Exposure Control Efficacy Library

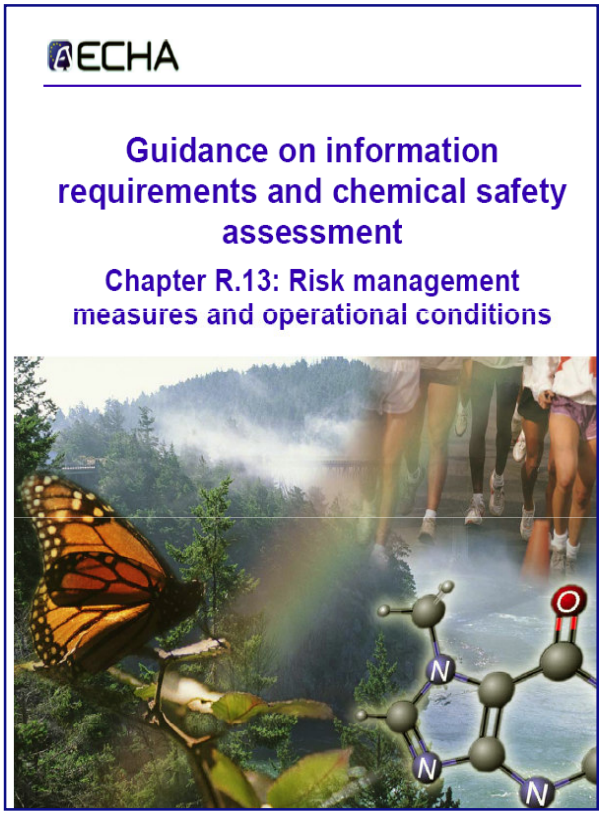
ECEL

TNO | Kennis voor zaken

Wouter Fransman

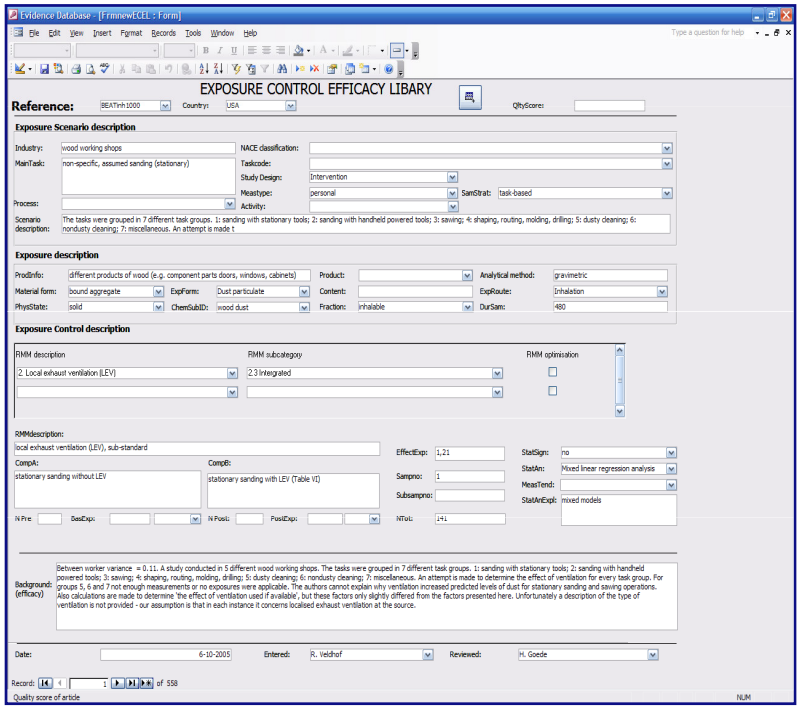
Achtergrond

- Veel onderzoek naar effectiviteit van beheersmaatregelen, maar resultaten niet eenduidig
- Beheersmaatregelen (Risk Management Measures (RMM)) spelen een centrale rol in REACH exposure scenarios
- REACH geeft de kans om de effectiviteit van beheersmaatregelen te evalueren en kwantificeren
- Op dit moment, geen database met effectiviteitwaarden bekend
- Dit gaat hopelijk veranderen in de nabije toekomst
  - *ECEL kan hierin een eerste stap zijn*



Wat is ECEL?

- MS Access database met effectiviteitwaarden van beheersmaatregelen
- Data geselecteerd uit peer reviewed publicaties
  - *Internationale arbeidshygiënische tijdschriften en PubMed*
- Effectiviteitwaarden onderbouwd met kwantitatieve metingen (met/zonder beheersmaatregel)
- Voldoende contextuele informatie



Kwaliteitscriteria voor data invoer in ECEL?

- Effectiviteit moet gebaseerd zijn op kwantitatieve meetdata
- Effectiviteit moet bepaald zijn met voor- en na-meting (met/zonder RMM)
- De effectiviteit van slechts 1 beheersmaatregel is getest
- Voldoende contextuele informatie aanwezig (study design, meetstrategie, aantal metingen, etc.)

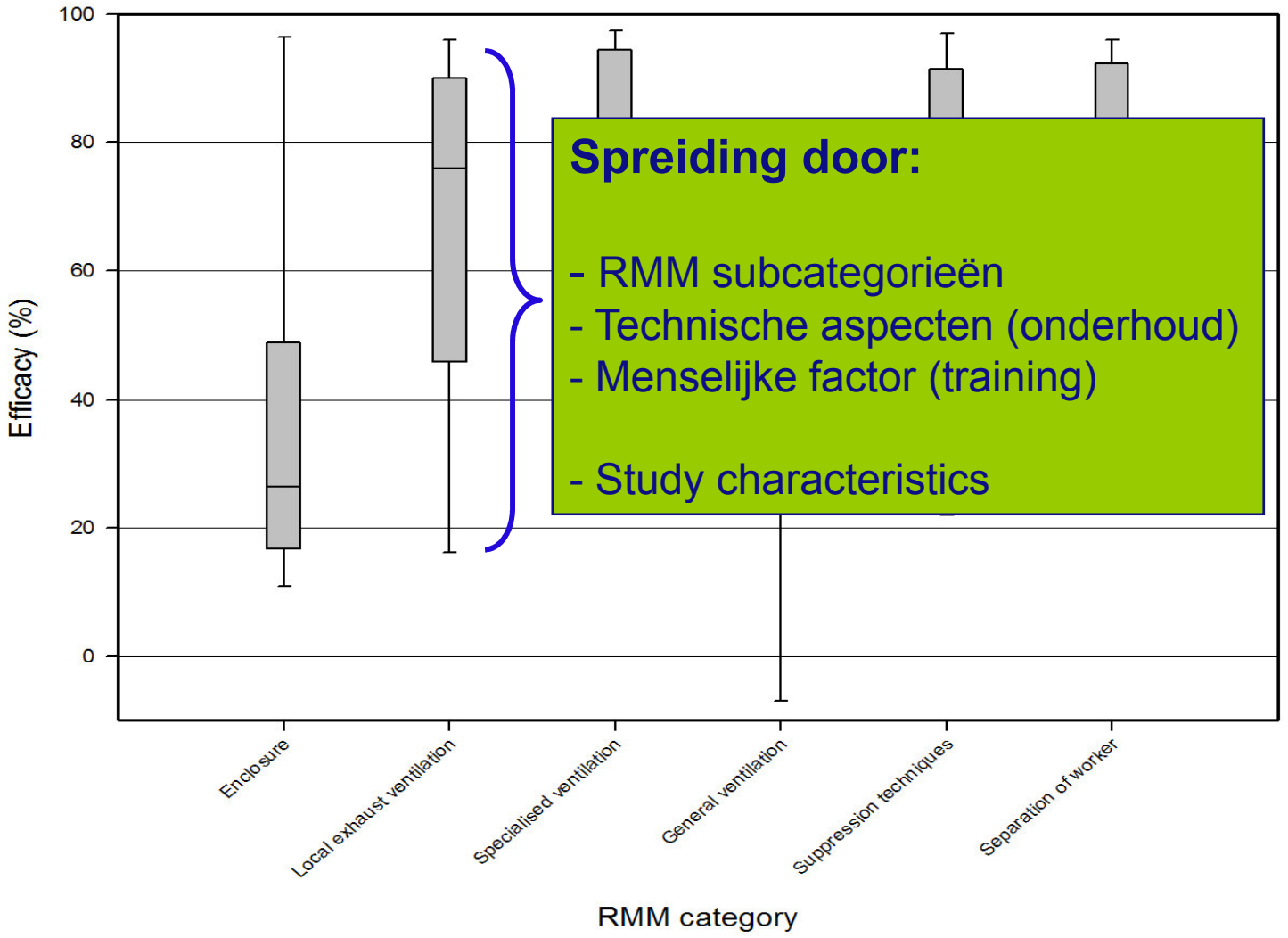
ECEL – Resultaten (1)

RMM	Aantal studies	Aantal effectiviteitwaarden per studie design			
		Cross-sectionele studies	Experimentele studies	Interventie studies	Totaal
Enclosure	5	14	0	0	14
LEV	50	75	88	117	280
Specialised ventilation	7	1	1	12	14
General ventilation	7	27	0	15	42
Suppression techniques	19	12	27	30	69
Separation of worker	2	11	0	3	14
Total	90	140	116	177	433

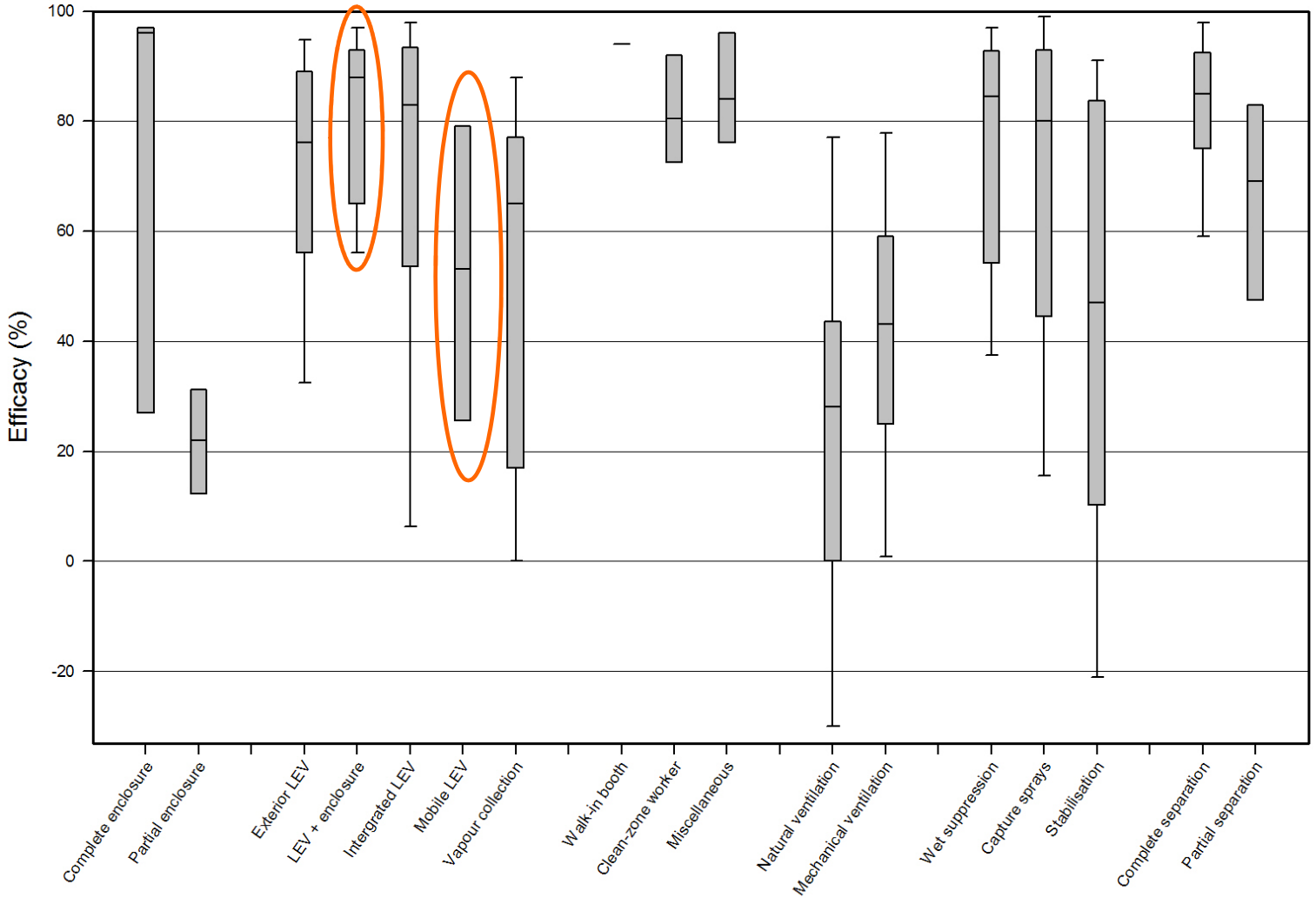
ECEL – Resultaten (2)

	N	Geschatte effectiviteit	95% Betrouwbaarheid interval
Overall	433	79%	76% - 82%
Study design			
• Cross-sectional	140	63%	53% - 70%
• Experimental	116	88%	85% - 90%
• Intervention	177	80%	76% - 84%
Sampling strategy			
• Shift-based	160	65%	57% - 71%
• Task-based / short term	273	84%	82% - 87%
Measurement type			
• Personal	301	78%	74% - 82%
• Stationary	132	80%	75% - 85%

ECEL – Resultaten (3)



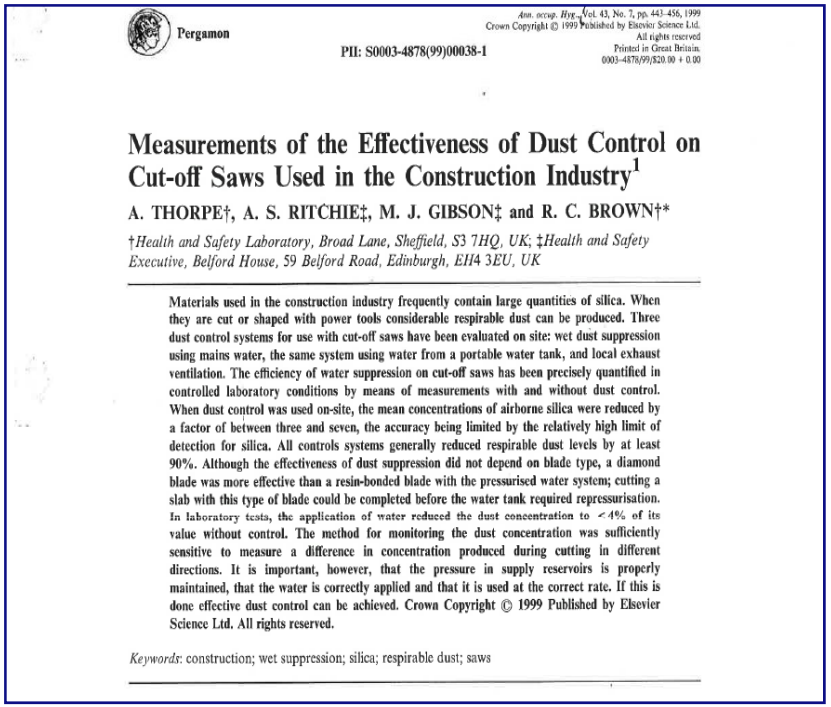
ECEL – Resultaten (4)



ECEL – Bron voor specifieke informatie

- Zoekfunctie:
  - *Wet suppression*
  - *Experimental study*

Water flow (l min^{-1})	% reduction
None	-
0.1	55
0.2	73
0.5	97
1.0	98



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Measurements of the Effectiveness of Dust Control on Cut-off Saws Used in the Construction Industry[1]

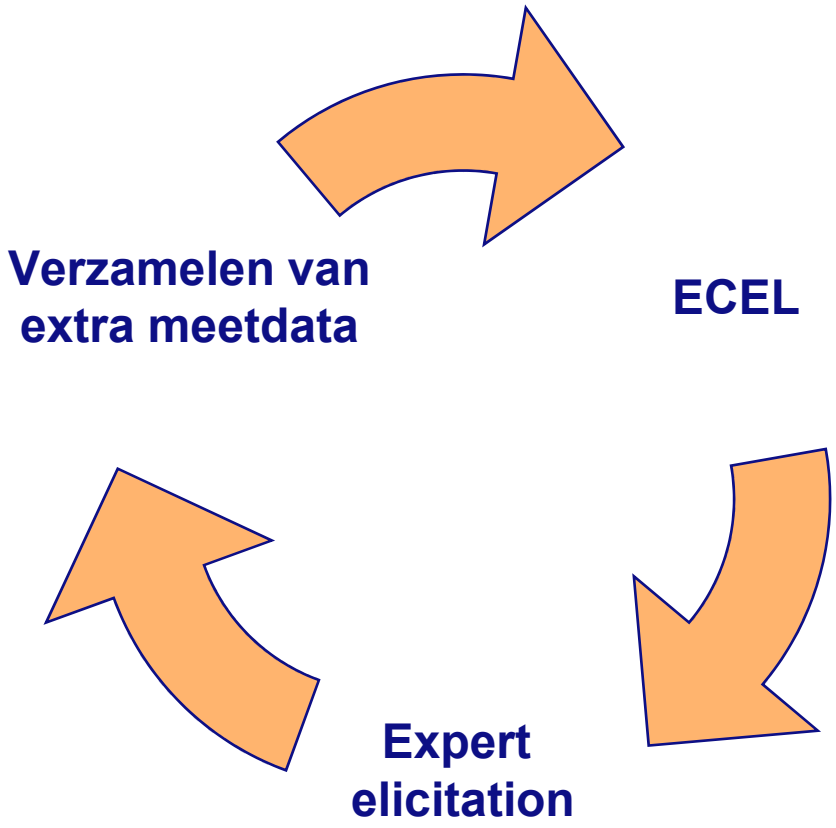
A. THORPE†, A. S. RITCHIE‡, M. J. GIBSON‡ and R. C. BROWN†*

†*Health and Safety Laboratory, Broad Lane, Sheffield, S3 7HQ, UK*; ‡*Health and Safety Executive, Belford House, 59 Belford Road, Edinburgh, EH4 3EU, UK*

Materials used in the construction industry frequently contain large quantities of silica. When they are cut or shaped with power tools considerable respirable dust can be produced. Three dust control systems for use with cut-off saws have been evaluated on site: wet dust suppression using mains water, the same system using water from a portable water tank, and local exhaust ventilation. The efficiency of water suppression on cut-off saws has been precisely quantified in controlled laboratory conditions by means of measurements with and without dust control. When dust control was used on-site, the mean concentrations of airborne silica were reduced by a factor of between three and seven, the accuracy being limited by the relatively high limit of detection for silica. All controls systems generally reduced respirable dust levels by at least 90%. Although the effectiveness of dust suppression did not depend on blade type, a diamond blade was more effective than a resin-bonded blade with the pressurised water system; cutting a slab with this type of blade could be completed before the water tank required repressurisation. In laboratory tests, the application of water reduced the dust concentration to <4% of its value without control. The method for monitoring the dust concentration was sufficiently sensitive to measure a difference in concentration produced during cutting in different directions. It is important, however, that the pressure in supply reservoirs is properly maintained, that the water is correctly applied and that it is used at the correct rate. If this is done effective dust control can be achieved. Crown Copyright © 1999 Published by Elsevier Science Ltd. All rights reserved.

Keywords: construction; wet suppression; silica; respirable dust; saws

‘Expert elicitation’ en onderbouwing met meetgegevens



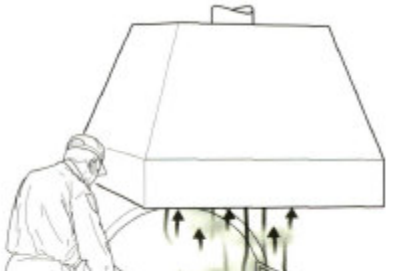
Expert elicitation

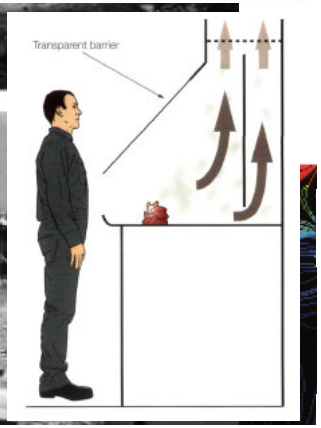
- Eendaagse workshop in Londen (januari 2009)
  - *Steve Bailey (GSK) / Wouter Fransman (TNO)*
  - *In de context van het ART project*

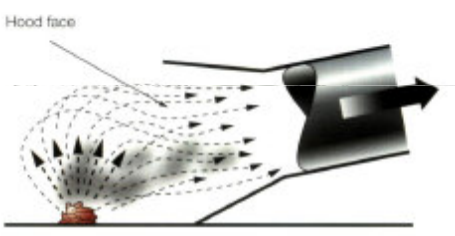
- Selectie expert panel
  - *15 BOHS experts*
- Systematisch beoordelen van beschikbare informatie
- Procedure voor het afleiden van effectiviteitwaarden
  - *Consensus na discussie*

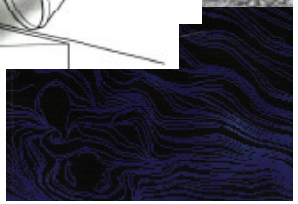
Classificatie van beheersmaatregelen volgens ART

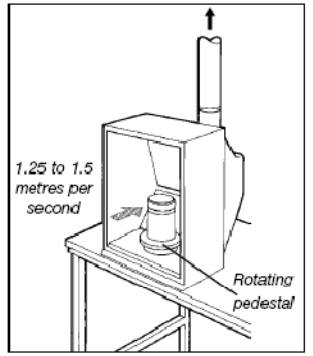
- No localized controls
- Suppression techniques
  - Wetting at the point of release
  - Knockdown suppression (post generation
- Containment (non-extracted)
- Local ventilation systems
  - Receiving hoods
    - Canopy hoods (hot processes)
    - Other receiving hoods
  - Capturing hoods
    - Fixed
    - Movable
  - On-tool (integrated) extraction
  - Enclosing hoods
    - Glove box
    - Fume cupboard
    - LEV systems with partial enclosure (no front cover)











Voorgestelde effectiviteitwaarden van beheersmaatregelen (volgens ART)

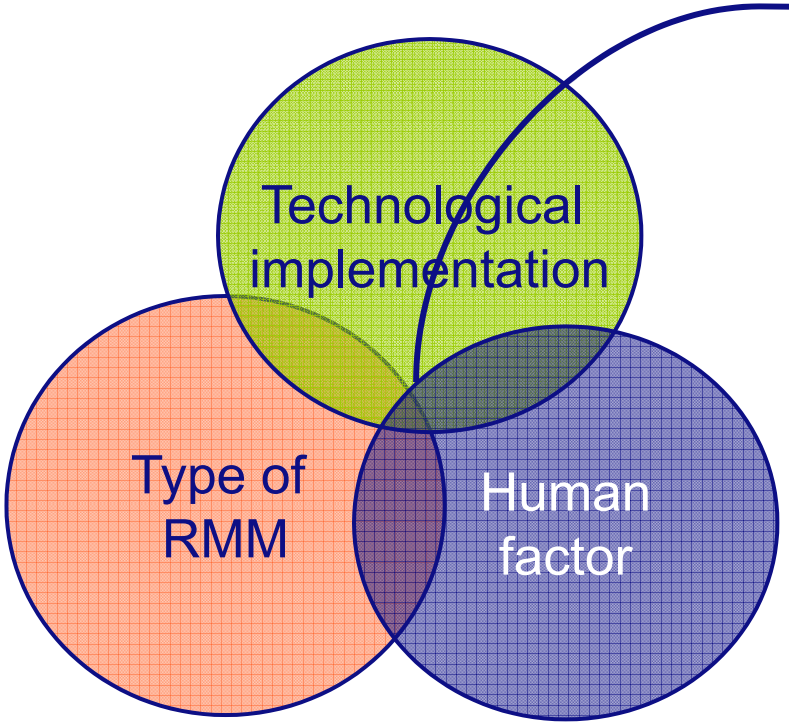
	Effectiviteitwaarde
Local ventilation systems	
• Receiving hoods	
Canopy hoods (hot processes)	0.5
Other receiving hoods	0.2
• Capture hoods	
Fixed	0.1
Movable	0.5
• On-tool (integrated) extraction	0.1
• Enclosing hoods	
Glove box	0.001
Fume cupboard	0.01
LEV systems with partial enclosure (no front cover)	0.1

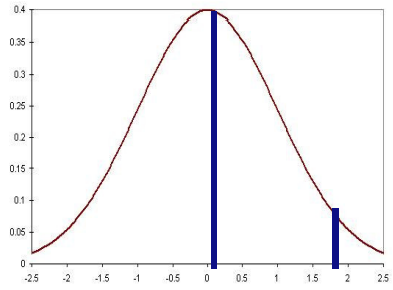
Verzamelen van extra meetdata

- Huidige versie van ECEL is een eerste poging om effectiviteitwaarden van beheersmaatregelen te bundelen
- Toevoeging van extra informatie is nodig
- Van peer reviewed literatuur bronnen naar ‘grijze literatuur’ of niet-gepubliceerde data

Conclusies (1)

- Verschuiving naar ‘evidence based’ blootstellingkarakterisering
  - *Expert judgement onderbouwen met meetgegevens*
  - *Noodzakelijk voor REACH*
- ‘Meta-analyse’ van beschikbare informatie is noodzakelijk en kosteneffectief
- ECEL is een goede eerste stap
  - *Geeft een gemiddelde effectiviteit van typen beheersmaatregelen*
  - *Hiaten in beschikbare informatie*
- Meer data zijn nodig om de effectiviteit te bepalen op RMM detail niveau
- Gemiddelde en maximaal haalbare effectiviteit





Typical default value (50th perc.)

Maximum achievable value

Conclusies (2)

- ECEL als onderbouwing van expert elicitation
  - *Transparantie*
  - *Optimaal gebruik van beschikbare informatie bij expert judgement*
- ECEL geeft aanleiding tot verbetering van onderzoek
  - *Keuze juiste study design*
  - *Voldoende contextuele informatie*
  - *Statistische data analyse en presentatie van resultaten*
- ECEL wordt al gebruikt voor modellering van blootstelling
  - *ART*
  - *Stoffenmanager*

Meer informatie…

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Development and Evaluation of an Exposure Control Efficacy Library (ECEL)

WOUTER FRANSMAN*, JODY SCHINKEL, TIM MEIJSTER, JOOP VAN HEMMEN, ERIK TIELEMANS and HENK GOEDE

Business Unit Quality & Safety, TNO Quality of Life, PO Box 360, 3700 AJ Zeist, The Netherlands

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