Effect of additive in spraying water of asphalt milling machine on DUST and QUARTZ exposure

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Introduction

Operators of **asphalt milling machine** (cold planer)

Exposure to **respirable dust and crystalline quartz**

Exposure levels

respirable dust: 0,2 - 3 mg/m^3

quartz: 30 - 500 µg/m^3

OEL respirable crystalline quartz

in NL : 75 µg/m^3

in USA : 50 µg/m^3 (intended change to 25 µg/m^3)

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Previous efforts of exposure control

*Arbouw and TNO (2002)**

Local exhaust ventilation system at picks drum and/or collecting conveyer

Results

Ventilation measures are insufficient to reduce quartz exposure to an acceptable level. Compliance with OEL depends on wind speed and direction.

*TNO = Netherlands Organisation for Applied Scientific Research
Arbouw = Dutch foundation for occupational hygiene and safety in construction industry

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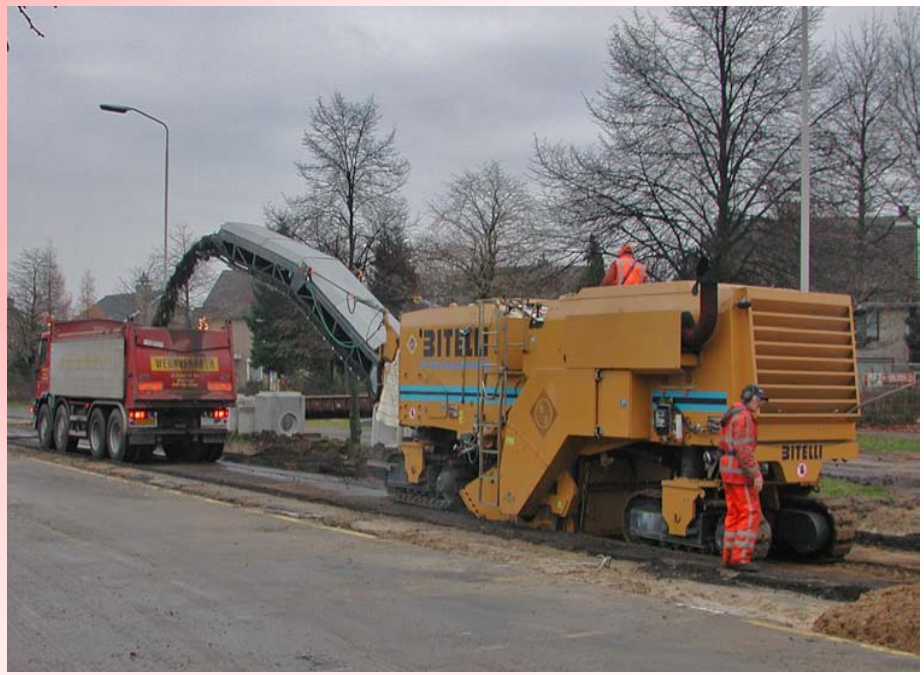
New dust emission reduction system (1)

Spraying of aerosolized water on milled asphalt material:

- at picks drum (12 spray nozzles)
- at collection conveyer (8 nozzles)
- at loading conveyer (4 nozzles)



Spray water contains **additive 'Bitfoam'** => dust becomes sticky and aggregates

System is **developed by**

- Pon Equipment BV, Amsterdam
- Reproad, Lelystad

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New dust emission reduction system (2)

Water use: 9000 L/day (60-70 bar)

Use of additive 'Bitfoam': 3-5 L/day

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Study objective

Determination of the effect of

(i) the spraying of water aerosol, and

(ii) the additive in the water aerosol

on the DUST and Quartz exposure of operators of asphalt milling machine

Does the new dust emission reduction system reduce the QUARTZ concentration to levels below the occupational exposure limit?

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Study design

- Asphalt milling machine: Bitelli, type SF 202
  equipped with:
  - (i) only cooling water system (standard procedure)
  - (ii) system of spraying water aerosol
  - (iii) system of spraying water aerosol with additive 'Bitfoam'
- 2 operators
- 6 road construction locations in Netherlands (Oct-Dec 2003)
- 15 Personal air samples (2 L/min, average sampling time: 250 min):
  1. Respirable dust (method: MDHS 14/3)
  2. Respirable crystalline quartz (method: NIOSH 7602)

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Results (1)

Dust/quartz emission reduction system on asphalt milling machine	*Concentration in breathing zone of asphalt millers (arithmetic mean, range)*				*Number of samples*
	Respirable DUST (mg/m^3)		*Respirable QUARTZ ($\mu g/m^3$)*		
Only cooling water	**2.4**	(1.8-2.9)	**449**	(395-509)	3
Water aerosol	**0.40**	(0.25-0.7)	**65**	(42-104)	4
Water aerosol *with* additive	**0.19**	(0.09-0.29)	**14**	(4-30)	8

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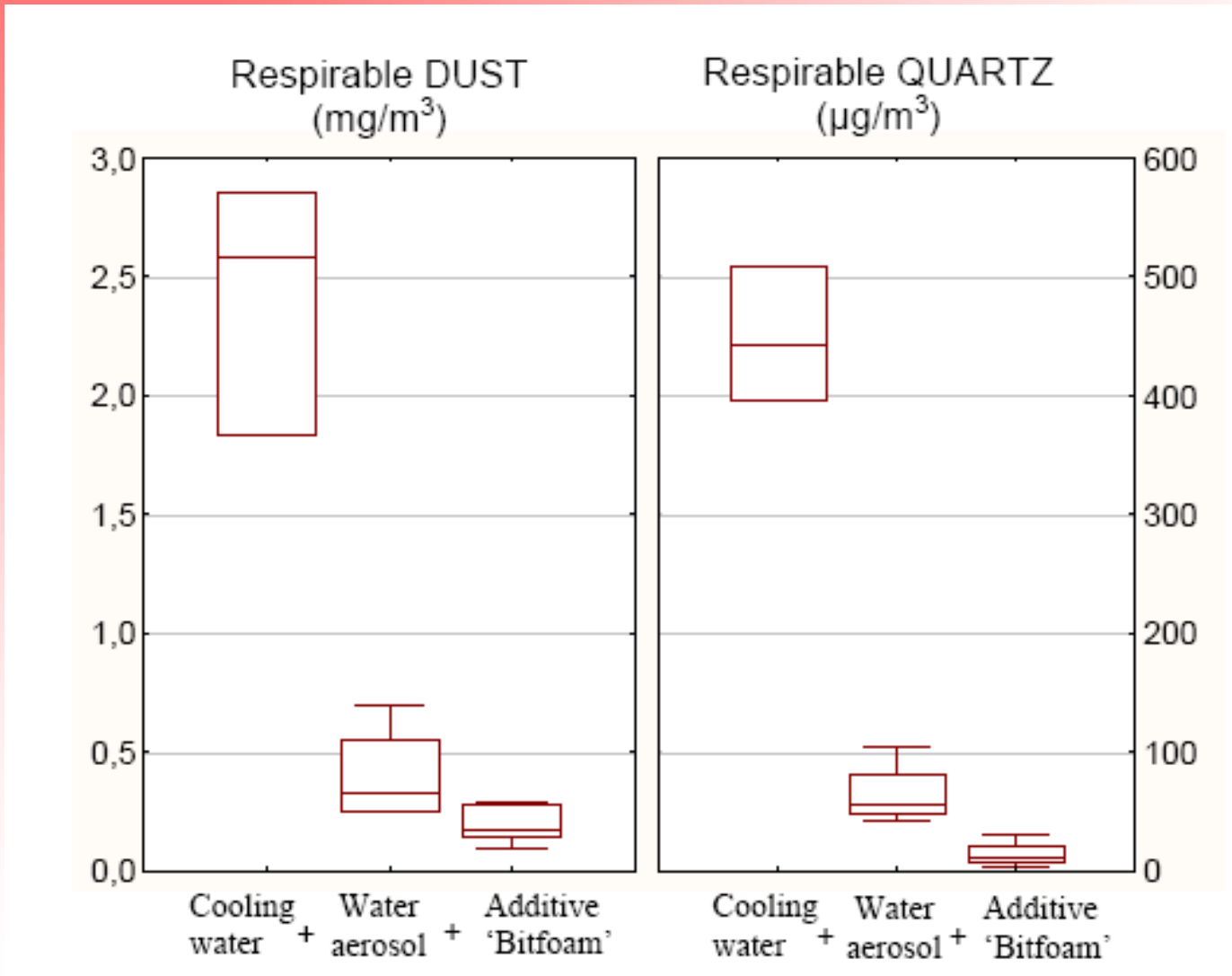
Results (2)



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Conclusion

This small scaled field study among operators of an asphalt milling machine shows that:

- the spraying of aerosolized water alone may reduce QUARTZ exposure 6-7 fold
- the additive in the aerosolized water further reduces QUARTZ exposure 4-5 times

This results in an average QUARTZ concentration in the breathing zone of the operators that is well below the occupational exposure limit

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Other applications (1)

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Other applications (2)

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Acknowledgements

Reproad BV, Lelystad, NL
Martin Hogenes

RPS Analyse BV, Ulvenhout, NL
Jeroen Smallenberg

Arbeidsinspectie, Arnhem, NL
Wim Kramer

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