Arbor), 4/30, 5/1, 5/2

CLEERS Technical Workshops



- ❑ Overall Concept
 - Promote collaborations/discussion of emission controls simulation
 - Identify state-of-the-art for various technologies and models
 - Identify key unresolved issues, technical paths to solutions

- ❑ Approach
 - Sponsor workshops focused on specific simulation topics
 - Workshop parameters
 - 1-2 days each, 3/yr at accessible locations (e.g., Detroit, Chicago)
 - Participation by industry, academia, national labs
 - Specific topic, 3-4 invited talks, 8-10 contributed talks
 - Published proceedings (Website)

First Workshop (May 7-8, 2001)



- ❑ Focus: Full-System Context for Lean Exhaust Emissions Control
- ❑ Priority technologies for further action:
 - Lean-NO_x adsorbers
 - Diesel particulate filters (especially regeneration)
 - SCR reactor systems (including injectors)
 - Sulfur traps
 - Engine exhaust heaters/conditioners
 - Reformers
- ❑ Key unanswered need: Models for above aftertreatment devices capable of simulating performance under realistic driving conditions and flexible system configurations

Follow-up Workshops



- ❑ Lean-NOx adsorbers – done (October 16-17, 2001)
- ❑ Diesel particulate filters – done (October 17-18, 2001)
- ❑ SCR reactor systems – Now!
 - Urea/ammonia (April 30-May 1)
 - Hydrocarbon/non-urea (May 1-2)
- ❑ Future (to be determined):
 - Sulfur traps
 - Engine exhaust heaters/conditioners
 - Reformers
 - Others?