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Institut für Gefahrstoff-Forschung
der Berufsgenossenschaft
Rohstoffe und chemische Industrie
Institut an der Ruhr-Universität Bochum

A 8585/18

Report

via an effectiveness check of the dust binding agent "DUST SAFE" at the workplace simulation test bench of the IGF in the technical center in Dortmund

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Management & Trade for innovative fire protection

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Object of investigation: "DUST SAFE"

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Mr. Gerd Göbel Febbex International GmbH Mr. Monz IGF

Participants in the measurement:

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Mr. Rothermund IGF

Measurement carried out on: September, October 2018

INHALTSVERZEICHNIS

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1 preliminary remark

Prevent Tec GmbH, Management & Trade for innovative fire protection, Heilbronn, commissioned the Institute for Hazardous Substances Research, IGF, to examine the dust binding agent "DUST SAFE".

The task was an effectiveness study when using "DUST SAFE" under real conditions.

"DUST SAFE" is a paste-like, fluffy mass that is applied to a dust surface to minimize dust exposure when sweeping. Since construction sites are the primary possible area of application, the investigations were carried out in the workplace simulation test stand of the IGF in the technical center in Dortmund.

The investigations with the subsequent evaluations did not concern measurements of hazardous substances according to TRGS 402 "Determining and assessing the hazards of activities involving hazardous substances: inhalative exposure". Rather, the statement should be made as to whether significant exposure minimization successes exist or not.

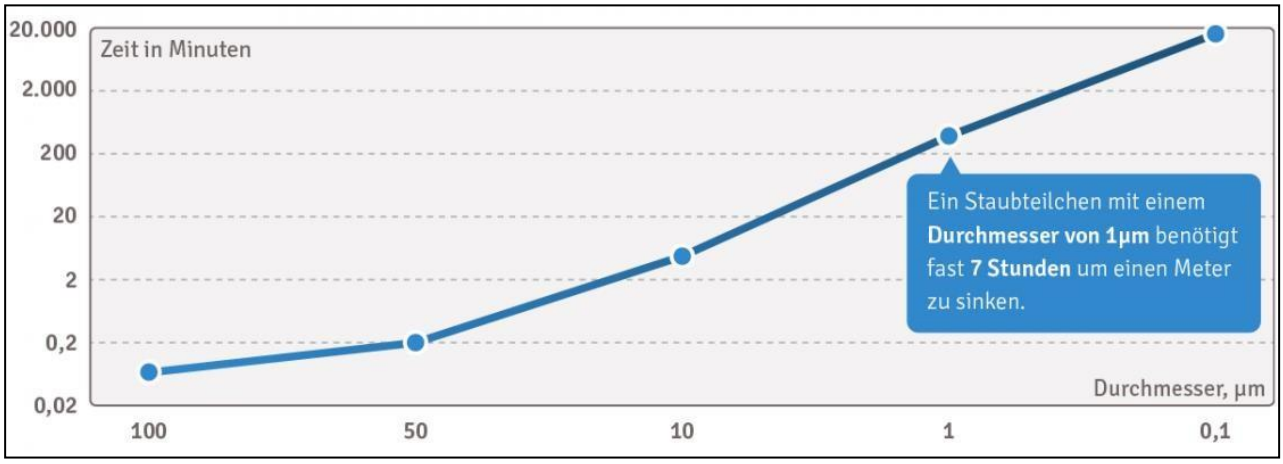
1. General

1.1 Explanation dust

Dusts belong to the aerosols along with smoke and mist. An aerosol is a disperse system in which the disperse phase is solid or liquid and the surrounding medium is gaseous. In the case of dust, this disperse distribution is created by whirling up a solid or by mechanical processes.

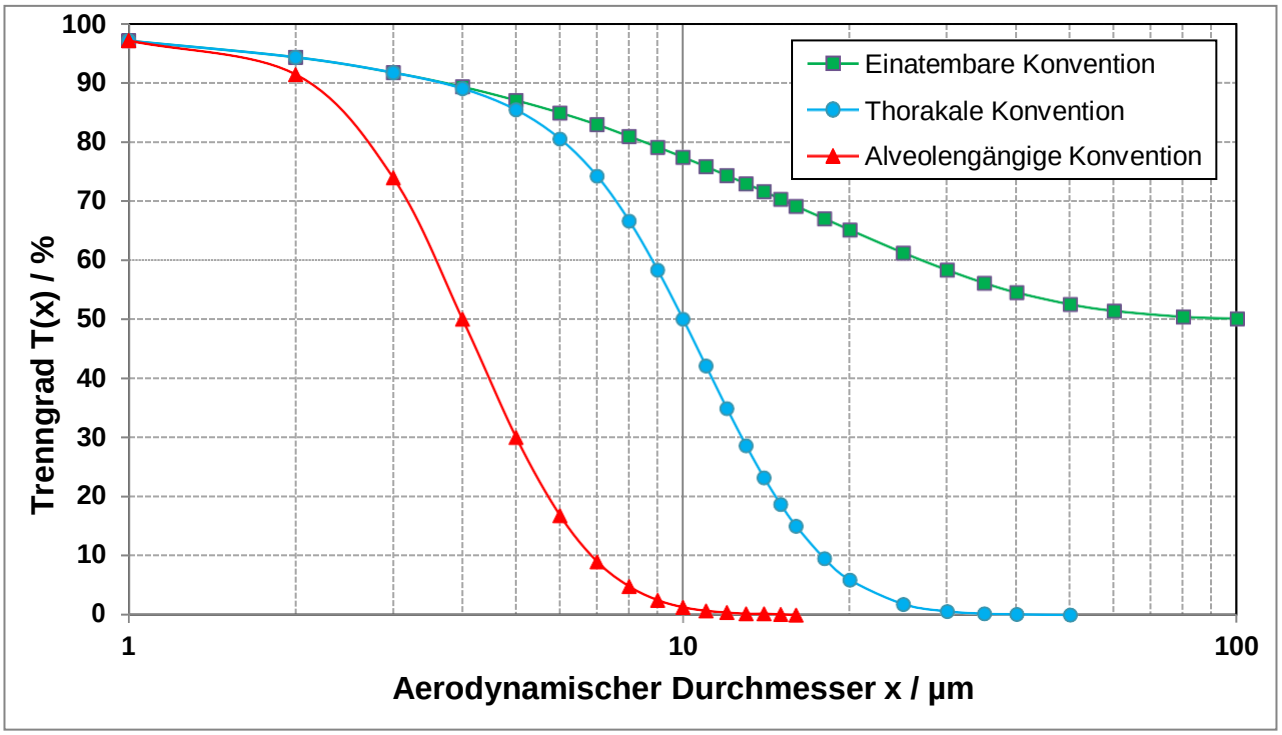
In addition to the dust concentration, the exposure time and the effect of the pollutant, the particle size is also taken into account when assessing the health hazards caused by dust. Particles larger than 0.5 mm are no longer referred to as dust. E-dust (total dust) is understood to mean the proportion of dust that can get into the respiratory tract (inhalable dust). The entire dust fraction that affects the lungs, nose and throat is taken into account. A dust (fine dust) primarily endangers the alveolar space. It includes a dust collective that passes through a separation system whose effect corresponds to the corresponding separation function according to EN 481. This can be e.g.

The length of time dust particles remain in the air depends on their size. Very small dust particles need a very long time to settle in still air (see Figure 1).



When inhaled, these smaller particles get into the tracheo-bronchial space and alveolar space of the lungs and are partly deposited there, while larger dust particles are already deposited in the nose, throat and larynx spaces by centrifugal separation. The proportion of dust that is inhaled but not exhaled is referred to as "total deposited dust".

The inhalability of the dust increases as the particle size decreases. Particles smaller than 100 µm burden the nose, throat and larynx. The bronchi are endangered with a particle size below 10 µm, the alveoli with a particle size below 5 µm. Particles below 0.5 µm are mostly exhaled again.
The probability of the composition of the total dust in relation to the diameter can be seen in Figure 1.



1.1 General dust limit value

Application and scope of the general dust limit value according to TRGS 900 "Workplace limit values":

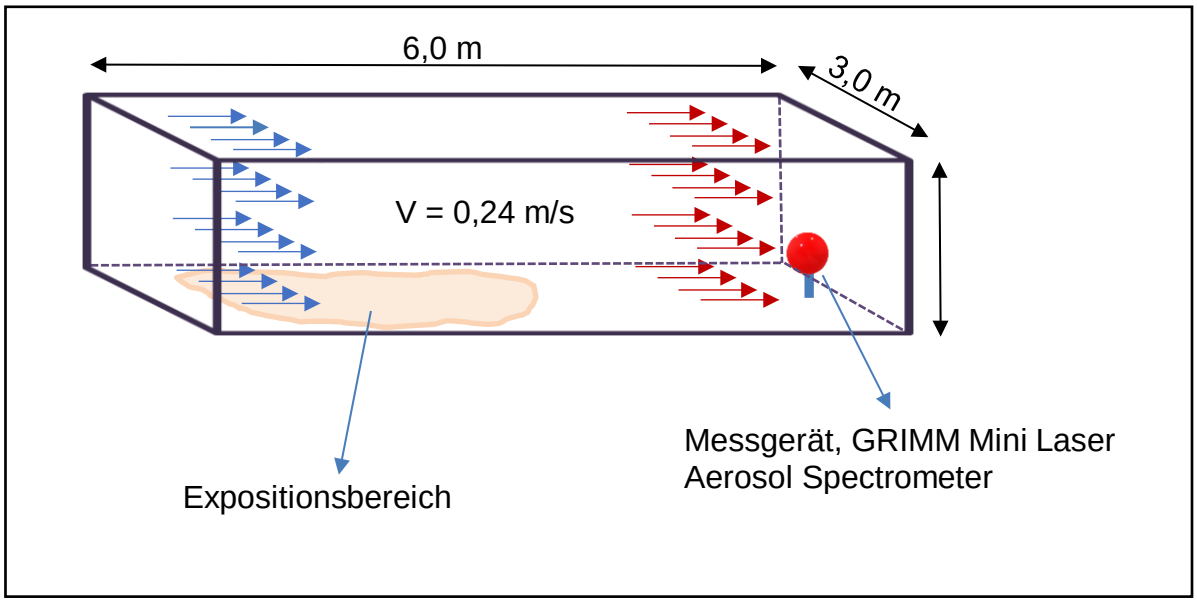
(1) The general limit value for dust (ASGW) is intended to prevent impairment of the function of the respiratory organs as a result of the general effect of dust. It is to be used as an AGW for poorly soluble or insoluble dusts that are not otherwise regulated.

(6) To assess the dust concentrations that occur in the air in the work area, the inhalable (E dust fraction) and the respirable dust fraction (A dust fraction) of the ASGW must be determined and evaluated in accordance with TRGS 402. The higher substance index is to be used for the workplace assessment. When calculating the assessment indices of substance mixtures according to TRGS 402 paragraph 5.2.1 no. 2, the substance indices for the ASGW are not to be taken into account.
(7) In practice, the dust fractions can also contain proportions for which substance-specific assessment standards (see TRGS 402) are specified. If such substances are contained in the dust fractions, they must be determined and evaluated separately. The workplace limit value (AGW) for the A dust fraction of 1.25 mg/m³ is based on an average density of 2.5 g/cm³. If materials of particularly low density (e.g. plastics, paper) or particularly high density (e.g. metals) are used at a workplace, the material density can be used for conversion. The AGW of the E dust fraction is defined as a shift average value of 10 mg/m³. For the E-dust fraction, a density-related conversion is technically not justifiable.

Hazardous substance	**GDL** [mg/m³]	**Density** [kg/m³]	**Remark**
Dust A	1,25	2,5	General dust limit value (GDL)
Dust B	10		

1.1 Workplace simulation test stand

To check the effectiveness of the "DUST TEC" dust binding agent, a measuring room with the dimensions H = 2.3 m, W = 3.0 m and L = 6.0 m was set up in the workplace simulation test stand, ASP.



A directed air flow in the direction of the extraction wall can be set over the entire cross-section of the room via an extraction wall installed on the front side. A low air velocity of approx. 0.24 m/s was selected to avoid turbulence or, in particular, turbulence of dust particles that had already settled. This air speed can also be regarded as representative of rooms that are not actively ventilated, since the natural air exchange rate means that these air flows are at their maximum.

1.1 Measuring Devices

A GRIMM Mini Laser Aerosol Spectrometer, Model 11R, was used as a measuring device to assess the existing exposure level. Due to the fast measurement resolution of six seconds, exposure changes could be detected sufficiently quickly. The aerosol spectrometer was set to the dust fractions of inhalable, thoracic and respirable dust in accordance with the DIN EN 481 standard described under point 2.12.1. Based on the general dust limit value from TRGS 900 “Workplace Limit Values”, 2.50 g/dm³ was assumed as the average density.

Manufacturer information

• **Manufacturer:** Grimm Aerosol Technik GmbH & Co. KG (Durag Group)

• **Model:** Mini-LAS 11-R

• **Metrics:** number size distribution E, T, A dust

PM10, PM2.5, PM1

• **Particle size range:** 0.25 - 32 µm

• **Concentration range:** <3,000 1/cm³ (number size distribution)

0.1 µg/m³ - 100 mg/m³

• **Temporal resolution:** ≥ 6 s

• **Number of size classes:** 31

• **Reproducibility:** ±3%

• **Flow rate:** 1.2 l/min

• **Wavelength:** 660nm

• **Scattering angle:** 90°

• **Size & Weight:** 28cm × 17cm × 6cm 2.1kg

• **Battery life:** 8 hours

• **Special features:** Integrated 47 mm PTFE sampling filter

1 Exam description

To achieve a comparable and reproducible series of tests, the following standard procedure was used for all products used:

Preparations:

1) Switching on the ventilation system
2) Turn on the GRIMM Mini Laser Aerosol Spectrometer, Model 11R
3) Establish communication between GRIMM Spectrometer and laptop with time alignment
4) Measuring the background

After ensuring that the background is less than 1/10 of the E-dust and less than 1/10 of the A-dust limit value, corresponding to A-dust < 0.125 mg/m³ and E-dust < 1 mg/m³, the investigations start. In reality, the background for both fractions was within the response range of the measuring device and is to be regarded as a marginal influence with no relevance for the further assessments.

Dusty sweeping:

a) Scattering of the product to be evaluated by hand over the first 3 meters over the entire width of the test room
b) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
c) Sweep up the product with a strong broom to form a heap, mitering for at least 2 minutes. (dust provoking sweeping)
d) Residence time at least 5 minutes, no relevant peaks may be visible on the record of the measurement
e) Picking up the debris and sweeping up the floor area
f) Again spreading the product to be evaluated by hand over the first 3 meters over the entire width of the test room
g) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
h) Sprinkle the product surface with DUST SAFE

a) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
b) Sweep up the product with a broom to form a heap, mitering for at least 2 minutes. (dust provoking sweeping)
c) Picking up the debris and sweeping up the floor area

Normal sweeping:
a) Scattering of the product to be evaluated by hand over the first 3 meters over the entire width of the test room
b) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
c) Sweep up the product with normal broom strokes to form a heap, mitering for at least 2 minutes. (normal sweeping)
d) Residence time at least 5 minutes, no relevant peaks may be visible on the record of the measurement
e) Picking up the debris and sweeping up the floor area
f) Again spreading the product to be evaluated by hand over the first 3 meters over the entire width of the test room
g) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
h) Sprinkle the product surface with "DUST SAFE"
i) at least 5 minutes residence time, no relevant peaks may be visible on the record of the measurement
j) Sweep the product into a heap with a normal broom, mitering for at least 2 minutes. (normal sweeping)
k) Picking up the debris and sweeping up the floor area

Dust-avoiding sweeping:
a) Scattering of the product to be evaluated by hand over the first 3 meters over the entire width of the test room
b) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement

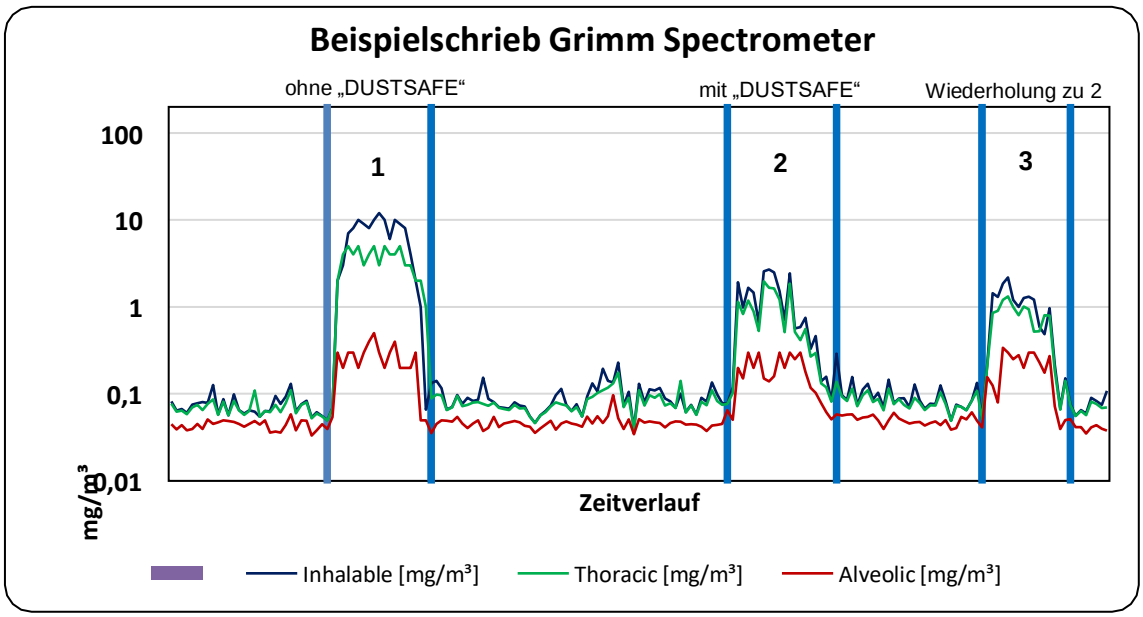
a) Sweep up the product with slow broom strokes to form a heap, mitering for at least 2 minutes. (dust-avoiding sweeping)
b) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
c) Picking up the debris and sweeping up the floor area
d) Again spreading the product to be evaluated by hand over the first 3 meters over the entire width of the test room
e) Residence time at least 5 minutes, no relevant peaks may be visible on the record of the measurement
f) Sprinkle the product surface with "DUST SAFE"
g) Residence time of at least 5 minutes, no relevant peaks may be visible on the record of the measurement
h) Sweep up the product with slow broom strokes to form a heap, mitering for at least 2 minutes. (dust-avoiding sweeping)
i) Picking up the debris and sweeping up the floor area

For the investigations, the quantity of "DUST SAFE" to be applied to the product surface was dimensioned in such a way that the product surface was powdered with "DUST SAFE". The surface was not covered, but loosely covered.

To check the effectiveness of "DUST SAFE", various dusty products, such as are typical on construction sites, were processed:
• Silica sand
• Silica sand powder
• Quartz sand mixed with quartz sand flour
• Lime
• Cement
• Plaster
• Gypsum with fibers
• Cement with gypsum spots (similar to e.g. pigeon droppings)

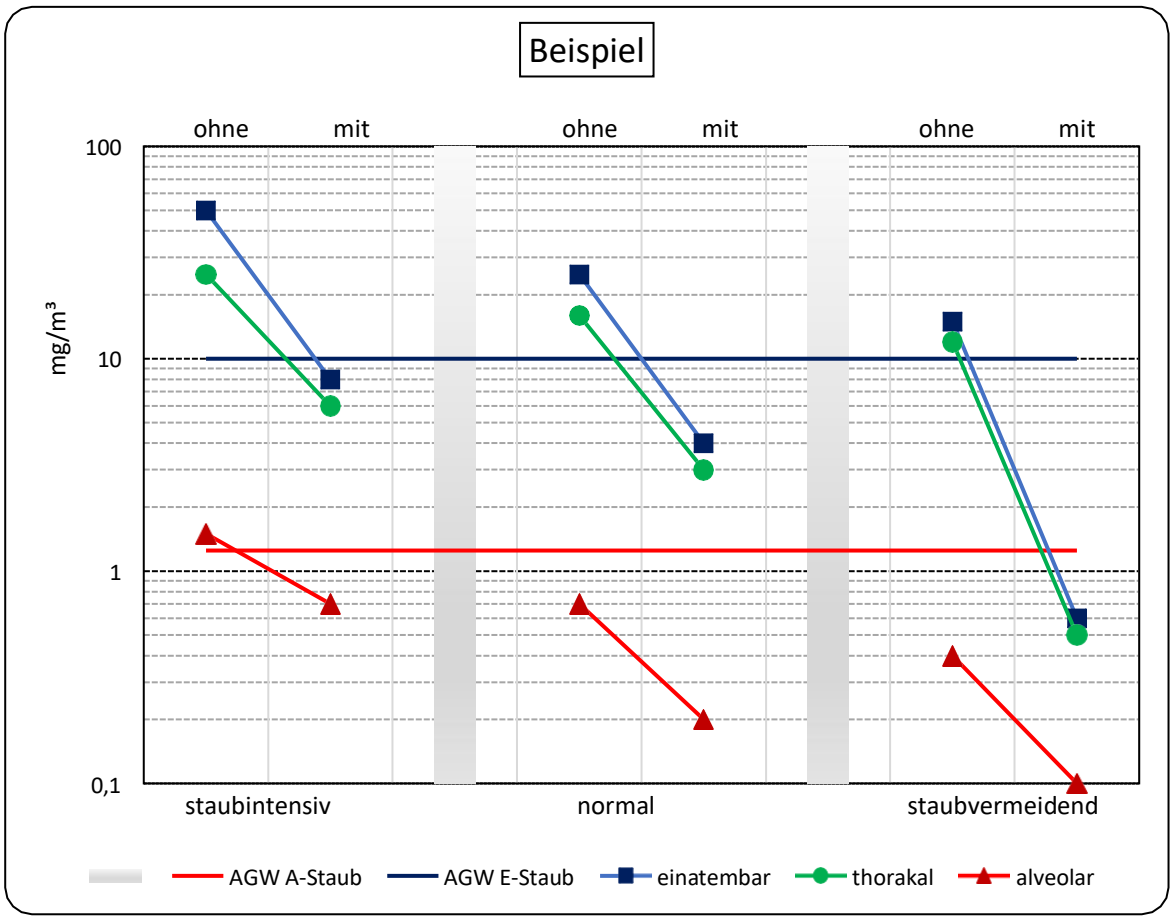
1 Measurement results

To evaluate the measurement results, the arithmetic mean was calculated for each fraction in the relevant period. Since the exposures are very heterogeneous and surge-like due to the processing method, the calculated value certainly only describes the true value relatively imprecisely with a large standard deviation. However, the range of the values to be compared (working with and working without
"DUST SAFE") is so large that reliable statements can be made. In Figure 7 (example record GRIMM Spectrometer) in area 1 there are jobs without the use of "DUST SAFE" and in areas 2 and 3 there are jobs with the use of
"DUST SAFE" applied. It must be ensured that the ordinate is logarithmically scaled. On the one hand, this example shows the width of the range of the measured values and on the other hand, through areas 2 and 3, the reproducibility of the method.



For the reasons given above, we deliberately refrained from specifying numerical values in the diagrams listed below. A direct comparison is shown, working "without" and "with" the use of the dust binding agent for the three working or sweeping methods "dust-intensive", "normal" and "dust-avoiding".

As an evaluation of the effectiveness, the percentage low result when using the dust binding agent is given for each product and each method, whereby in the sense of "worse case" the calculated percentages are rounded down to a full 5 percent. (e.g. 88.4% is reported as 85% and 84.6% as 80%)



Fraction	Results in &		
	Intense	Normal	Avoidant
Inhalable	80	80	95
Thoracic	75	80	95
Alveoral	50	70	75

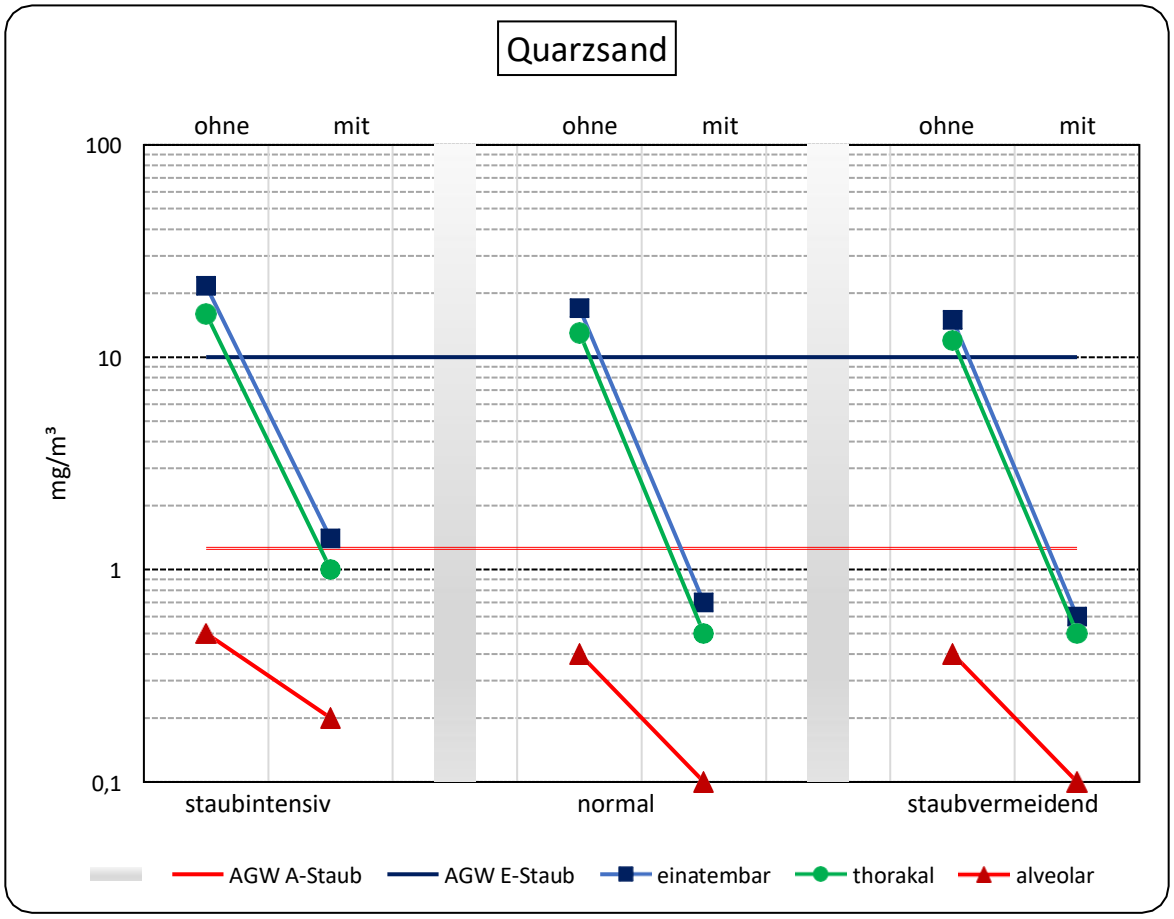


Abbildung 9 (Messwerte Quarzsand)

Fraction	Results in %		
	Intense	Normal	Avoidant
Inhalable	90	95	95
Thoracic	90	95	95
Alveolar	60	75	75

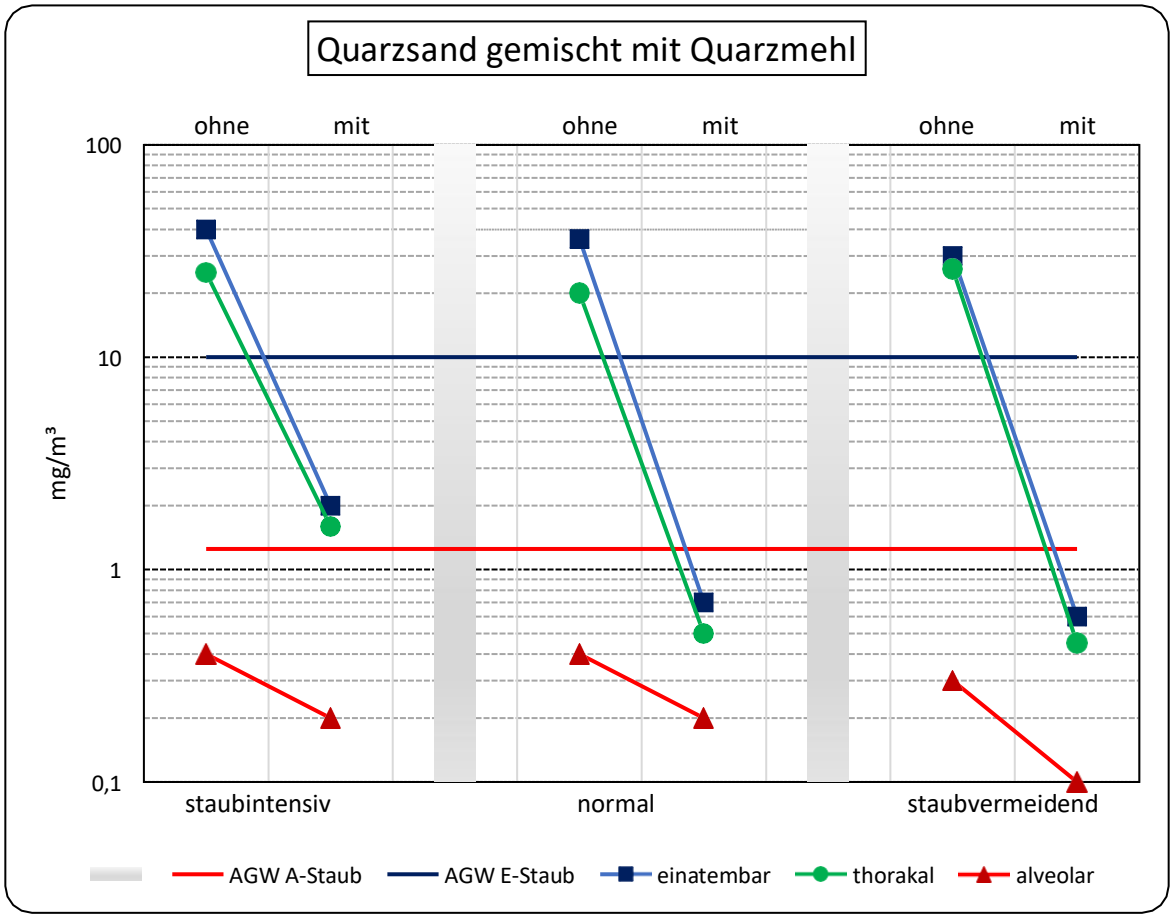


Abbildung 10 (Messwerte Quarzsand gemischt mit Quarzmehl)

Fraction	Results in %		
	Intense	Normal	Avoidant
Inhalable	95	95	95
Thoracic	90	95	95
Alveolar	50	50	65

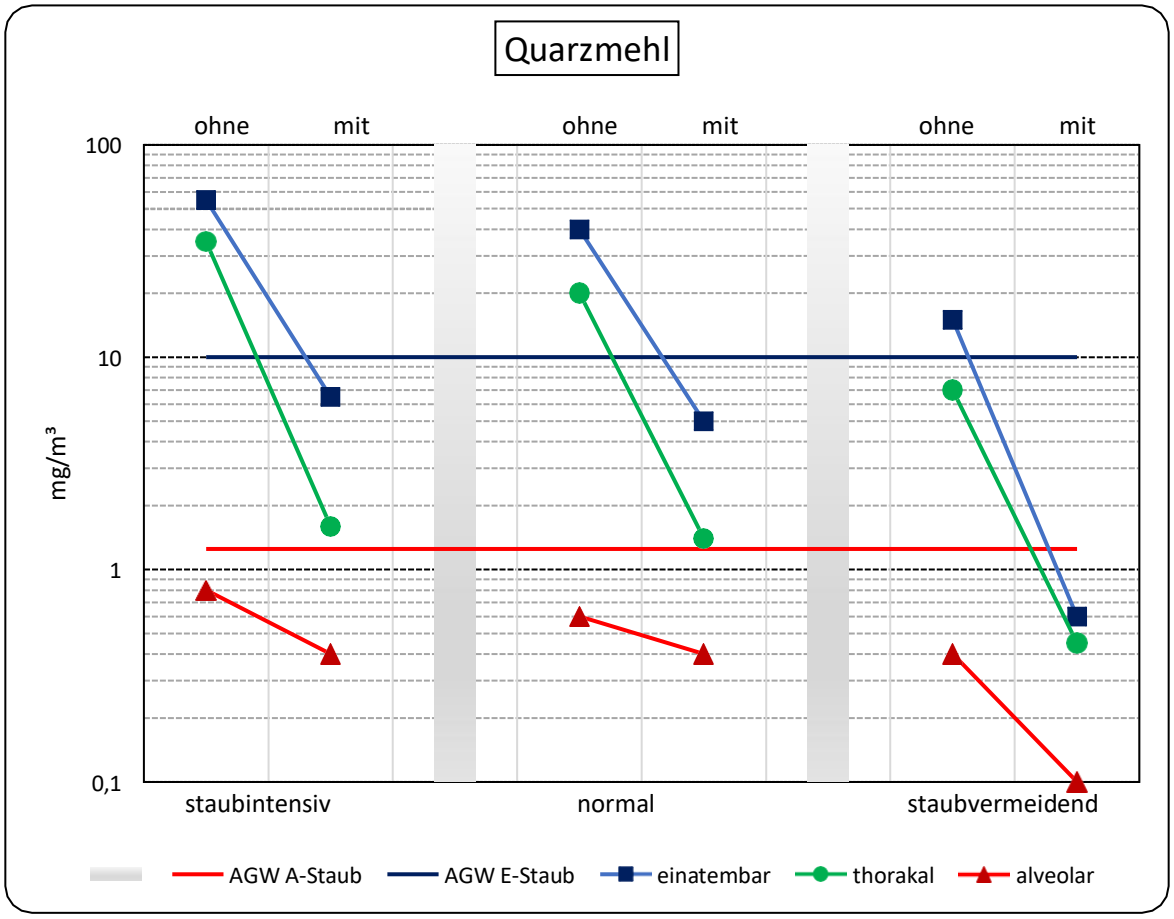


Abbildung 11 (Messwerte Quarzmehl)

Fraciton	Results in %		
	Intense	Normal	Avoidant
Inhalable	85	85	95
Thoracic	95	90	90
Alveolar	50	30	75

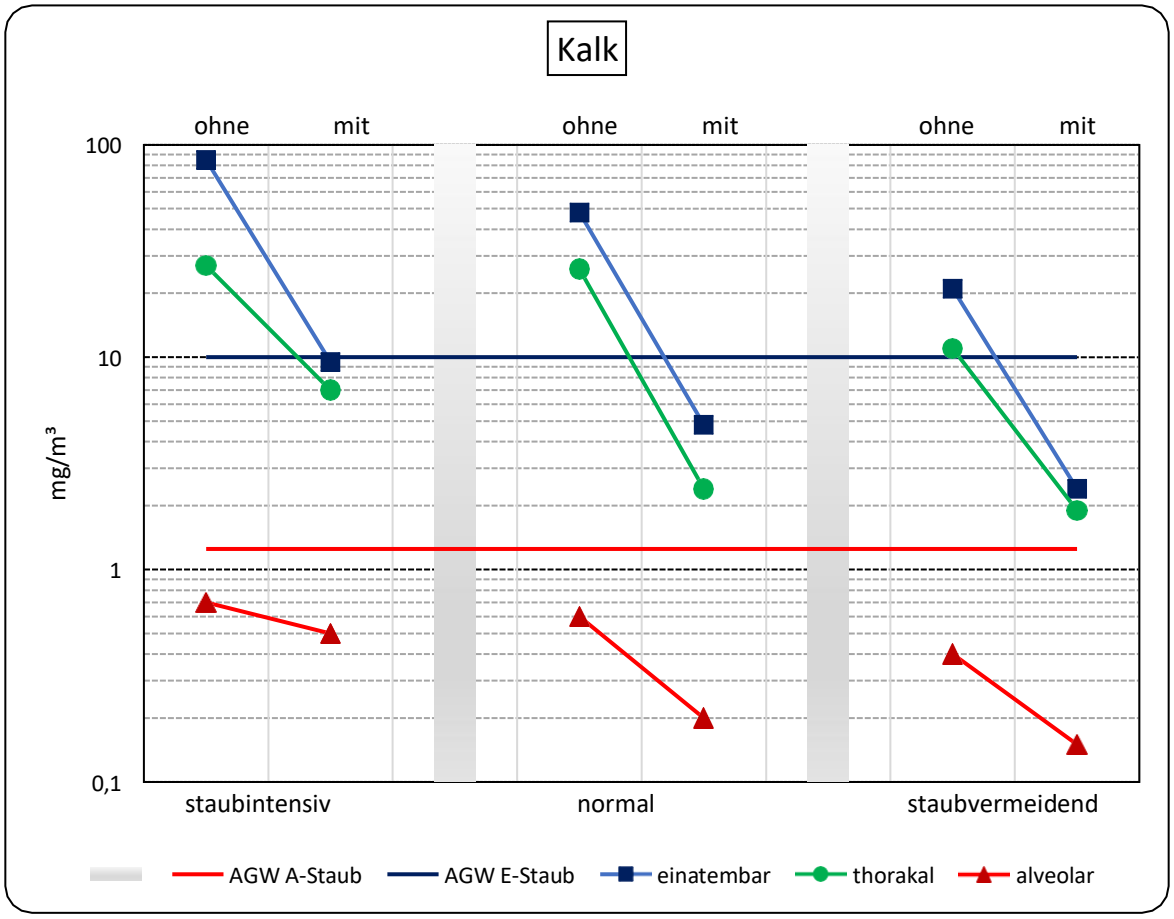


Abbildung 12 (Messwerte Kalk)

Fraktion	Minderbefund in %		
	intensiv	normal	vermeidend
einatembar	85	90	85
thorakal	70	90	80
alveolar	25	65	60

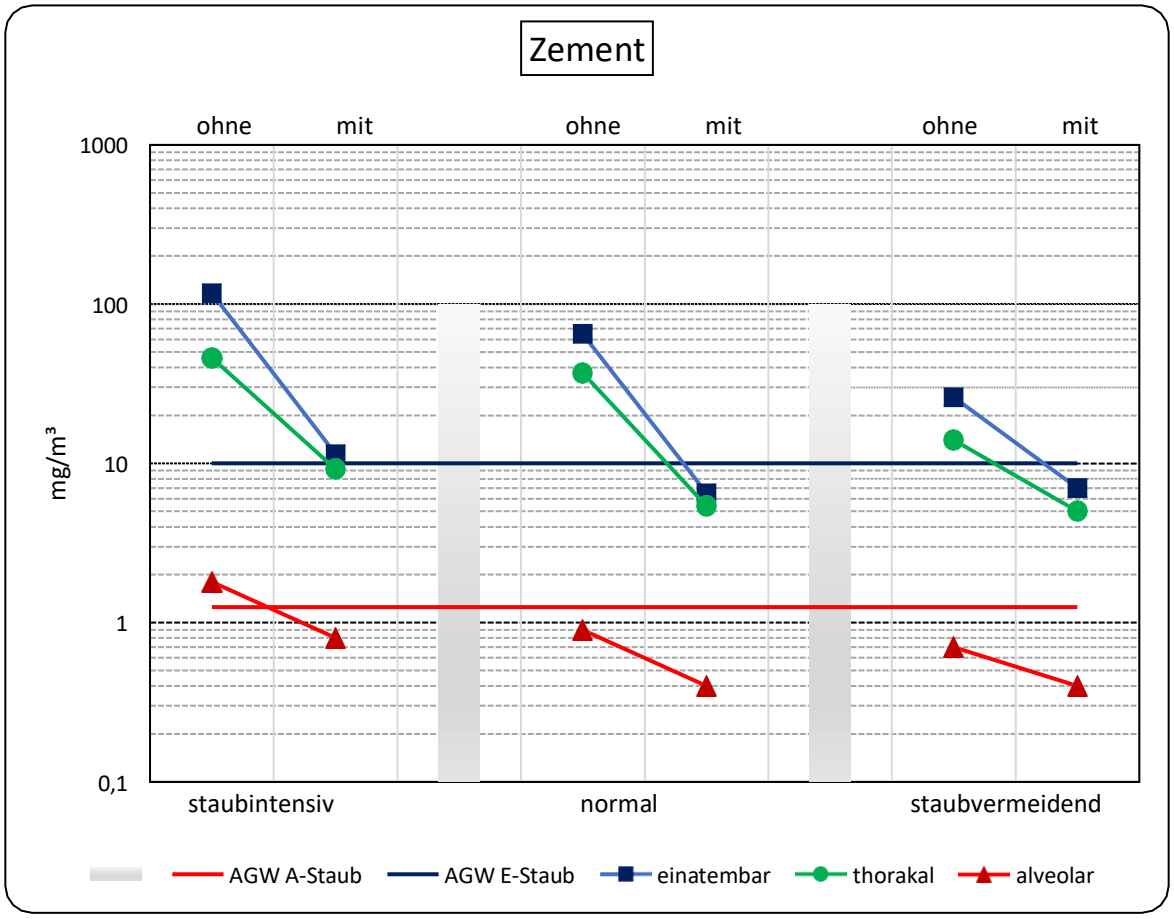


Abbildung 13 (Messwerte Zement)

Fraktion	Minderbefund in %		
	intensiv	normal	vermeidend
einatembar	90	90	70
thorakal	80	85	60
alveolar	55	55	40

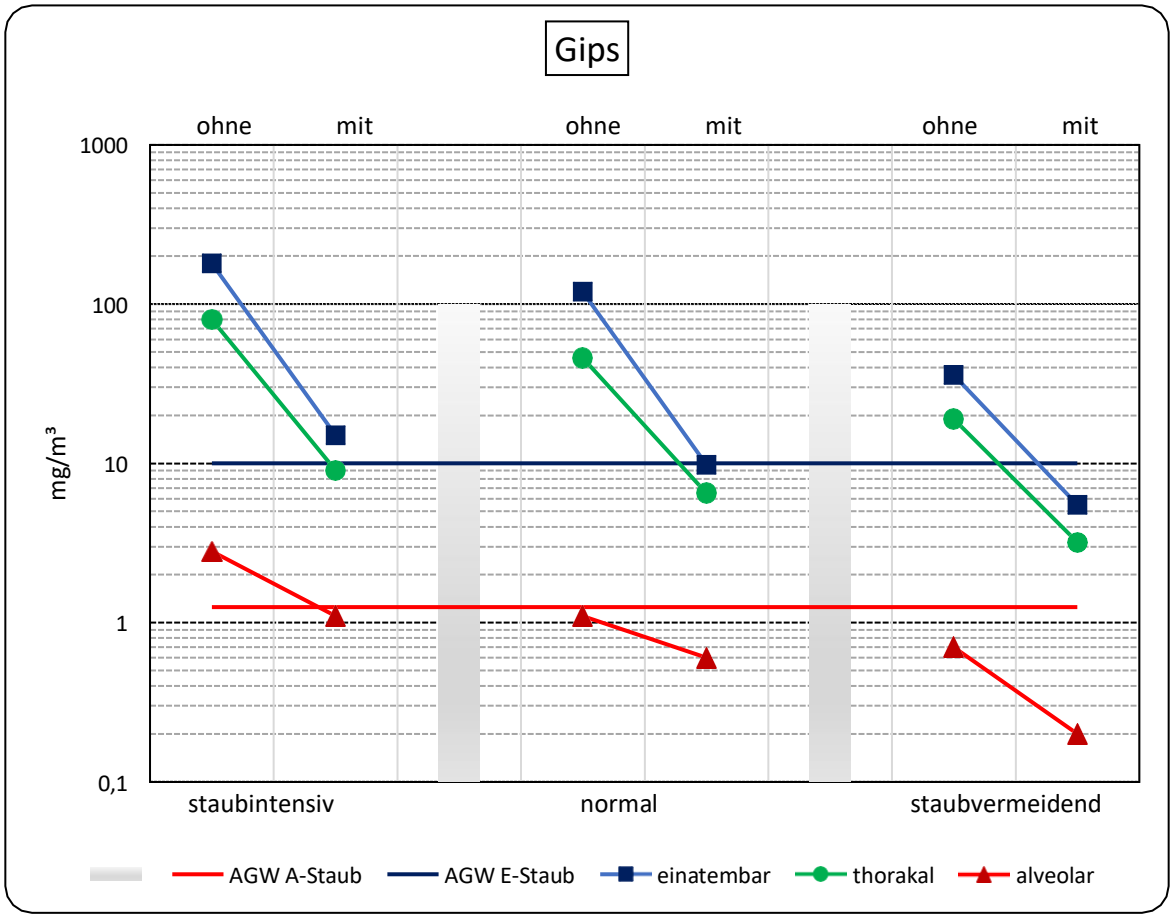


Abbildung 14 (Messwerte Gips)

Fraktion	Minderbefund in %		
	intensiv	normal	vermeidend
einatembar	90	90	80
thorakal	85	85	80
alveolar	60	45	70

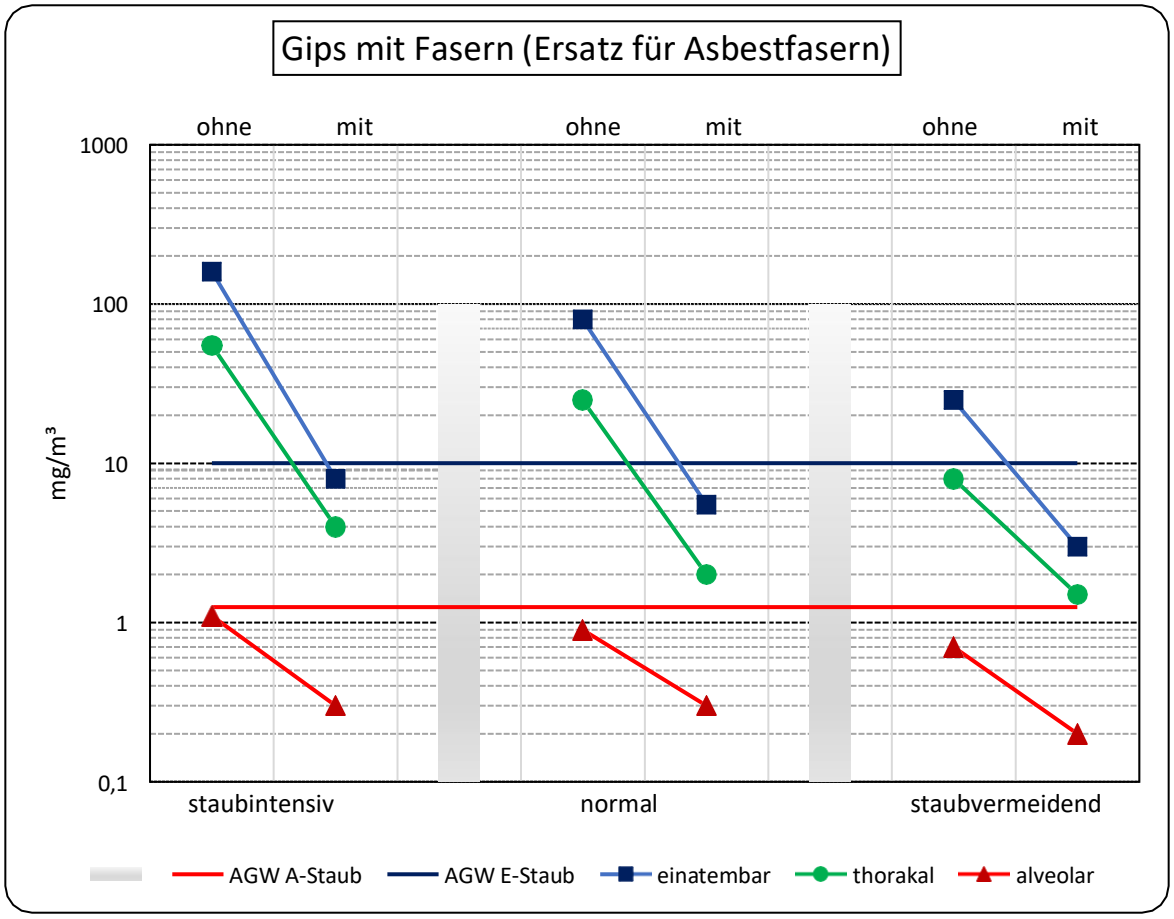


Abbildung 15 (Messwerte Gips mit Fasern (Ersatz für Asbestfasern))

Fraktion	Minderbefund in %		
	intensiv	normal	vermeidend
einatembar	95	90	85
thorakal	90	90	80
alveolar	70	65	70

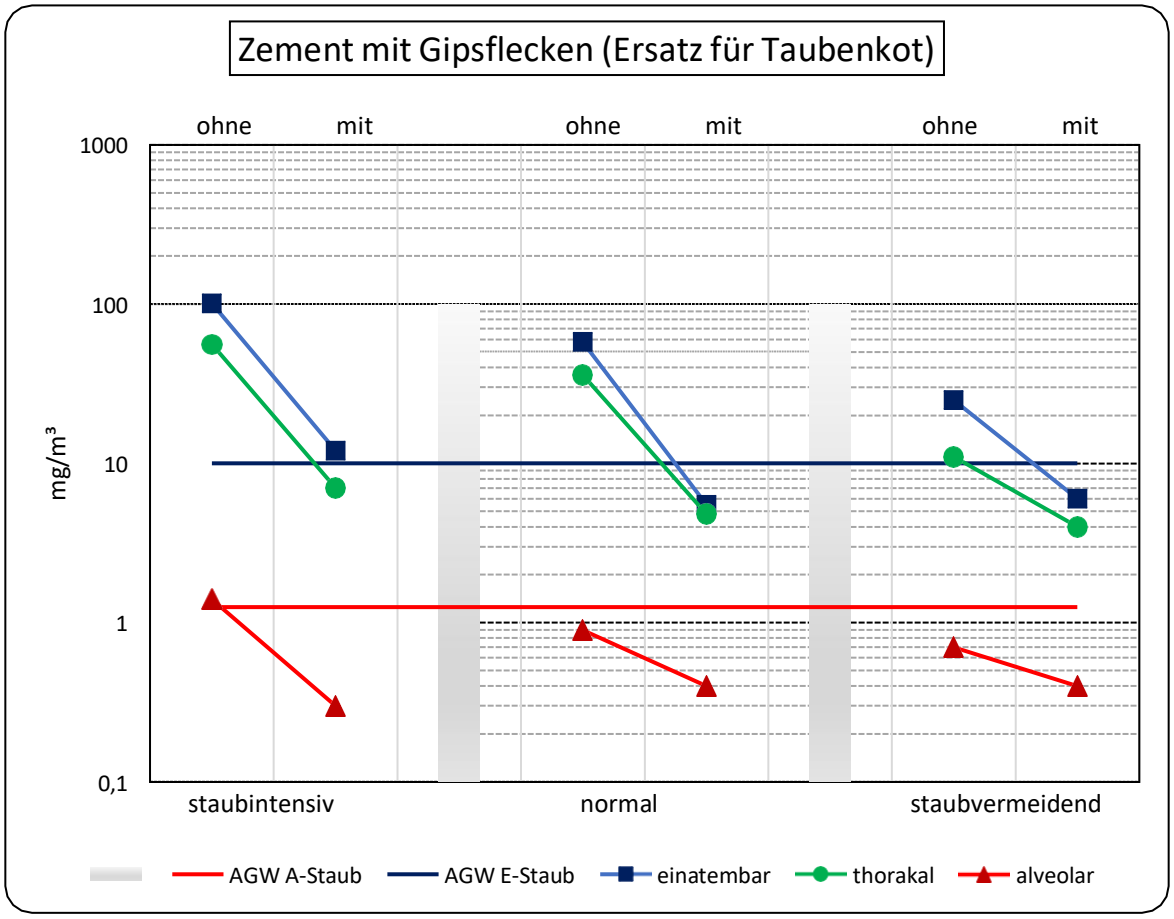


Abbildung 16 (Messwerte Zement mit Gipsflecken (Ersatz für Taubenkot))

Fraktion	Minderbefund in %		
	intensiv	normal	vermeidend
einatembar	85	90	75
thorakal	85	85	60
alveolar	75	55	40

1 Zusammenfassung mit Bewertung

Die Prevent Tec GmbH, Management & Trade for innovative fire protection, Heilbronn, beauftragte das Institut für Gefahrstoff-Forschung, IGF, mit Untersuchungen des Staubbindemittels „DUST SAFE“.

Aufgabenstellung war eine Wirksamkeitsuntersuchung bei der Verwendung von „DUST SAFE“ unter realen Rahmenbedingungen.

Bei „DUST SAFE“ handelt es sich um eine pastenähnliche, lockere Masse, die auf eine Staubfläche aufgetragen, die Exposition von Staub beim Zusammenkehren minimieren soll. Da als möglicher Anwendungsbereich primär Baustellen in Betracht kommen, wurden die Untersuchungen im Arbeitsplatz-Simulations-Prüfstand des IGF im Technikum Dortmund durchgeführt.

Bei den Untersuchungen mit den anschließenden Bewertungen handelte es sich nicht um Gefahrstoffmessungen nach TRGS 402 „Ermitteln und Beurteilen der Gefährdungen bei Tätigkeiten mit Gefahrstoffen: Inhalative Exposition“. Vielmehr soll die Aussage getroffen werden, liegen signifikante Expositionsminimierungserfolge vor oder nicht.

Im Arbeitsplatz-Simulations-Prüfstand wurde ein Untersuchungsraum mit den Abmaßen B x H x L, 3,0 m x 2,3 m x 6,0 m, eingerichtet. Innerhalb dieses Raumes wurde eine konstante Luftgeschwindigkeit von ca. 0,24 m/s in Längsrichtung eingestellt, so dass definiert zwischen Reinluft, Expositionsort und exponierter Luft unterschieden werden konnte. Beim verwendeten Messgerät handelte es sich um ein GRIMM Mini Laser Aerosol Spectrometer, Model 11R, welches sich stationär für alle Versuche im Bereich der exponierten Luft befand.

Das GRIMM Mini Laser Aerosol Spectrometer, Model 11R, misst die Konzentrationen von einatembaren, thorakalen und alveolaren Staub als Masse/m³ im 6 Sekunden Takt, was eine direkte Beurteilung zum zur Zeit geltenden Allgemeinen Staubgrenzwert zulässt.

Um eine Vergleichbarkeit der verschiedenen Materialien untereinander zu ermöglichen wurden alle Versuche nach dem gleichen vorgegebenen Arbeitsablauf durchgeführt. Im wesentlichem sind hier die unterschiedlichen Tätigkeiten:

- Staubintensives Kehren
- normales Kehren
- staubvermeidendes Kehren

zu nennen. Weiterhin wurde festgelegt, dass zwischen den einzelnen Arbeitsschritten mindestens eine Pause von 5 Minutendauer liegt, so dass alle Tätigkeiten klar voneinander unterschieden werden konnten.

Als grundsätzliches Ergebnis der Untersuchungen konnte festgestellt werden, dass die Verwendung des Staubbindemittels „DUST SAFE“ eine signifikante staubexpositionsmindernde Wirkung nachweist. In allen Versuchen aller Produkte, wurde eine deutliche Wirkung erzielt, es wurden Minderungsniveaus im Mittel zwischen 70 % und 90%).

Nach Auffassung des IGF gilt diese Wirkung für alle üblicherweise in Baustellen auftretenden Stäube. Ob die Staubexpositionsminderung bei Verwendung von „DUST SAFE“ immer ausreichend ist, die Staubkonzentration unter den zur Zeit geltenden Allgemeinen Staubgrenzwert zu drücken, kann an dieser Stelle nicht beurteilt werden aber dem Grundsatz der anzustrebenden Expositionsminderung ist definitiv Rechnung getragen.

Berichtserstellung

Institut für Gefahrstoff-Forschung (IGF) der Berufsgenossenschaft Rohstoffe und chemische Industrie (BG RCI)

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Our sign: A-303712-18-Bi
Contact person: Herr Bien

Gelsenkirchen, day 01.10.2018

"Dust-Safe®" Dust Remover and Binding Agent
here: occupational health assessment and environmental test in accordance with DWA-A 716-1 "General requirements for binding agents"

Your order from 06.09.2018; Mr. Joachim Baumann

Ladies and Gentlemen

with v.g. In a letter you commissioned us with the occupational health assessment and environmental testing and assessment of the binding agent with the designation "Dust-Safe®".

The assessment made was based on the announcement by the Federal Minister for the Environment, Nature Conservation and Nuclear Safety dated March 12, 1990 (GMBl No. 18 p. 335), the supplement to the v.g. Notice of June 16, 1998 (GMBl No. 15 p. 312) as well as the general "General requirements for oil and chemical binding agents" in accordance with worksheet DWA-A 716-1 of the German Association for Water Management, Wastewater and Waste e.V. from July 2011, taking into account general principles of environmental hygiene and toxicology.

These regulations mean that, in addition to occupational health issues, the specialist departments named in the Joint Ministerial Gazette must check whether the binders placed on the market are suitable for use from an "environmental" point of view.

The "environmental" suitability test is carried out according to the parameter specifications for landfill classes I and II, which are in the appendix of the currently valid version of the Landfill Ordinance (DepV) with the issue date of 27.04.2009 (BGBI I p. 900), which was last amended by Article 2 of the ordinance of September 27, 2017 (Federal Law Gazette I p. 3465) are listed. Binding agents of types I, II and IV or "W" must meet the classification criteria for landfill class I and binding agents of type III or "R" for binding agents of type III or "R" those of landfill class II of the above-mentioned ordinance pH value range between 4.0 and 11.0 must be guaranteed (cf.
Requirements for oil binders: LTwS no. 27, June 1999, Appendix 6 or general requirements for oil and chemical binding agents: DWA-A 716-1, July 2011, chap. 4.3).

1. Occupational medical assessment of the oil binder

The basic substance of the binder to be examined is kieselguhr embedded in polyacrylate (see attached scanning electron microscopic assessment of the sample in accordance with DIN ISO 22309:2015-11 in Annex 2), which is used to absorb liquids and as a dust removal agent should. According to the manufacturer, fragrances, oils, disinfectants and food colorings were added as additives to ensure a disinfecting effect and to reduce odors, the exact composition and origin of which were disclosed for the present assessment.

In a suspension of the material with a 0.01% calcium chloride solution (pH determination according to DIN ISO 10390), the binder reacts neutrally (pH value = 6.70) and is therefore in a range that is suitable for possible skin or Eye contact according to Annex 1, Part 3, Chapters 3.2 and 3.3 of the "CLP Regulation" for the classification and labeling of substances, mixtures and products (Regulation (EC) 1272/2008) should not cause any irritation. With further dilution with water up to a solids/water ratio of 10g/l, the pH value shifts beyond the neutralization point into a very weakly alkaline range (pH value = 7.7). In this respect, for any dilution, the statement that the binder examined here can basically be regarded as “skin-friendly” is correct.

A fines fraction for the respirable fine dust fraction that could be determined with the help of a sieve analysis (cf. Appendix 1, b) could not be detected. Accordingly, it can be assumed that there is no relevant inhalative hazard for the user, even if the binding agent is applied to large areas, e.g. indoors.

In our opinion, due to the swelling capacity of the binding agent, the risk of swallowing can also be ruled out, since the material forms a puncture-resistant mass when it comes into contact with moisture, which would create an immediate barrier if attempted to ingest it.

With regard to the issuance of the occupational health clearance certificate, it can be stated that based on the tests carried out and the information available to us, there are no overall objections to the use of the "Dust-Safe®" binding agent for absorbing liquids.

1. Environmental assessment

As can be seen from the analysis results recorded in the attached Appendix 1 in comparison to the limit values of the DepV, the product presented here, which was sent to us on September 7th, 2018, is characterized by increased proportions of organic compounds. The leaching filtrate obtained based on DIN 38414 Part 4 (due to the high water content of the original substance and due to the additional water absorption capacity, an increase in the water content was necessary) shows a concentration value for the "organic carbon (DOC)" parameter that is above the allocation criteria moved for landfill classes I and II. In our opinion, the levels of dissolved organic carbon in the eluate are based on the
above-mentioned product additives. All other parameters examined can be classified as unremarkable within the scope of the orienting declaration analyzes that were carried out.

Due to v.g. Strictly speaking, the product on hand here does not meet the "environmental" requirements that would have to be made specifically of oil binders used to combat oil on roads or bodies of water, and should therefore not be used as an oil binder. Due to the intended area of application of "Dust-Safe®" as a dust removal and binding agent, e.g. for absorbing organic liquids, we believe that the underlying environmental hygiene requirements are met. In our opinion, there are also no objections to disposing of the binding agent used to absorb natural organic liquids with conventional household waste.

Yours sincerely, The director of the institute i.A.

Dipl.-Environmental Science Sebastian Bien
Deputy Head of Department for Waste Water, Soil and Air Hygiene

Attachments: 3 attachments with a total of 3 pages.

Binder "Dust-Safe®"

Processing period: 07.09.2018 bis 01.10.2018
HY Book code: A2018-21903 *(Solidf)* and 21904 *(Eluat)*

a) Substance analysis
DIN ISO 10390:2005-12

pH-Wert = 6,70

c) Sieve analysis
DIN EN ISO 17892-4:2017-04*

Fraction [µm]	Results [Gew.-%]
< 20	< 0,1
20 – 63	< 0,1
63 - 125	< 0,1
125 – 200	< 0,1
200 – 630	< 0,1
630 - 2000	4,0
> 2000	96,0

b) Analysis (Weigh in = 10,2 g / l) ***DIN EN 12457-4:2003-01***

Parameters			Binder "DustSafe®"	Limits according to regulation	
				Type I, II und IV / „W"	Type III / „R"
pH-Value			7,7	4 - 11	4 - 11
Org. Carbon	C	mg/l	257	≤ 50	≤ 80
Phenols		mg/l	< 0,01	≤ 0,2	≤ 50
Arsenic	As	mg/l	< 0,001	≤ 0,2	≤ 0,2
Lead	Pb	mg/l	< 0,001	≤ 0,2	≤ 1
Cadmium	Cd	mg/l	< 0,0001	≤ 0,05	≤ 0,1
Copper	Cu	mg/l	0,012	≤ 1	≤ 5
Nickel	Ni	mg/l	< 0,001	≤ 0,2	≤ 1
Mercury	Hg	mg/l	< 0,00001	≤ 0,005	≤ 0,02
Zinc	Zn	mg/l	0,010	≤ 2	≤ 5
Fluoride	F^-	mg/l	< 0,05	≤ 5	≤ 15
Cyanide, lfr.	CN^-	mg/l	< 0,01	≤ 0,1	≤ 0,5
Vapor test residue		mg/l	100	≤ 3000	≤ 6000
Barium	Ba	mg/l	< 0,005	≤ 5	≤ 10
Chrome	Cr ges.	mg/l	< 0,001	≤ 0,3	≤ 1
Molybdenum	Mo	mg/l	0,001	≤ 0,3	≤ 1
Antimony	Sb	mg/l	< 0,001	≤ 0,03	≤ 0,07
Selenium	Se	mg/l	< 0,001	≤ 0,03	≤ 0,05
Chloride	Cl^-	mg/l	< 5,0	≤ 1500	≤ 1500
Sulfate	SO_4	mg/l	< 5,0	≤ 2000	≤ 2000
Electrical conductivity		µS/cm	60	–	–
Dry residue original sample		%	9,81	–	–

*d) Energy dispersive X-ray Spectroscopy REM/EDX DIN ISO 22309:2015-11**

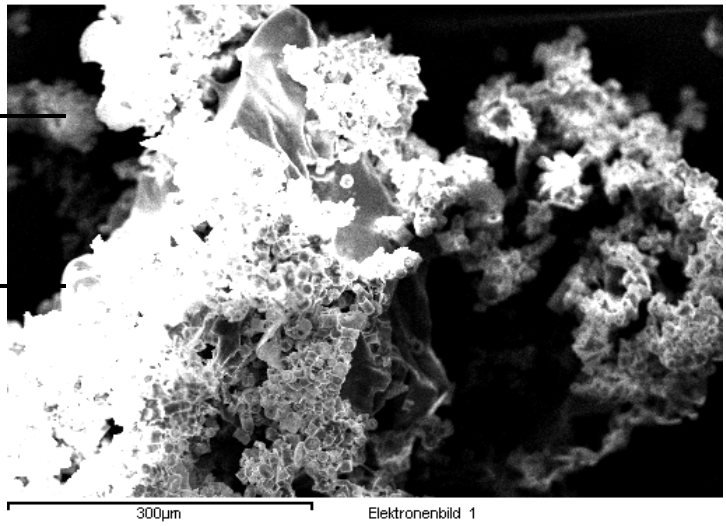
Sample: A2018-21903
Binder „**DUST SAFE“** from 07.09.2018

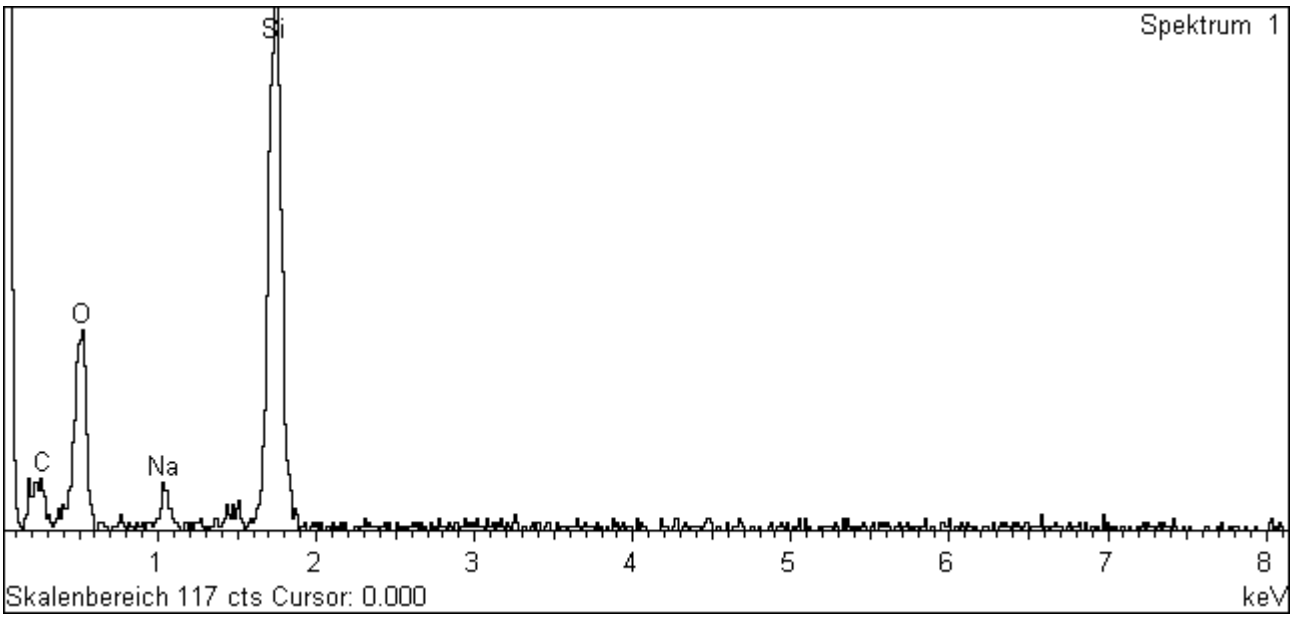
Spectrum proccessing:
No peak omitted

Proccssing option : Oxygen by stoichiometry (normalized)
Number of iterations = 2

Default:
Na Albite 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM

Element	Mass%	Atom%	Komp.%	Formula
Na K	4.13	3.61	5.57	Na2O
Si K	44.14	31.53	94.43	SiO2
O	51.73	64.86		
In total	100.00			





Accredited analysis methods (eluate analysis)

Parameters	Methode
pH-Value	DIN EN ISO 10523 (2012-04)
DOC	DIN EN 1484 (H 3) (1997-08)
Total phenol	DIN EN ISO 14402 (1999-12) / DIN 38409-16 (1984-06)
Arsenic	DIN EN ISO 17294-2 (2005-02)
Lead	DIN EN ISO 17294-2 (2005-02)
Cadmium	DIN EN ISO 17294-2 (2005-02)
Copper	DIN EN ISO 17294-2 (2005-02)
Nickel	DIN EN ISO 17294-2 (2005-02)
Mercury	DIN EN ISO 12846 (2012-08)
Zinc	DIN EN ISO 17294-2 (2005-02)
Fluoride	DIN EN ISO 10304-1 (2009-07)
Cyanide, easily releasable	DIN EN ISO 14403-2 (2012-10)
Water soluble, percentage (evaporation residue)	DIN 38409-H 1 (1987-01)
Barium	DIN EN ISO 17294-2 (2005-02)
Chrome, sat.	DIN EN ISO 17294-2 (2005-02)
Molybdenum	DIN EN ISO 17294-2 (2005-02)
Antimony	DIN EN ISO 17294-2 (2005-02)
Selenium	DIN EN ISO 17294-2 (2005-02)
Chloride	DIN EN ISO 10304-1 (2009-07)
Sulfate	DIN EN ISO 10304-1 (2009-07)
Electrical coductivity	DIN EN 27888 (1993-11)
Dry residue	DIN EN 12879 (S 3a) (2001-02)