



Werk veilig.
Houd plezier.
Kijk vooruit.

Reducing diesel engine emission

The struggle of the Dutch construction industry

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*Every young talent who starts in
construction and infra receives
his or her pension safely,
healthily, motivated and learning.*

Our norm



The construction industry



Challenging as always

Work safely



Health

Physical load

Mental strain

Need for recovery

Safety

Hazardous substances

Healthy lifestyle

Keep smiling



Workload

Collaboration

Work-life balance

Content of the function

Job satisfaction

Leadership

Motivation

Appreciation

Look forward



Workability (WAI)

Employee benefits

Employability

Agility

Education & development

Hazardous substances in the construction industry

- Silica dust
- Wood dust
- Asbestos
- Diesel Motor Emission (DME)
- Welding fumes
- Solvents
- 2-component products
- Paint dust (heavy metals!)
- Cement dust



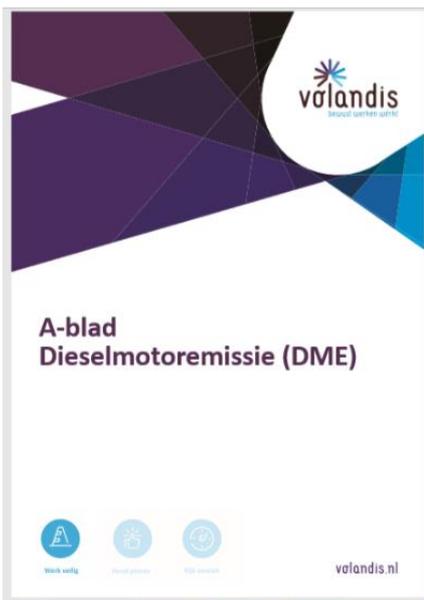
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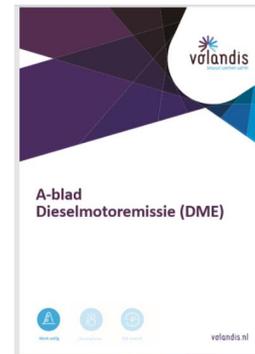


Our good practice



Why the A-form?

- DME is a carcinogenic mixture
- The Dutch construction industry has a tradition of social dialogue
 - “A-form” => state of the art solutions, brought together by both employers and employees
- Update is ongoing...
- Input from industries, users etc.



The A-form

- Practical information on control measures
- All control measures on a row, per building phase
 - Company can choose & pick

Tabel 4.2: Beheersmaatregelen per functie in de voorbereidingsfase

Functie	Inkoper	Materieeldienst	Werkvoorbereider
Beheersmaatregel			
Een andere krachtbron	X	X	X
Voldoen aan emissielimieten	X	X	X
Zuinige banden	X	X	
Capaciteit afstemmen op vermogen	X	X	X
Nabehandelen (filters)	X	X	X
Planning			X

1. Is it possible to replace the diesel engine?



2. Is it possible to reduce emission of the engine?



3. Is it possible to isolate the workplace?



4. Is it possible to reduce the chance of inhalation of DEE?



5. Use personal protective equipment

A closer look at the A-form

- At that time (2016): measurements were done
 - To address the problem
- OK. But what can we do?
- Start with the begin: take a look at your fleet

Tabel 3.1 Vergelijking van Europese non-road en on-road emissielimieten

Non-road Europa (Stage)					On-Road Europa (Euro)			
Year	Stage	Power kW	NO _x g/kWh	PM g/kWh	Year	Euro	NO _x g/kWh	PM g/kWh
1999	I	130-560	9,2	0,54	1992	I	8,0	0,36 (>85 kW)
2002	II	130-560	6	0,2	1997	II	7,0	0,15
2003	II	75-130	6	0,3	2000	III	5,0	0,10
2006	IIIA	130-560	4*	0,2	2005	IV	3,5	0,03/0,02**
2007		56-130	4*	0,3				
2011	IIIB	130-560	2	0,025	2008	V	2,0	0,03/0,02**
2012		56-130	3,3	0,025				
2014	IV	56-560	0,4	0,025	2014	VI	0,4***	0,01

PM = particle matter

* NO_x + HC

** voor respectievelijk ESC (stationaire testcyclus) en ETC (transiënte cyclus)

*** op basis van ESC/ETC, aanpassing voor WHSC/WHTC (World Harmonized Test Cycles) voorzien

- Start with the begin: take a look at your fleet

It's all about the planning...

- What equipment should be replaced (first)?
 - Or can be retrofitted with alternative power sources, filters etc.
- What equipment should be used on which location?
 - Confined spaces, lot of employees, lot of bystanders? Extra focus on no-emission!



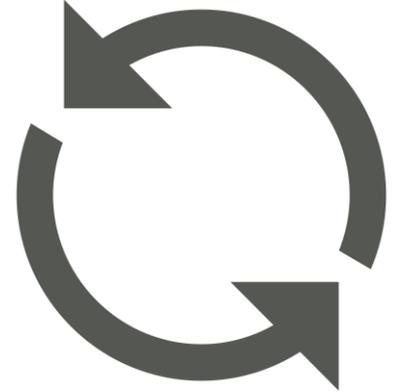
Summary of all the discussed preventive measures, their protective potential and applicability

De maatregelen zoals deze aan de orde zijn gekomen in hoofdstuk 4 zijn in onderstaande tabel verkort weergegeven. In de middelste kolom is een inschatting gemaakt van het effect van een maatregel op de reductie van DME heeft.

Tabel 5.1 Hoeveel reductie kan worden bereikt met welke beheersmaatregel?			
Maatregel	Reductie deeltjes	Toepassing	
Andere krachtbron			
Elektriciteit	100%	Heftruck (< 4 ton) Transportbanden Compressoren	Palletwagens Verpompen mortel Hoogwerkers
LPG/aardgas	100%	Heftruck (< 12 ton)	
Aanpassingen aan de dieselmotor			
Emissie arme motor	Ca. factor 10	Nieuw rijdend materieel (zonder kenteken > 2011, met kenteken > 2005)	
Hybride motor	Wisselend	Graafmachines	
Motormanagement	Wisselend	Al het materieel, aggregaten	
Stationaire afschakeling (start-stop)	Wisselend	Al het rijdend materieel	
Goede rijstijl	Onbekend	Al het rijdend materieel	
Onderhoud	10-15%	Al het materieel, aggregaten	
Afvangen van DME			
Filters	Max. 95%	Al het materieel, aggregaten	
Afzuiginstallaties	Max. 90%	Vaste locaties (materieeldienst, werkplaats)	
Ventilatie	Wisselend	Omsloten en besloten ruimten	
Bescherming van de blootgestelde persoon			
Afstand vergroten	Wisselend	Uitlaat naar boven; aggregaat verder weg	
Werken in een cabine	Onbekend	Rijdend materieel met cabines	
Grade control systemen	Onbekend	Grondverzetwerkzaamheden	
Organisatie /planning	Wisselend	Alle bouwlocaties	
Ademhalingsbescherming	Max. 95%	Alle personen	

About the current update

- State of technology develops fast
 - Alternative fuels
 - LNG, bio-diesels, hydrogen gas, fuel additives
 - Catalysts
 - Filtering techniques
- Expert meeting is being organized
- The sector must be activated more



Challenges...

- Background concentration exceeds OEL on many Dutch locations
- Technical solutions differ for small and heavy equipment
 - E.g., power infrastructure
- Environment <vs> working circumstances
 - How safe and durable are batteries?
 - How well-coordinated are legislation and alternatives on reduction of CO₂, NO_x and DME?
- How cooperative are clients to pay for HSE?



Solutions?

- Address DME reduction in the earliest phase of a construction project
- Is buying new equipment too expensive? Share of hire...
- Look for cooperation between branches
 - E.g., construction and agriculture share a lot of characteristics
 - Also on European level!
- Look for a coordinated, integrative governmental approach
- Stay in conversation with your employees on safe and healthy behaviour
 - How to make clients behave safe and healthy?
 - And how to make them pay for our behaviour?

Our future...

- Diesel engines are getting cleaner and cleaner...
 - ...or can't we measure anymore?
 - Better burning means smaller particles: nano?
- Switch to electric or alternative fuels like hydrogen gas?
- Let's share knowledge on every level: in companies, branches, between branches and on international level



Thank you!

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Work safely



Keep smiling



Look forward