

Diesel **E**missions **E**valuation **P**rogram

Overview: Where We Have Been

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Chair, DEEP Management Board
October, 2004*

*Vice President
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Diesel Engines

- Patented by Rudolf Diesel in 1892.
- First commercial use was 1893 (25 HP).
- Compression of gaseous fuel and air increases temperature to cause ignition.
- Four stroke: suction, compression, power, exhaust.

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Diesel Advantages

- High thermal efficiency.
- High flash point of fuel.
- Reliability and ruggedness.
- Maintenance.
- Quick full load capacity.
- Low CO (gas) in exhaust.

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Diesel Fuel Combustion Products

Gases

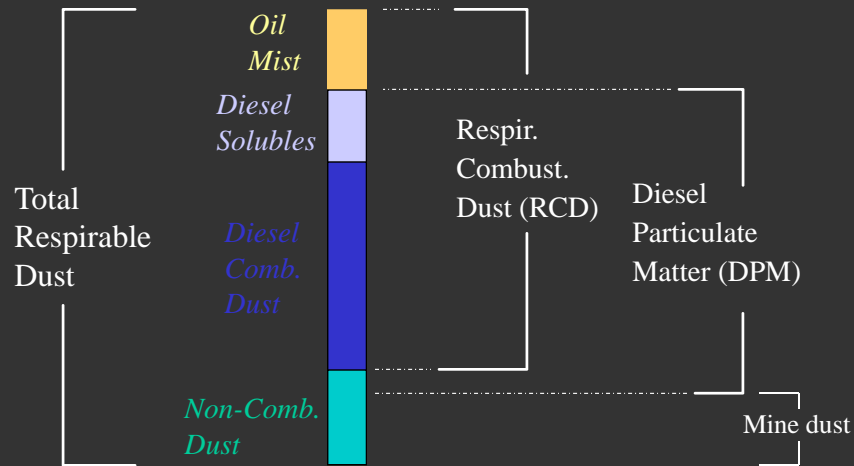
Nitrogen
Water
CO₂
CO
NO, NO₂
SO₂, SO₃
Oxygen

Liquids, Solids

Metal oxides
Metal sulfates
Chained hydrocarbons
Aromatic hydrocarbons
Carbon

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Components of underground dust



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TYPICAL MEAN EXPOSURES TO DPM

Area	mg/m ³
Rural	0.001
Urban	0.002
Near highways	0.025
N.A. M/N-M Mining	0.700

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Chronology of DEEP

- ACGIH Notice of Intended Change = 0.15 mg/m^3
- OELs in Canada generally 1.5 mg/m^3 (RCD)
- Recognition by Canadian mining companies of lack of accurate measurement techniques and lack of proven technology for DPM reduction.
- Convened Canadian Ad-Hoc Diesel Committee meeting in Mar/96 to discuss path forward.

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Canadian Ad-Hoc Diesel Comm. Mar/96

- 100 people instead of usual 25.
- Labour invited because of know-how and because any meaningful research would involve them.
- Consensus that the TLV issue was important. Wanted to move forward.
- Set up Steering Comm. to discuss options.

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Steering Committee of DEEP

- 2 industry
- 2 labour
- 1 engine manu.
- 1 control equip. manu.
- 1 govt mine inspect.
- 1 from Canmet
- 1 from former USBM
- No U.S. companies
- No NMA
- MSHA prohibited by U.S. govt.

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DEEP development

- Jun/96: Conceptual Scope of Work
- Q3-Q4/96: Presentations to companies, organizations, labour, Federal govt: NRCan, Industry Can, Health Can., Agriculture Can
- Jan/97 Detailed Program Description

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INTERESTS OF STAKEHOLDERS

- How to reliably measure DPM at low levels
- How to distinguish oil mist from DPM
- How existing control options compare in effectiveness, ruggedness and cost
- No single DPM reduction strategy will work for all areas ———> develop a tool-box of options/costs for site specific application

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DEEP PHILOSOPHY

- There must be collaboration between users and researchers.
- Field testing is imperative.
- Labour and government must be full partners in the planning, execution and interpretation of studies.
- Specific interests of certain mines will be taken into account.
- Technology transfer and training of mining personnel has to occur during studies.

Memorandum of Understanding Feb-Apr/97

- Representation on Mboard, Chair, V-Chair
- Treasurer—CAMIRO
- Secretariat– NRCan
- Technical Comm. Role and members
- Project Teams, Project Leaders roles
- Funding
- Contracting policies
- Intellectual property

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Funding

- Each stakeholder specify \$ committed for 1997, 1998, 1999.
- Each stakeholder specify in-kind contributions.
- Each company can sponsor its desired projects. \$ can be held for future defined project. If \$ not spent or held, then MBoard decides how to spend it.

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STAKEHOLDERS OF DEEP

Labour

Canadian Auto Workers
United Steel Workers of Amer.

Industry

Barrick Gold
Inco
Cambior
CAMIRO
Falconbridge
Hudson Bay Mining &
Smelting
IMC Kalium
Noranda
Placer Dome Canada
Williams Op. Co.

Suppliers

Ontario Soybean Growers
Saskatchewan Canola Dev.
Corp.
North Dakota Canola
Diesel Engine Manuf.
Manuf. of Env. Controls Assoc.

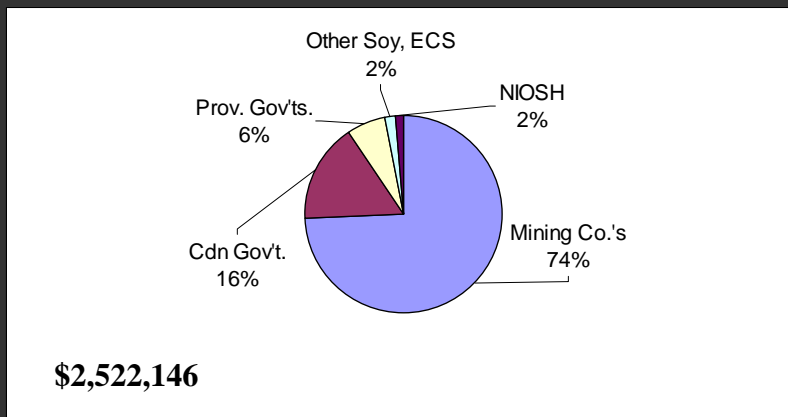
Government

Assoc. of Chief Mine Inspectors
Natural Resources Canada
Ontario WSIB
New Brunswick WHSCC
Manitoba WCB

Outside Linkages

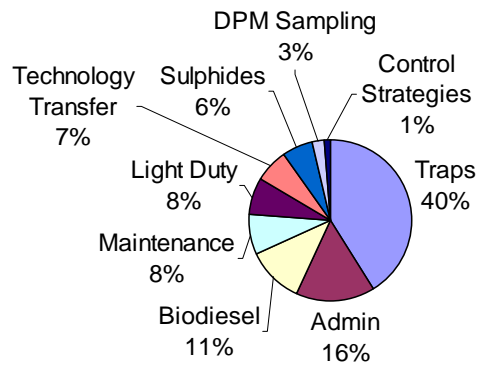
VERT (Europe)
Kali und Salz (Germany)

DEEP REVENUES



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DEEP EXPENDITURES



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Keys for success

- A driver ; champion
- Direct ownership by mine operators
- Good technical advice ; Good research program
- Funding
- Inclusivity of all interested parties
- Delivery of practical results
- Technology transfer

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Finishing up

- Inco Stobie Mine particulate traps Final Report by end of Jan/05.
- DEEP Comprehensive Final Report by end of Q1/05.
- Communication to stakeholders and financial accounting.
- Implementation.
- Continued technology transfer.

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DEEP Summary

