CARB + MANUFACTURERS

Meeting on Active Particulate Trap Regeneration

to increase success-probability
when retrofitting in-service older engines
of unknown technical conditions
in undefinable applications

Pasadena 6.+7.September 2001

TTM, A.Mayer

DRAFT

AGENDA

EUROPEAN TRAP MANUFACTURERS MEETING

SEPTEMBER 6, 2001

9:00 A.M.	**Welcome and Introductions**
9:15 A.M.	**California Issues and Needs**
9:35 A.M.	**JMC**
9:55 A.M.	**ZEUNA-STAERKER**
10:15 A.M.	**DCL**
10:35 A.M.	**BREAK**
10:55 A.M.	**HJS**
11:15 A.M.	**UNIKAT/ECS**
11:35 A.M.	**AIRMEE**
11:55 A.M.	**LUNCH**
1:00 P.M.	**HUSS**
1:20 P.M.	**IBIDEN**
1:40 P.M.	**DEUTZ**
2:00 P.M.	**HUG**
2:20 P.M.	**SIEMENS/BUCK**
2:40 P.M.	**OCTEL**
3:00 P.M.	**BREAK**
3:15 P.M.	**RHODIA**
3:35 P.M.	**CDT/LUBRIZOL**
3:55 P.M.	**Mr. Andreas Mayer-VERT Program**
4:15 P.M.	**Open Discussion of California's needs with European Manufacturers**
5:00 P.M.	**END**

CALIFORNIA TRAP RETROFIT ISSUES TO ADDRESS

A. Application Issues:

1. On-Road Applications - What types and model years of on-road vehicles does your product work on?
2. Off-Road and Stationary Applications – What types and model years of off-road and stationary vehicles/equipment does your product work on?
3. Application Limits – What vehicles/equipment cannot be retrofitted with your product?
4. Application of your product for Two Stroke Engines, and Pre-1994 Engines.
5. Temperature Limits – Discuss the temperature limits applicable for your product.
6. Emission Limits – What level of soot or PM engine emissions is too high for your product?
7. Sulfur Fuel – What is the range of sulfur in fuel in Europe?
8. MECA List – Can you comment on trap application probabilities compared to Europe's vehicle retrofit applications? (Please see attached MECA list).

B. In-Use Issues:

1. In-Use Compliance – Describe testing and inspection procedures applicable in the countries that you sell your product?
2. Failures – Describe your experiences with failures in detail and the causes and remedies (if any).
3. Other Pollutants – Does use of your product cause an increase in other pollutants, NO2 especially?
4. Additives Effects – Do any additives harm your product? If so, which ones?
5. Durability – What is your experience with in-use durability for your product?
6. Maintenance Requirements – How well do vehicle owners comply with maintenance requirements?

C. Marketing Issues:

1. Current Production Capacity – Are you currently able to supply to the California market or do you have plans to increase production?
2. Service Support – How would you provide service support in California? How do you provide service in Europe?

What are activ regenerated Trap Systems ?

- ART are cont. electron. soot-load controlled
- when the soot load reaches a limit
  → regeneration is started by providing the energy for controlled soot combustion
- this can be an automatic or a manual process

- automatic: full-flow-Diesel-burner
  twin-filter-Diesel-burner
  electric sequential heater
  engine intake throttling

- semi-automatic: plug in to net-electricity

- manual: of-board regeneration
  exchange-filters

Additives or catalytic coatings should be used to minimize energy consumption and smooth regeneration

Active versus Passive Regenerating

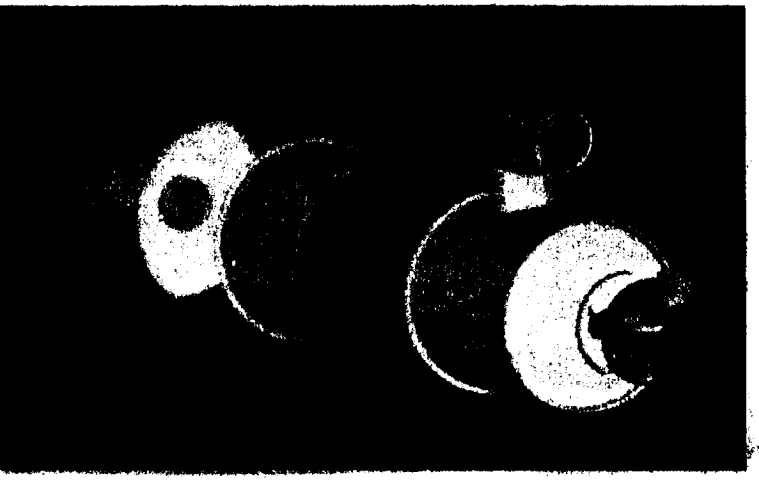
Passive
needs detailed information on engine emissions and application conditions
→ ideal for OEM in case of vehicle fleets running under repeatable conditions Swiss eg modern city busses

Active
can handle all (4S) engine properties and all applications
→ ideal for retrofit
in case of vehicles with unknown or frequently changing operation conditions

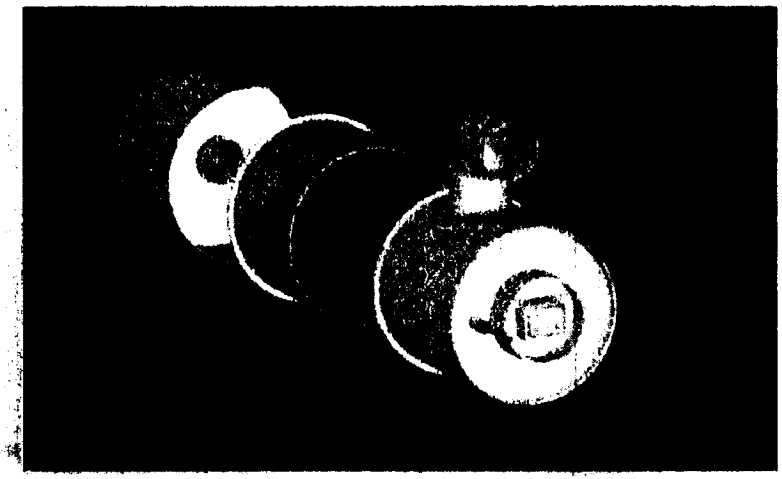
New Soot Particulate Filter Generation (Modular Systems)

HUSS Umwelttechnik

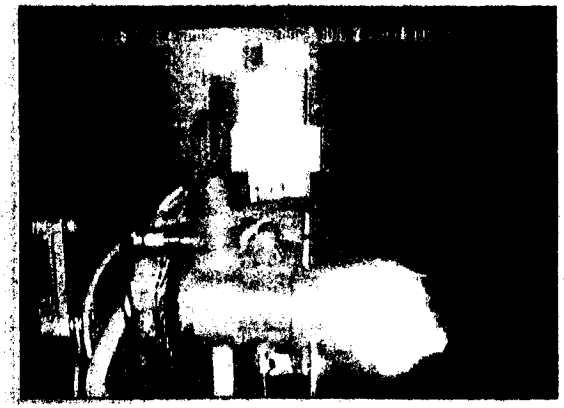
System with fuel burner



System with electric heater

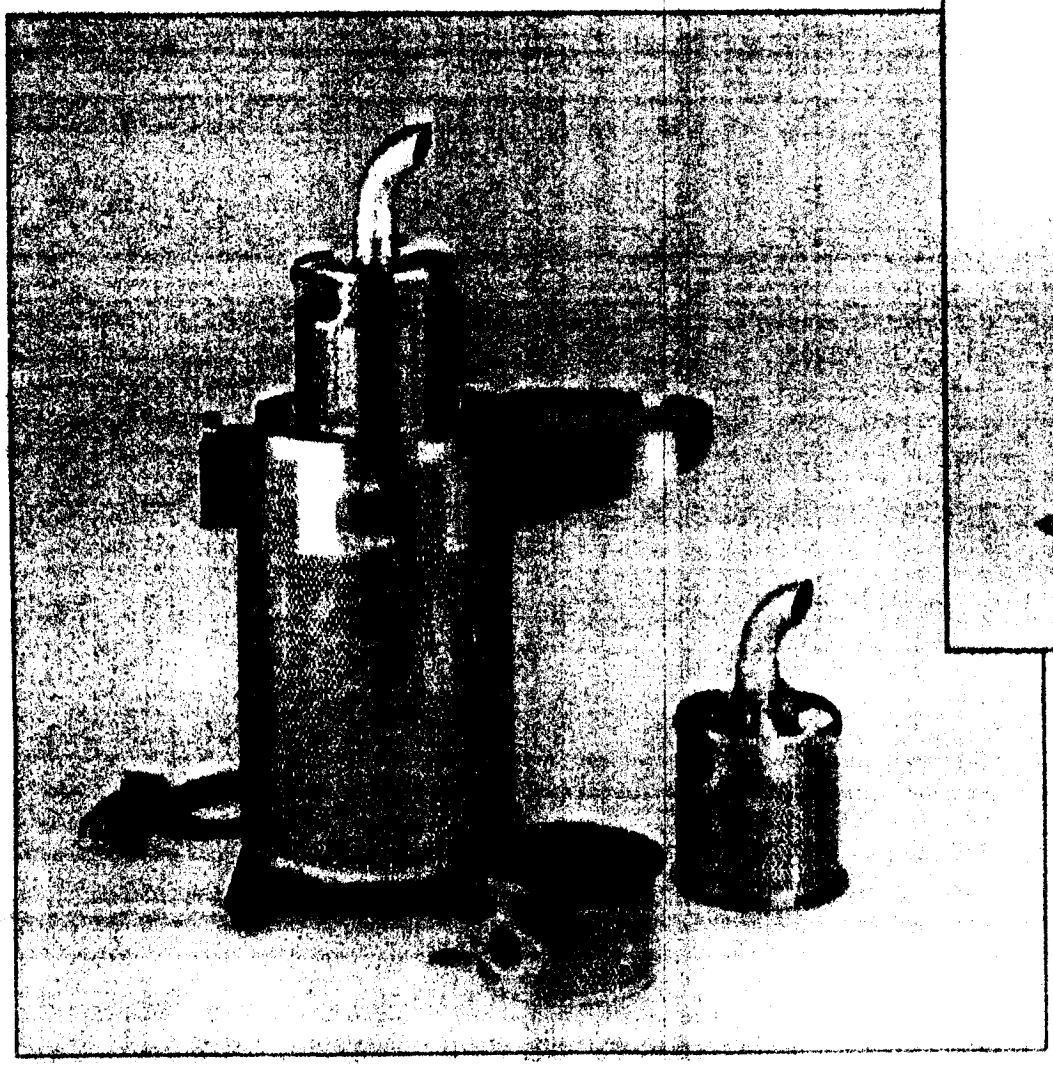


Control unit with display



Rechargeable Soot Particulate Filter System

HUSS
Umwelttechnik



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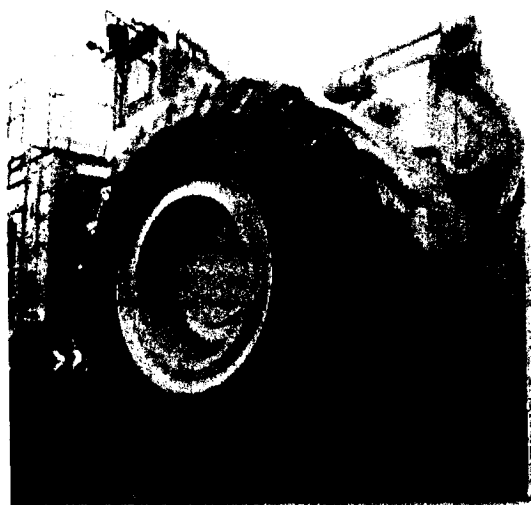
Markets / Applications and Our Products

HUSS Umwelttechnik

Forklift Trucks

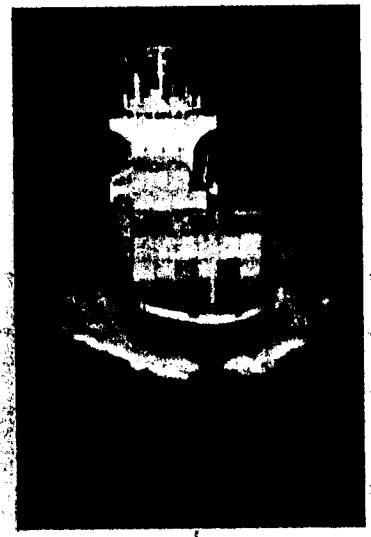
- Soot particulate filter with fuel burner
- Soot particulate filter with electric heaters
- Rechargeable soot filter

Construction Machinery



- Soot particulate filter with fuel burner
- Rechargeable soot filter

Marine Application



- Exhaust mufflers
- Catalytic exhaust gas cleaners
- Spark arresters

Diesel-Lokomotives

- Exhaust mufflers

Berthold Peikert
09/2001 Huss Ltd
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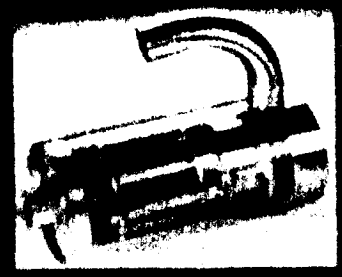
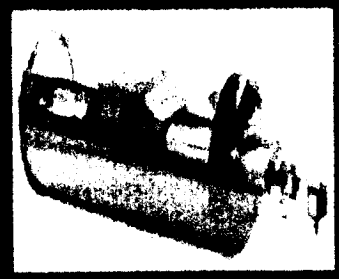
Diesel-
Exhaust Technology

Oxidation Catalyst



DPF-System



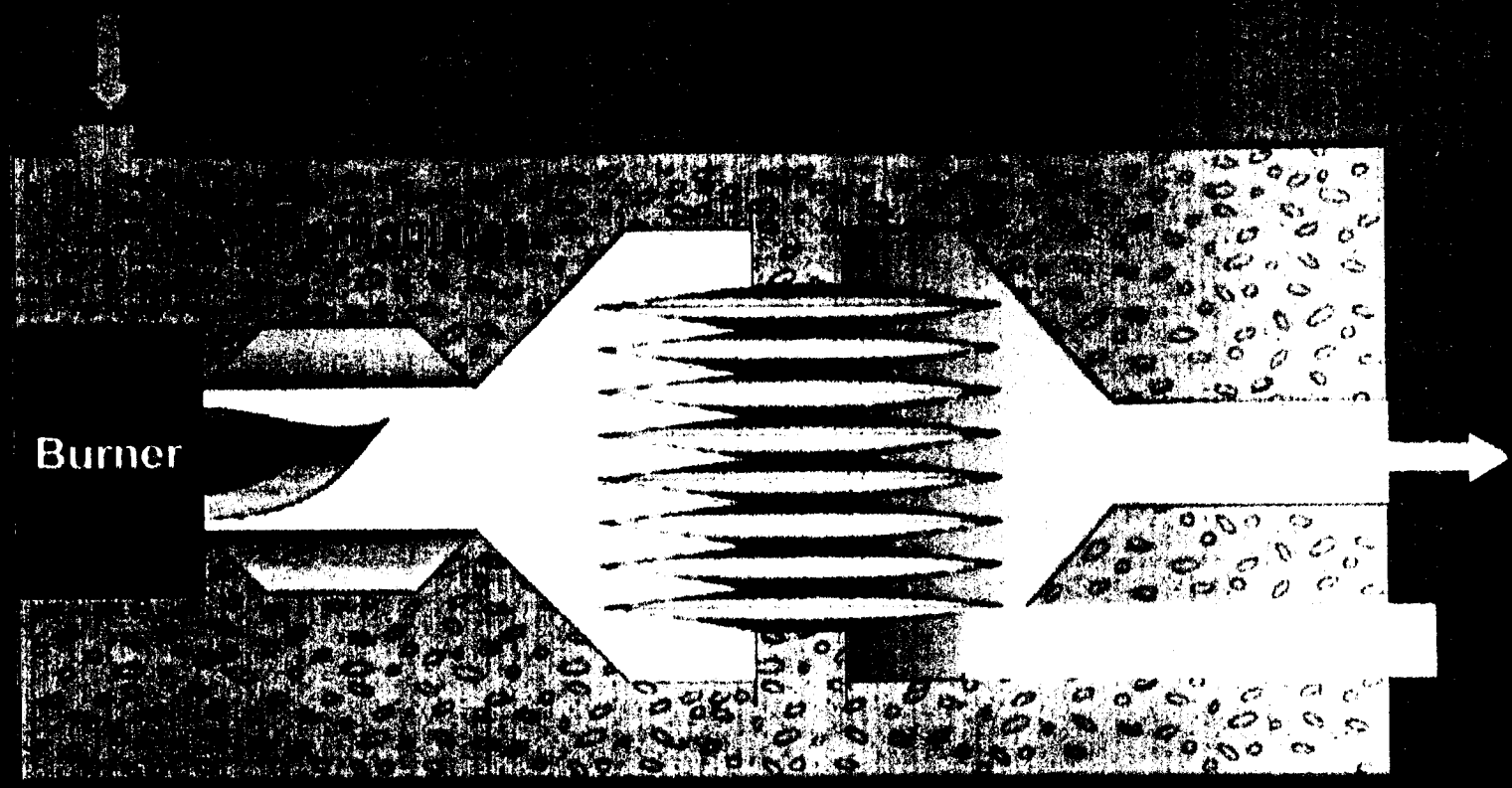
Modular CRT-System

HJS

exhaust systems • catalytic converters

kelma fotoresistant
56 10120

Schematic View DPF



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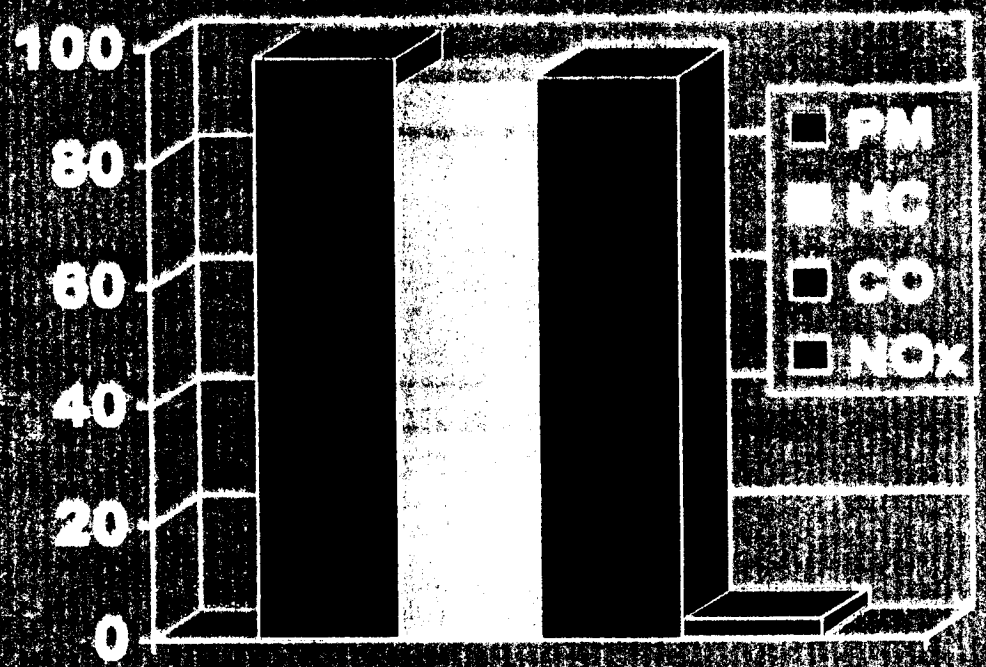
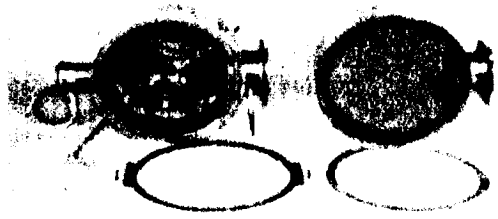
Unikat Combifilter™

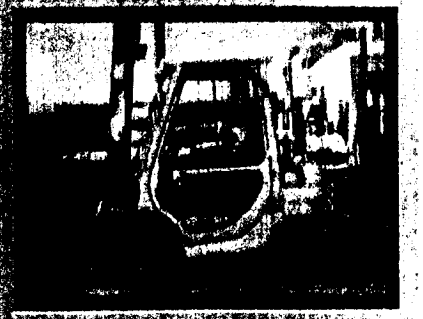
Actively Regenerated DPF for Captive Fleet Use & Stationary Engines

Emission Reductions (%)



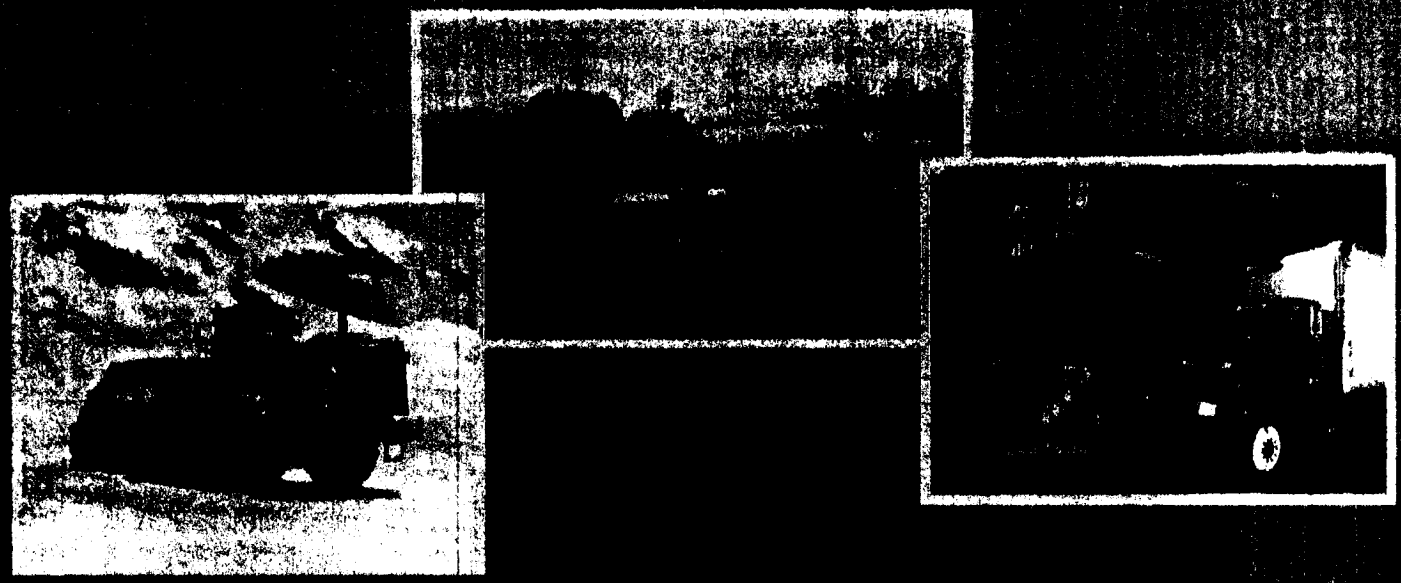
Combifilter with AZ Purifier





LUBRIZOL

LUBRIZOL

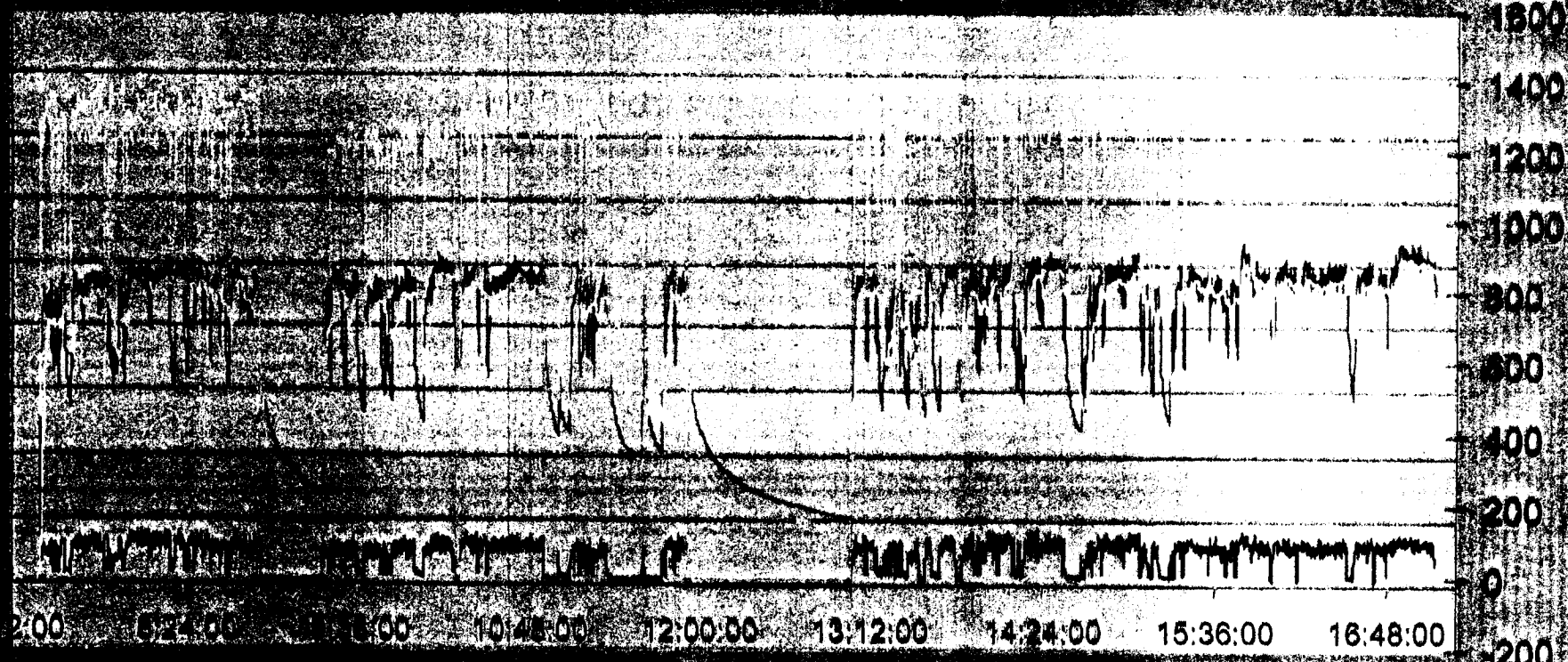


Diesel Emission Upgrade Products from Lubrizol and Engine Control Systems

European Trap Manufacturers Meeting
September, 2001

Caterpillar 325B with Combifilter K18

Full Day, 9511 Additive, post conditioning



— Back pressure (mbar) — Inlet (Deg.C)
Outlet (Deg.C) Engine Speed (rpm)

Right Hand Scale
Engine Speed

LUBRIZOL

LUBRIZOL

Filter Regeneration Strategies

- MINE-X SOOTFILTER ®
  - (A) Ideal: Self regeneration under normal duty cycle
  - (B) Non-Ideal: Loading of engine at fixed periods or off-board regeneration cleaning by kiln or compressed air

- DCL Titan ™ System
  - (A) Off-board regeneration at end of operating shift

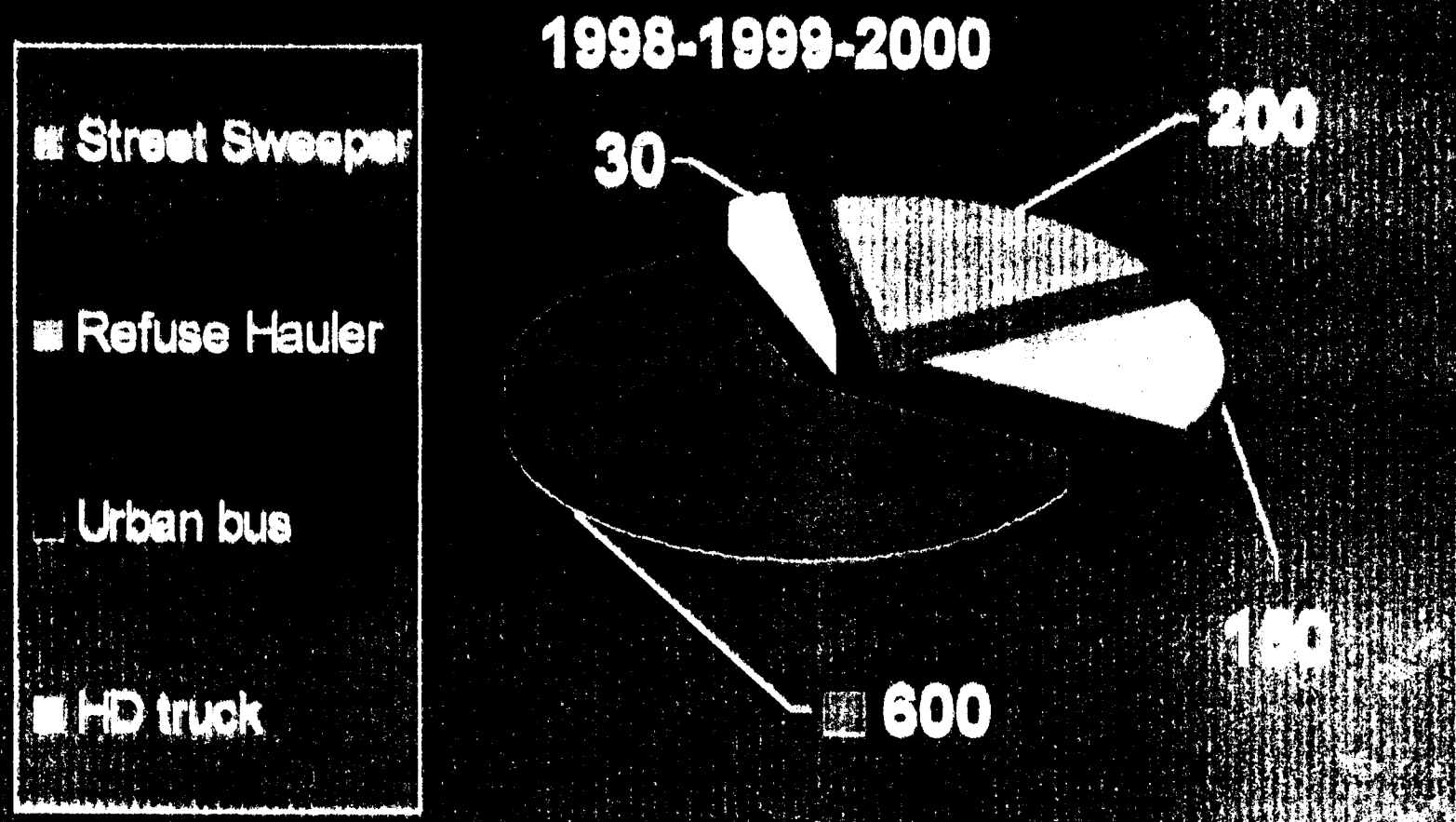
- DCL BlueSky ™ System
  - (A) On-board passive regeneration under high temperature duty
  - (B) On-board active regeneration as required

Experience - Applications List

- Excavators
- Wheel Loaders
- Articulated Haulers
- Bulldozers
- Dump Trucks
- Forklift Trucks
- Load-Haul-Dump (LHD) Trucks
- Gensets
- Skid Steer Loaders
- Road Grader
- Concrete Mixers

AIRMEEX

ON ROAD APPLICATION



AIRMEEX EXPERIENCE

AIRMEEX

type	unit	date	Km or h	Engine hp
Forklift	3000	1996	15 000h	45-150
Constr M	150	1996	8000 h	15-280
Locom	25	1996	3000-5000	300- 800
Genset-C	130	1996	2500-6000	30-1000
City bus	600	1998	200000 km	150-280
HD truck	30	1999	130000 km	200-425(1300)
LDV	25	1998	100000 km	80-130
Swiper	200	1996	6500 h	60-150
Refuse H	150	1998	80 000km	150-320

Burning Crude Oil

Octel Deutschland GmbH

Without Ferrocene

With Ferrocene