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53

**The Diesel Exhaust Aftertreatment Cluster
in the EU-growth programme**

4th ETH CONFERENCE ON NANOPARTICLE MEASUREMENT
Zuerich Aug. 8-9, 2000

**THE DIESEL EXHAUST
AFTERTREATMENT (DEXA) CLUSTER
IN THE EU 5th FRAMEWORK PROGRAMME
on Competitive and Sustainable Growth**

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*** Centro Ricerche Fiat, Orbassano, Italy*

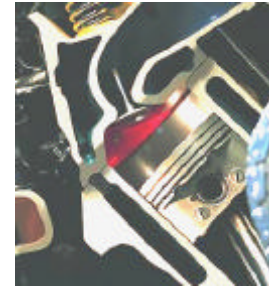
**** AVL, Graz, Austria*



MOTIVATION: A systems approach to diesel emission control

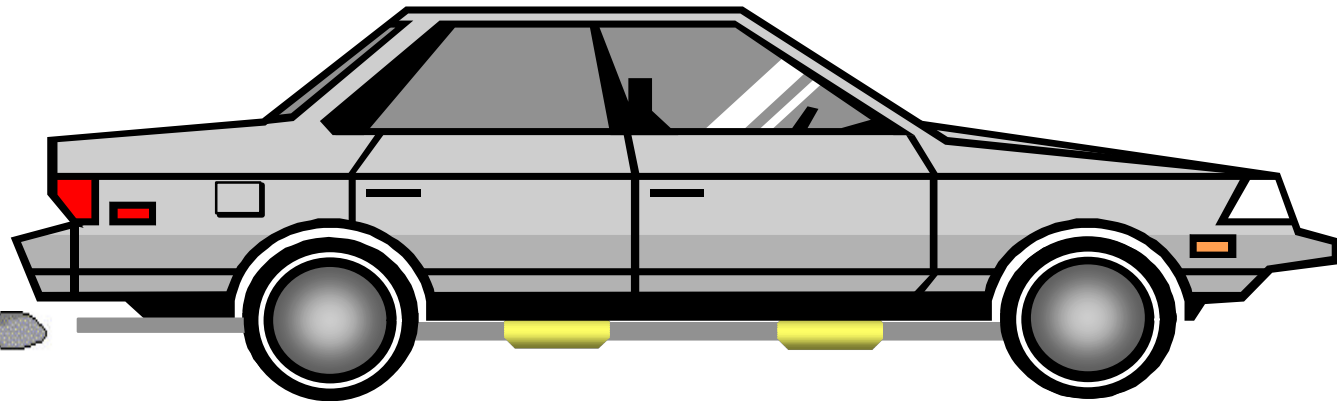
Fuel/Lube oil

→ Effects of Sulfur - content/composition on emissions and aftertreatment system



In-cylinder measures

→ Advanced Fuel Injection
→ Combustion mode



Real time soot nanoparticle measurement

→ Size/Composition
Raw vs. Dilute

Exhaust Aftertreatment System

→ Novel device designs (filters, catalysts)
→ CAE tools for system Design/Optimization/Control (traps, DeNOx system, Ox. Cat.)



OBJECTIVES OF DEXA CLUSTER

The present cluster of projects is aiming at providing a complete and integrated approach at the European level, on diesel exhaust aftertreatment, with emphasis on particulate emissions control, focusing on three aspects:

- ◆ component technology integration aspect (ART-DEXA)
- ◆ system design aspect (SYLOC-DEXA)
- ◆ quality assessment/measurements aspect (PSICO-DEXA)



CLUSTER MANAGEMENT



ART-DEXA

PROJECT N°: GRD1-1999-10451

DURATION: 1/2/2000-31/1/2003

Coordinator:

Massimo Debenedetti

CR FIAT



SYLOC-DEXA

PROJECT N°: GRD1-1999-10588

DURATION: 1/2/2000-31/1/2003

Coordinator:

Peter Prenninger

AVL List GmbH



PSICO-DEXA

PROJECT N°: GRD1-1999-11154

DURATION: 1/1/2000-31/12/2002

Cluster Coordinator:

Athanasios G. Konstandopoulos

CERTH/CPERI



DEXA CLUSTER PARTNERS (1)

INDUSTRIAL PARTNERS

u CENTRO RICERCHE FIAT SCpA,	I
u RENAULT RECHERCHE et INNOVATION	F
u JOHNSON MATTHEY PLC	UK
u AVL List GmbH	A
u FEV MOTORENTECHNIK GmbH	D
u ZEUNA STAERKER GmbH & CO KG	D
u WIZARD ZAHORANSKY KG	D
u OBERNOSTERER STRICKSTOFFE GmbH	A



DEXA CLUSTER PARTNERS (2)

RESEARCH INSTITUTES

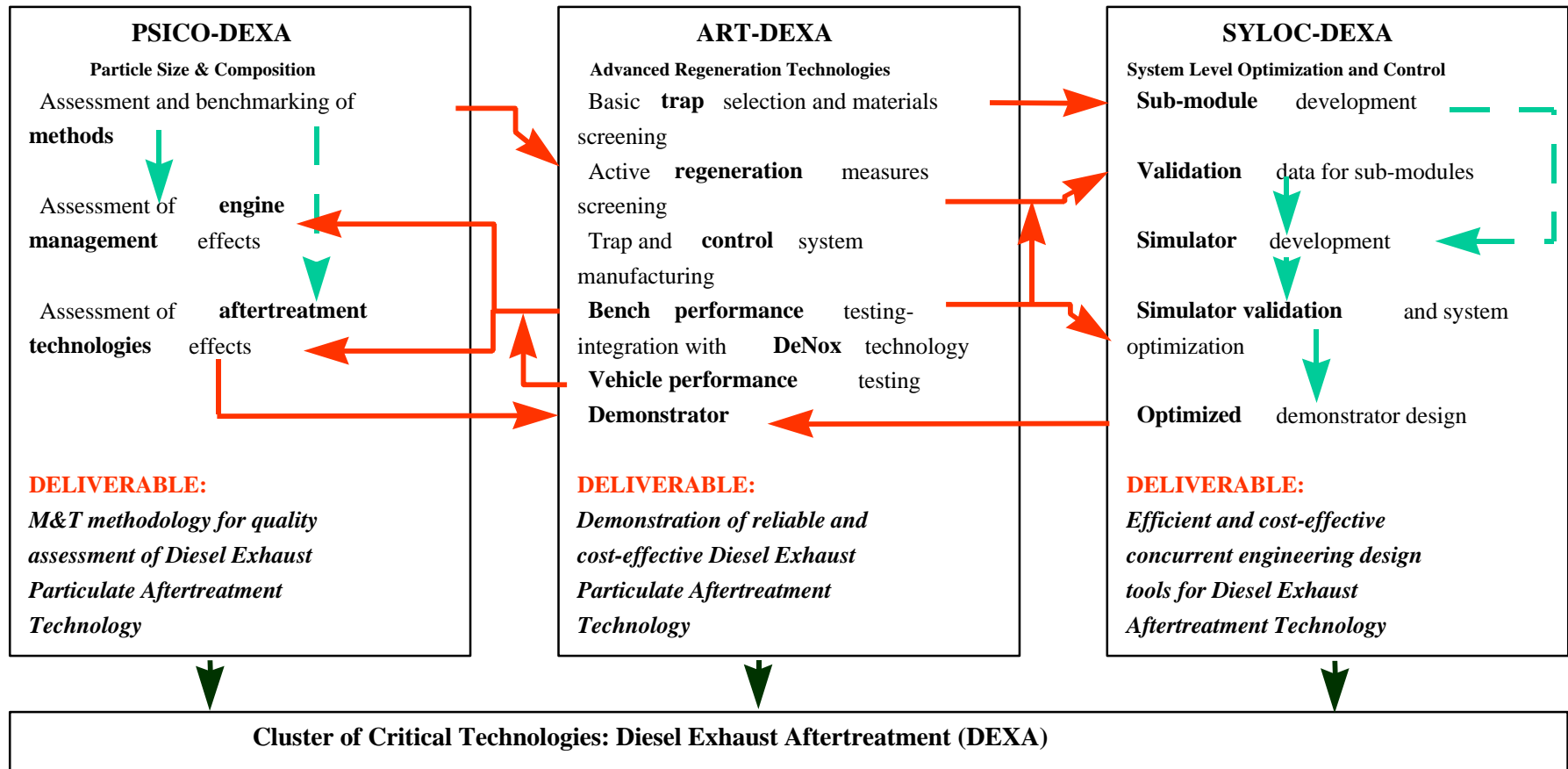
- u **CERTH/CPERI-Aerosol & Particle Technology Lab** EL
- u **CLAUSTHALER UMWELT TECHNIK-INSTITUT GmbH** D
- u **ISTITUTO MOTORI, National Research Council of Italy** I
- u **EC - JOINT RESEARCH CENTRE** NL

UNIVERSITIES

- u **UNIVERSITAET LEOBEN - Christian Doppler Lab** A
- u **POLITECNICO DI TORINO** I
- u **UN. DI NAPOLI FEDERICO II - Dept. Chem. Eng.** I



DEXA CLUSTER STRUCTURE



OBJECTIVES WITH RESPECT TO PARTICLE CHARACTERIZATION

- **To develop, tailor, evaluate/screen and cross-calibrate size, composition and joint size- composition measurement techniques for diesel particulate emissions in the raw and diluted exhaust, with emphasis**
 - on the evaluation of the effects of sampling conditions on measured size distributions
 - on the cross-comparison and validation of methods
 - on the deployment and assessment of real-time techniques
- **To evaluate the effect of advanced Diesel engine combustion technology management under well defined boundary conditions applying the developed techniques and methodologies for particle characterization**
- **To evaluate the effect of advanced Diesel engine aftertreatment technology under well defined boundary conditions applying the developed techniques and methodologies for particle characterization**



Particle Measurement Techniques Employed (1)



Berne Low Pressure Impactor and Electr. Low Press. Impactor (ELPI)



Scanning Mobility Particle Sizer (SMPS) and Transient Mobility Particle Sizer (TDMPS)



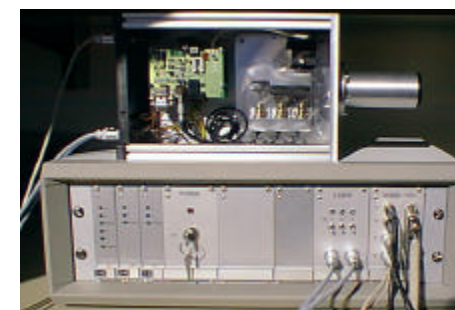
Nano DMA and Dual DMPS



Nanomet Particle Measuring System



API Aerosizer (TOFPS)

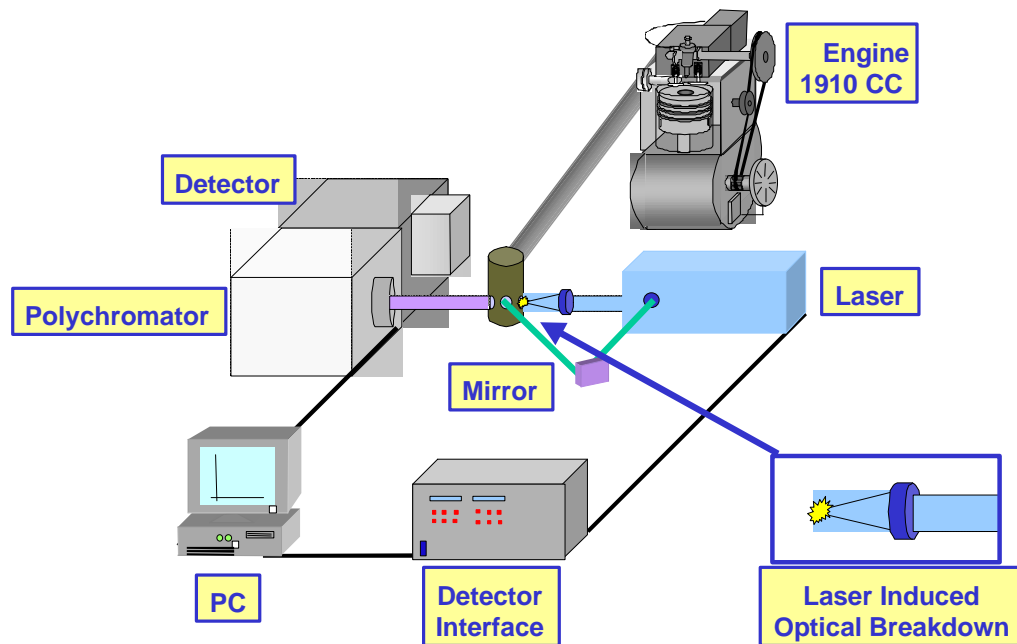


Multiwavelength Extinction Sensor

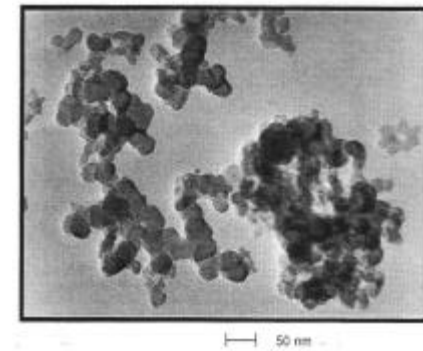


Particle Measurement Techniques Employed (2)

Broadband UV-vis. Extinction and Scattering



Thermophoretic Sampling and Transmission Electron Microscopy



Particle Composition Measurement Techniques

- ◆ **Standard dilution tunnel mass-based methods and TGA/DSC for soluble/insoluble fractions, solids/volatiles, etc**
- ◆ **Neutron Activation Spectroscopy for trace species analysis**
- ◆ **Spectral absorption in UV-vis and fluorescence**
- ◆ **Fast extraction for PAH analysis**
- ◆ **Nanomet Photoelectric Aerosol Sensor**
- ◆ **Mass-Spectrometer in conjunction with DMA/thermal denuder for size specific composition**
- ◆ **Analytic Electron Microscopy**



DEXA CLUSTER STATUS

- ◆ **First 6-month review meeting in September 2000**
- ◆ **A web-site will be operational with 3 levels of access confidentiality: Intra-project, intra-cluster, public**
- ◆ **Definitions & procurement phases have been completed and all projects are advancing as planned**

