Scaffold Public Documents - **SPD10**

Innovative strategies, methods and tools for occupational risks management of manufactured nanomaterials (MNMs) in the construction industry

RESULTS OF APPLICATION OF THE STOFFENMANAGER NANO-TOOL IN THE CONSTRUCTION WORK AREA

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1. EXECUTIVE SUMMARY

The aim of this task was to test the applicability/usefulness of the control banding (CB)-approach, more specifically the freely available control banding tool Stoffenmanager Nano 1.0, in assessing and managing risks of nanomaterials in the construction sector. The results of the selected CB-approach were compared with the expert judgement of scientists from the Finnish Institute of Occupational Health (FIOH). The expert evaluation was based on contextual information of the products and tasks, visual observations and screening measurements at the workplace.

The risk assessment by using the CB-approach and the expert evaluation was carried out in three companies in Finland and in two cases in Spain. The tasks performed by the Finnish companies related to application of a coating (floors, walls, HVAC products etc.). Both companies were visited two times between November 2013 and April 2014. The third Finnish company was manufacturing paints. This company was visited in March 2014. Two of the exposure scenarios were from pilot scale sites in Spain, which were visited by experts from Tecnalia, who also made exposure measurements. FIOH added the information of the pilot cases into the Stoffenmanager Nano tool and carried out the risk level assessment.

The results of the task indicate that the Stoffenmanager Nanotool is applicable in some of the studied industrial workplaces. However, in some cases it is concluded that Stoffenmanager Nano is not applicable, because there was in fact no evidence that the raw material contained engineered nanoparticles (ENP). Thus, the hazard assessment was the most difficult part, because it was difficult to identify the nanomaterial from the products. In some cases, the company thought that they were using nanomaterials in the product, but during the project it was found out that it did not contain nanomaterial, but nanotechnology was used in producing the product. MSDSs of the products do often not give any details (hazardous properties, size or shape) about the nanocomponents and the concentration of the nanomaterial in the product is unclear. In this project, the products were not characterized, and if needed, information was requested from the manufacturer.

In the studied cases, the selection of the source domain in the Stoffenmanager Nano tool was clear and easy. However, there could be more explanations and examples on the handling process e.g. example descriptions of work, and amounts of used product in the task and activities domain. In some cases, the duration and the frequency of the work was difficult to interpret, because the work shift varied according to workday and season. This kind of variation is rather common at construction sites. However, the situation is the same for every risk assessment tool.

The Stoffenmanager Nano tool gives quite similar results in every case. One reason for that is that all the nanomaterials are classified in one of the hazard classes C (high), D (very high), or E (extremely high). Even though the possible exposure is low, the risk priority level may be the highest one, if the substance belongs to the worst hazard class. However, we should keep in mind that the outcomes of the tool is not risk levels, but risk priority levels, meaning that in these cases one should be very careful with the substances and check that the control measures are working properly and the best practices are applied at the workplace.

One main advantage of using Stoffenmanager Nano tool is that the company and the workers have to study the MSDS or get other information about the used product and also consider how they are handling it. Often this has already a positive reaction to the work practices and attitude at the workplace. However, the risk assessment using only the Stoffenmanager Nano is not enough at the construction site, where the work environment is rather complicated, there are high numbers of different activities taking place at the same time, and the amounts of chemicals used are often substantial. The risk assessment should include also other activities and chemicals for example with the help of experts or the generic Stoffenmanager or other available CB-tool.

2. OBJECTIVES AND SCOPE

The aim of this task was to test the applicability/usefulness of Stoffenmanager Nano 1.0 in the construction sector. This study brings information on potential risks, which should be of interest for the employers at the workplaces handling nanomaterials, and also important feedback to the developers of different applications based on the Control banding approach.

3. INTRODUCTION

The construction sector is a rather complicated work environment as high numbers of different activities are taking place at the same time, the amounts of materials are high, and a lot of different emission sources are present at the same time. Also the use of nanomaterials and nanotechnology is becoming more common at workplaces in the construction sector. Nanoproducts for construction purposes have been developed for cement, wet mortar and concrete, paints, coatings, insulation materials, glass and infra-structural materials. They can be used on their own or in combination with other materials. Nanotechnology creates possibilities to produce materials with novel functionalities and improved characteristics such as higher durability, weigh reduction, fire resistance, thermal stability, transfer, self-cleaning and photocatalytic properties.

The SCAFFOLD project is focusing on the possible exposure to nanomaterials during the whole lifecycle of construction products. One aim in the project is to develop a risk management tool for the construction sector to help companies to manage with the possible risks of using nanomaterials. The tool is partly based on the Control Banding (CB) –approach. There are some tools already available (Brouwer D et al 2012), but they have not been developed for the construction sector, which is a rather different kind of work environment compared to e.g. the chemical industry. In this task, the usefulness of the Stoffenmanager Nano Module 1.0 tool was tested for the needs in the construction sector. The Stoffenmanager Nano tool was selected, because it is freely, easily available and in English. It has been developed for the industrial workplaces and it has the most detailed exposure evaluation, compared to other tools.

The Stoffenmanager Nano Module 1.0 tool has been developed for all types of synthesized nanoparticles and –fibres and also for their agglomerated or aggregated forms. The tool is applicable, if the particles are intentionally produced or manufactured, primary particles are less than 100 nm and their surface area is larger than 60 m^2/g. The particles should not be water soluble. At the moment, the Stoffenmanager Nano tool is aimed to be a tier one level tool for prioritising risk at the workplace. However, later it could be developed to a quantitative risk assessment tool (Van Duuren-Stuurman, Vink et al. 2012). Stoffenmanager Nano is based on the determination of hazard and exposure through various parameters. For each answer a score is given. These scores ultimately result in a certain hazard band (A-E) and in a certain exposure band (1-4) as described in Table 1. The combination of these bands determines the overall risk priority (1-3) (Table 1).

Stoffenmanager Nano assesses the hazard level of the nanomaterial by evaluating physico-chemical properties such as solubility, shape and size. Selected nanomaterials have been already categorized to hazard bands according to the toxicological properties of parent (bulk) compound and the studied toxicological properties of nanomaterial. The last categorization is based on primary particle size of the nanomaterial. Also unknown nanomaterial can be added to the tool.

Stoffenmanager Nano assesses respiratory exposure in occupational environment in detail. The exposure probability is evaluated based on the process information such as description of the source of the nanoparticles (source domain), description of the handling process, size of the working space, maintenance schedule, duration and frequency of the handling, distance of workers to the emission source, the product type, concentration, dustiness or moisture content, viscosity, and control measures like personal protective equipment and ventilation.(Van Duuren-Stuurman, Vink et al. 2012)

Table 1. Bands used in the Stoffenmanager Nano Module 1.0. Adopted from Duuren-Stuurman et al., 2011.

Hazard band / Exposure band	A	B	C	D	E
1	3	3	3	2	1
2	3	3	2	2	1
3	3	2	2	1	1
4	2	1	1	1	1

Hazard band: A= lowest hazard, E= highest hazard. Exposure band: 1=lowest exposure, 4=highest exposure. Overall result: 1= highest priority, 3= lowest priority

The Stoffenmanager Nanomodule assesses the risk priority through the hazard and exposure classes. So, even though all the possible control measures have been applied, the risk priority may be the highest priority, if the used product/chemical belongs to the highest hazard class, meaning that a very careful attitude to safe work is important.

4. METHODOLOGY

Three different workplaces were visited in Finland. Two of them used spraying techniques to coat surfaces on either floor or wall with a protective coating material and one to coat components for Heating, Ventilation and Air Conditioning (HVAC)systems. The third company produced paints. Different activities, e.g. unloading pigment and producing paint, were studied in the paint factory.

We included two cases from Spain, where the exposure scenarios were studied by Tecnalia. FIOH made risk priority assessments with the Stoffenmanager Nano tool and the results were included in the comparison of the Control Banding approach and air measurements of particles (Scaffold D 3.3).The studied workplaces are presented in the Table 2.

The workplaces were visited by the occupational hygiene experts, who gathered all the contextual information of the used products, tasks and work environment. In all workplaces also screening measurements were made. Expert assessments of the risk level at the workplaces were based on this information.

The same expert who visited the workplace also filled the Stoffenmanager Nanomodule together with representatives of the company (in some cases). Finally, the expert assessment and the risk priority levels from the Stoffenmanager Nanomodule were compared.

Table 2. The workplaces which were included into the Scaffold study

Company	Case	Industrial sector	Task	Number of similarly exposed workers	Used or/and suspected nanomaterial
1	**1 and 2**	**building completion and finishing**	**coating of wall and floor**	**2-4**	**polymer**
2	**3 and 4**	**manufacture of plastic products**	**coating of air terminal devices**	**1**	**polymer**
3	**5**	**manufacture of paints, varnishes, similar coatings, printing inks and mastics**	**unloading pigment, manufacturing paint**	**2**	**metal oxides**
pilot scale	**6**	**building completion and finishing**	**spraying of depollutant material**	**1**	**TiO_2**
lab scale	**7**	**manufacture of paints, varnishes, similar coatings, printing inks and mastics**	**manufacturing depollutant material**	**1**	**TiO_2**

4.1 Description of the studied workplaces and the tasks/activities

Case 1: A company using protective material for coating wall.

The company used a protective material for the coating of the walls of an apartment house. The Material Safety Data Sheet (MSDS) was found (the date of the MSDS was 13042012) from the web pages of the marketing company. The product contained fluorated acryl-copolymers with silane and it was water based. Afterwards, it was found out that nanotechnology was used to produce the product, but there might in fact not be any nanosized particles in the end-product. The product contained also 1-3 % of the substance 1-ethylpyrrolidine-2-one, which has been classified as harmful (Eye dam. 1 H318, Repr. 2, H361) according the MSDS.

In the case 1, two to four workers applied the coatings at the workplace. The product was spread to the wall by using a low pressure spraying bottle or with a roller. One worker used the spraying bottle and the other one used the roller for spreading out the coating at the wall. Two other workers washed the walls before coating. The work was done outdoors, and the tasks took about 30 to 60 minutes. The amount of the used protective material was 10 to 12 dm^3. At the workplace, there were many other emission sources, like diesel exhaust emissions from fork lift and dust from sawing wood and drilling concrete during the measurements and coating. Also background concentration from urban air was present. The workers used filter respirators (FFP2), protective gloves, work clothing with long sleeves, safety googles and helmet. In this company, this kind of coating activity can be done outdoors or indoors. The coating activities can vary from ten minutes to six hours per day, depending on the size and requirements of the coating project. In summertime (ten weeks) the frequency of the work is five days per week in this company.

Case 2: The same company as in case 1; using protective material for the coating of the floor of a public building.

The used products were a combination of two different protective materials. A mixture was spread on the floor with a high pressure spraying gun. After drying, another mixture of protective material was spread by mopping. The MSDSs were available (date 11092012). Both products were water-based and contained fluorated acryl-copolymers with silane. During the project it turned out that the products were made by the application of nanotechnology, but the end-products may not contain any nanosized particles. The products contain also other hazardous chemicals like 1-5 % 3-butoxy-2-propanol, which can irritate the eyes and skin (Eye irrit. H319, Skin irrit. H315) and 1-5% trietoxy(2,4,4-trimethylpentyl)silan, which is flammable and harmful for the environment (H226, H412).

In the case 2, there were four workers at the site. At first, the floor was washed. After washing, the floor was coated with the mixture of two different protective materials by using the spraying gun and later by mopping. The used amount of protective material was 20 ml/m^2. The worker who used the spraying gun wore a power assisted respirator with the face shield(assigned protection factor (APF) is 20) and chemical protective gloves. The other workers used filter respirators and gloves. The work was done indoors.

Cases 3 and 4: A company using sol-gel technique for coating o fair terminal devices.

The company was using sol-gel technology to apply nanocoating on air terminal devices, such as air valves and diffusers. Based on the MSDS the product used had the following hazard classification: H226, H315, H312, and H332. According to the manufacturer, the product does not contain nanoparticles (diameter between 1 -100 nm). However, the product contains other hazardous substances such as solvents.

The sol-gel product was sprayed on the air terminal devices. In the case 3, one worker was applying coating by air gun spraying. The spraying process was proceeded in a well-ventilated spraying booth. After the spraying, the products were transferred into the drying oven. The worker used a half mask type respiratory protective equipment (APF = 20) and cut protective gloves (EN 388 cut level 3).

In the case 4, the similar process was fully automatized in the enclosed and ventilated process line. The role of the operator was to monitor and control the process as well as upload the products to the process line. In this case, the operator did not wear any personal protective devices.

Case 5: A company manufacturing paints

Three activities (unloading of pigment and producing paints A and B) of the paint company were included to the study.

I. Unloading of pigment was done directly from the lorries by using long pipe (16 700 kg of talc) or from the big bags (two bags of 1000 kg of zinc oxide). The MSDSs and Technical Data Sheets of the materials were available. None of the documents mentioned nanosized particles. In talc, 10% of the particles were less than 1 µm (diameter of the particle). In the case of the zinc oxide, the characterization included surface area (BET 3.5-6.7 m^2/g) and MESH number (No. 325 = sieve size 44 µm), but not the actual particle size. One person was following the unloading processes, which lasted about one hour per sack. Starting and finishing the unloading were the dustiest activities. The unloading station was cleaned by vacuum cleaner during the day.

II. Paint A contained eight different powders, some of them were added by hand and some from the closed piping system. The MSDS and Technical Data Sheets were available, but there were not much information about the potential nanosized particles. According to the documents, some powders contained particles less than 1 µm (Bentone), the d50 was 0.7 µm ($BaSO_4$) or 45% of the powder were particles less than 2 µm (talc). Meaning, that none of the powders contained nanoparticles at a concentration higher than 50%. The manufacturing activity (adding all the powders into the paint mixture) took about one to two hours. Two workers were making the paint and they produced three different batches during the work shift. They were using filter respirators (P3), safety googles, and protective clothing.

III. Paint B contained only two dry powders, all the other substances were liquids. One of the powders was added by hand (burnt lime, d50 7 µm) and the other by using the closed system (talc, 23% of the particles were < 2µm). This activity took only 15 minutes. Two workers were working at the same time and they made three or four batches in the work shift. They were using filter respirators (P3), safety googles and protective clothing.

Case 6: Spraying self-cleaning coating sol-gel (Tecnalia)

This task was done outdoors. There were two different coatings which were applied on the wall. The coating sol-gel contained 1.7% of nanosized TiO_2, which primary particle size was 21 nm. The standard spraying gun was used in the coating activity and the task took 20 minutes with one material. The worker used PPE (FFP3, gloves). (Scaffold Deliverable D3.3 - Exposure Measurement Data at Lab-Scale)

Case 7-: Manufacturing depollutant mortar (Tecnalia)

Manufacturing depollutant mortar took place at an industrial site. There were three tasks: weighing of additive, adding additives to the hopper and bagging final product. The mortar contained 0.4% of nanosized TiO_2, which primary particle size was 21 nm. All these tasks took about 5 to 10 minutes per material. Amount of handled materials was at the kilogram range. There was natural ventilation at the site. One person was working at time, and the worker used PPEs (FFP3, gloves). (Scaffold D3.3 - Exposure Measurement Data at Lab-Scale)

5. RESULTS

All the results containing the expert evaluation, the outcome of the Stoffenmanager Nanotool and also the results obtained when using the generic Stoffenmanager tool are presented in the Table 11.

5.1 Case 1

In the case 1, the ground level outside walls of an apartment house was coated. There were two workers making the coating. Coating was done with a roller or with a low pressure spraying bottle, which did not make any visible aerosol.

Expert evaluation:

In worker´s exposure evaluation the aerosol concentration measurements from the worker breathing zone showed high variation during the coating work, typically between 5500 – 100000 #/cm3. Also few higher, separate short-term peak concentrations were observed. The source for these aerosol concentrations could not be identified, because similar concentrations and variability was measured from the far field measurement point at the same time. Hence the major source for these aerosol concentrations was most likely urban air.

The exposure level in these tasks according to the measurements was low, even though no technical control measures were used. The used product was based on water, so it did not evaporate easily. Also the used working practices do not form visible aerosol. The hazard of the suspected nanomaterial was assessed as average, because the suspected nanomaterial was a polymer, which is not a reactive material by itself. However, the product contained a chemical which suspected to be harmful for the reproductivity. However, the portion of this chemical is small (less than 3 %). This makes the hazard class of the product high. The respiratory exposure is likely low in the task, but dermal exposure is possible. Therefore, the use of personal protection equipment (PPE) is highly recommended, especially long sleeves and chemical protective gloves. The use of PPE is also recommended as the use of engineered control measures is not possible, while the work is done outdoors and always in different locations.

Our evaluation of the risk level was that it is low for the suspected nanomaterials (polymers) in the product, because the expected respiratory exposure level was low. However, the risk level related to using the protective product as such was high, due to the other hazardous compound in the product.

Stoffenmanager Nanotool:

It was not sure, if the used product contains engineered nanoparticles (polymer), so the situation was not fully within the scope of the application of the Stoffenmanager Nano 1.0. In spite of this fact, we wanted to test the usage of the tool because it might be unclear for downstream users also whether the product contains nanoparticles or not.

For the task in the case 1, the Stoffenmanager Nano classified hazard as very high (D) for the task as we assumed that coating product contained nanosized polymer. The task weighted exposure was considered as average, when the time and frequency of activity is taken into

account the exposure class was considered low. Risk score was average in the case 1 (Table 3).The risk priority level was assessed higher by using the Stoffenmanager Nano- tool than the expert judgement. However, the other hazardous chemicals have to be taken into account also, meaning that the expert judgement for risk level is high. The generic Stoffenmanager was used for risk assessment of that chemical. The risk score was high by using Stoffenmanager (Table 4).

Table 3. Risk assessment by using the Stoffenmanager Nano tool in the case 1

General data		
product		Case 1
nanoparticle		fluorated acryl-copolymers with silan
concentration of the nanoparticle in the product		Substantial (10-50%)
name risk assessment		Spraying 26092013
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	D	D
exposure class	2	1
risk score	II	II
Question		**Question**
entered data		Spraying or dispersion of a ready-to-use nanoproduct
source domain		Ready-to-use-product
Appearance		Particles dispersed in a liquid
product dustiness		-
product moisture content		-
dilution		Undiluted
viscosity		Liquids with low viscosity (like water)
fibers		No
fiber size		No
Hazardous properties		Unknown
nanoparticle type		Polymers
Number of employees that can be exposed		3
Production or usage volume		1000
Start date of product work period		10/1/2009 12:00:00 AM
End date of product work period		-
Actualisation date		-
task		Handling of liquids using low pressure, low speed with large or medium quantities.
duration of the task		4 to 8 hours a day
frequency of the task		2 to 3 days a week
task in the breathing zone		Yes
Multiple employees		Yes
regular cleaning of the working room		No
regular inspections and maintenance		Yes
control measures at the source		No control measures at the source
segregation of the employee		No general ventilation
protection of the employee		Filter mask P2 (FFP2)

Table 4. Risk assessment by using the generic Stoffenmanager in the case 1

Basic information	
Product	Protective product
Location/Department	Coating company
Product set	Stoffenmanager
Name risk assessment	Coating
Result risk assessment	
Hazard class	D
Exposure class	3 (0,0204)
Risk score	I
Working conditions	
H-phrases	H318: Causes serious eye damage H361: Suspected of damaging fertility or the unborn child (state specific effect if known)(state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
Dilution of the product (as % of product)*	100% product, no water
Vapour pressure product (Pa)	2300 Pa 20° C
Activity	Handling of liquids using low pressure, low speed or on medium-sized surfaces.
Duration of the task	4 to 8 hours a day
Frequency of the task	2-3 days a week
Regular cleaning of work area	No
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	Yes
Evaporation, drying or curing after activity	No
Volume of the working room	Handling outdoors
Ventilation working room	General ventilation (open windows and doors)
Control measures at the source	No control measures at the source
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Half mask respirator with filter/cartridge (gas cartridge)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

5.2 Case 2

The other coating process was carried out in an indoor environment in two phases. The first task was high-pressure spraying and the second task was mopping of the sprayed surface.

Expert evaluation:

During the coating work the aerosol concentration increased significantly during the spraying task. The number concentration of particles in the worker´s breathing zone was three times the background concentration and the mass concentration 30 times the background concentration. During the spraying, the particles spread through the hall. The mopping task on the other hand did not cause noticeable differences in aerosol concentrations between breathing zone and background.

According to the measurements, the exposure level during spraying was high and during mopping low. The products were same in both activities. The hazard class of the products was low according to the MSDS. However, the risk level in the tasks was assessed to be high during spraying and low during mopping due to increased numbers of airborne particles. The worker is recommended to use PPE, but also the location should be ventilated during and after the task.

Stoffenmanager Nanotool:

It was not sure if the used product contained engineered nanoparticles (polymer), so the situation was not fully within the scope of the application of the Stoffenmanager Nano 1.0. In spite of this fact, we wanted to test the usage of the tool because it might be unclear for downstream users also whether the products contain nanoparticles or not.

For the tasks in the case 2, the Stoffenmanager Nano classified hazards of the used products as very high (D) when it was assumed that the product contains nanosized polymer. The exposure was considered as high both in task weighted and time and frequency weighted exposure in the spraying task. Risk score was high for the coating the floor by spraying (Table 5). The exposure class was average in the mopping task. Risk score was average in coating the floor by mopping (Table 6).

The Stoffenmanager Nano tool gave similar results as the expert evaluation for the spraying task. For the mopping task, the exposure and risk priority classes obtained by Stoffenmanager Nano were higher than the expert judgement.

Table 5. Risk assessment of the spraying task by using the Stoffenmanager Nano tool in the case 2

General data		
product		Case 2
nano particle		fluorated acryl-copolymers with silan
concentration of the nanoparticle in the product		Substantial (10-50%)
name risk assessment		Coating the floor by spraying
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	D	D
exposure class	3	3
risk score	I	I
Question		**Question**
entered data		Spraying or dispersion of a ready-to-use nanoproduct
source domain		Ready-to-use-product
Appearance		Particles dispersed in a liquid
product dustiness		-
product moisture content		-
dilution		Undiluted
viscosity		Liquids with low viscosity (like water)
fibers		No
fiber size		No
Hazardous properties		Unknown
nanoparticle type		Polymers
Number of employees that can be exposed		4
Production or usage volume		-
Start date of product work period		4/1/2009 12:00:00 AM
End date of product work period		-
Actualisation date		-
task		Handling of liquids at high pressure resulting in substantial generation of visible mist or spray/haze
duration of the task		4 to 8 hours a day
frequency of the task		2 to 3 days a week
task in the breathing zone		Yes
Multiple employees		No
regular cleaning of the working room		Yes
regular inspections and maintenance		Yes
control measures at the source		No control measures at the source
segregation of the employee		Mechanical and or natural ventilation
protection of the employee		Half/full face powered air respirator TMP3 (particulate cartridge)

Table 6. Risk assessment of the mopping task by using the Stoffenmanager Nano tool in the case 2

General data		
product		Case 2
nano particle		fluorated acryl-copolymers with silan
concentration of the nanoparticle in the product		Substantial (10-50%)
name risk assessment		Coating floor by mopping
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	D	D
exposure class	2	2
risk score	II	II
Question		**Question**
entered data		Spraying or dispersion of a ready-to-use nanoproduct
source domain		Ready-to-use-product
Appearance		Particles dispersed in a liquid
product dustiness		-
product moisture content		-
dilution		Undiluted
viscosity		Liquids with low viscosity (like water)
fibers		No
fiber size		No
Hazardous properties		Unknown
nanoparticle type		Polymers
Number of employees that can be exposed		4
Production or usage volume		-
Start date of product work period		4/1/2009 12:00:00 AM
End date of product work period		-
Actualisation date		-
task		Handling of liquids using low pressure, low speed with large or medium quantities.
duration of the task		4 to 8 hours a day
frequency of the task		2 to 3 days a week
task in the breathing zone		Yes
Multiple employees		No
regular cleaning of the working room		Yes
regular inspections and maintenance		Yes
control measures at the source		No control measures at the source
segregation of the employee		Mechanical and or natural ventilation
protection of the employee		Filter mask P3 (FFP3)

5.3 Case 3 and 4

The company was using sol-gel nano-coating. According to the supplier's technical information "sol-gel technology combines different materials on a molecular level to create true nanocomposite structures". Based on that information the user might end up to assess risks emerging from the engineered nanoparticles.

Expert evaluation:

After the discussion with the manufacturer of the sol-gel product it was clear that the product does not contain nanoparticles. Although the product did not contain nanoparticles it was unclear whether nanosized particles are formed during the spraying operation or not.

In case 3: Manual spraying in the paint shop, exposure to the spraying aerosol was low, mainly due to the fact that the coating process was performed in the separate spraying booth having

good ventilation (capture velocity 0,25 – 0,7 m/s) and the spray gun operator was wearing a half-mask respirator (A2P3 filter). Nanoparticle concentrations measured from the breathing zone of the worker (DiscMini) showed only the occasional short peaks of nanosized particles which exceeded background concentration and can be associated to the production process.

In case 4: Automated coating line, exposure to nanosized particles were most of the time at the same level as the background concentration. Very few peaks of nanoparticles were observed in the breathing zone of the line operator.

Based on both measurement and observations done during the visit, the possibility to have exposure was considered low and the risk caused by engineered nanoparticles was low in both cases.

Stoffenmanager Nanotool:

The used product did not contain engineered nanoparticles and the situation was not within the scope of the application of the Stoffenmanager Nano 1.0. In spite of the fact, we wanted to test the usage of the tool because it might be unclear for downstream users whether the products contain nanoparticles or not. We tested Stoffenmanager Nano 1.0 with the hazard class assumption based on the MSDS hazard classification of the whole product (H332 → Hazard class B) and with the assumption that the hazard class of the nanomaterial is unknown (Hazard class D).It was not surprise that the result of the risk assessment was highly dependent on the hazard class chosen (B - average or D – very high). The exposure class was in both cases the same (class 2 -average). Depending on the hazard class the risk priority was either III (low) or II (average) (Tables 7 and 8). The expert evaluation came to a conclusion of low risk level at the tasks, because of good engineered control measures.

Table 7. Risk assessment by using the Stoffenmanager Nano tool in the case 3

General data		
product		Case 3
nanoparticle		polymer
concentration of the nanoparticle in the product		Small (1-10%)
name risk assessment		Spraying booth
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	B	B
exposure class	2	2
risk score	III	III
Question		**Question**
entered data		Spraying or dispersion of a ready-to-use nanoproduct
source domain		Ready-to-use-product
Appearance		Particles dispersed in a liquid
product dustiness		-
product moisture content		-
dilution		Undiluted
viscosity		Liquids with low viscosity (like water)
fibers		No
fiber size		No
Hazardous properties		Harmful and/or irritating
nanoparticle type		Polymers
Number of employees that can be exposed		3
Production or usage volume		200
Start date of product work period		11/12/2009 12:00:00 AM
End date of product work period		-
Actualisation date		-
task		Handling of liquids at high pressure resulting in substantial generation of visible mist or spray/haze
duration of the task		4 to 8 hours a day
frequency of the task		4 to 5 days a week
task in the breathing zone		Yes
Multiple employees		No
regular cleaning of the working room		Yes
regular inspections and maintenance		Yes
control measures at the source		Local exhaust ventilation
segregation of the employee		Spraying booth
protection of the employee		Half mask respirator with filter, type P2L

Table 8. Risk assessment by using the Stoffenmanager Nano tool in the case 4

General data		
product		Case 4
nanoparticle		polymer
concentration of the nanoparticle in the product		Small (1-10%)
name risk assessment		Automated coating line
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	B	B
exposure class	2	2
risk score	III	III
Question		**Question**
entered data		Spraying or dispersion of a ready-to-use nanoproduct
source domain		Ready-to-use-product
Appearance		Particles dispersed in a liquid
product dustiness		-
product moisture content		-
dilution		Undiluted
viscosity		Liquids with low viscosity (like water)
fibers		No
fiber size		No
Hazardous properties		Harmful and/or irritating
nanoparticle type		Polymers
Number of employees that can be exposed		3
Production or usage volume		200
Start date of product work period		11/12/2009 12:00:00 AM
End date of product work period		-
Actualisation date		-
task		Handling of liquids at high pressure resulting in substantial generation of visible mist or spray/haze
duration of the task		2 to 4 hours a day
frequency of the task		4 to 5 days a week
task in the breathing zone		No
Multiple employees		Yes
regular cleaning of the working room		Yes
regular inspections and maintenance		Yes
control measures at the source		Containment of the source with local exhaust ventilation
segregation of the employee		Mechanical and or natural ventilation
protection of the employee		None

5.4 Case 5

Expert evaluation:

In the unloading of pigment, the air measurement showed that there was a slight increase in the number of particles during the unloading. However, the increase of particles was much higher when the door was open and outdoor air reached the room. During unloading, the average of the particle concentrations was at the same level as the Finnish Target Level and the Nano Reference Value (NRV)for engineered nanoparticles (ENP) e.g. TiO_2(FIOH 2013, SER 2012, IFA 2014).This level is 40 000 particles/cm^3 (8 hour TWA). If the background was taken into account, the level of particles was lower than the Target level. However, agglomerated particles of zinc oxide, TiO2 and talc were found from the TEM pictures.

The measurements showed an increase in the number of particles in the air during the manufacturing of paint A. The duration of one mixture was about one hour. During the workday, the exposure level was estimated to be at the same level as the Target Level and NRV for ENPs (40 000 #/cm^3).

According to measurements, the size of the particles which came from manufacturing paint B (adding pigments and powders into the paint mixture) was over 300 nm (measuring point 3). The concentration of nanoparticles did not vary between the tasks. The duration of adding the powder was very short, only 15 minutes per mixture.

In all these cases the expert judgement was that the exposure level was low when the whole day time weighted exposure was considered.

The hazard level related to these tasks was average. Some of the chemicals are quite safe to use, and there was no information about hazardous properties or nanoparticles of these chemicals in the MSDS and Technical information Sheets. However, it should be kept in mind, that some of the powders used for these types of products may be hazardous, such as quartz, which was used in the factory the day before this evaluation.

Based on the considerations on the exposure and hazard levels, the risk level was evaluated as average. The working site was applied with local ventilation and the workers used filter respirators when manufacturing paints A and B. The worker located at the unloading site was only occasionally at the site, which decreased the risk level in the task.

The generic Stoffenmanager (See the Appendix 1):

The Stoffenmanager Nano was not used in case 5, because the source domain of nanopowders was not suitable in this case. The primary particle size of the used powder should be smaller than 100 nm and a specific surface area of the particle greater than 60 m^2/g. These criteria were not fulfilled. So, the risk assessment was performed by using the generic Stoffenmanager. In the risk assessment, the hazard classes of raw materials were low, except in the case of quartz. The exposure classes for the different tasks were high or very high, because of large amounts of raw material, which were used in the tasks. The risk priority level was low in most of the tasks. In the task where quartz was used, the risk priority level was high.

5.5 Case 6 and 7

Expert evaluation:

The measured level of exposure was higher than the NRV in the spraying activity and at the level of NRVs in manufacturing. The spraying activity took 15 minutes and the manufacturing (including activities of weighing, adding and bagging) took about 60 minutes. There was high increase of particles in the range 10 nm to 10 µm during spraying. Also during adding the additives the concentration of particles increased. The mass concentration of TiO_2 was at the

level of the recommended OEL for TiO_2, which is 0.1 mg/m^3 (8 hour TWA) (presented in Scaffold Public Document SPD7). The exposure to agglomerated nanomaterial was found to be average. The hazard class of nanosized TiO_2 was assumed to be average, because of the primary particle size. When we assume that the task will last whole workday, the risk level would be average according to the fact that the level of measured TiO_2 was at the same level as the proposed OEL (Scaffold SPD7). However, in this pilot case, the total exposure time lasted only a couple of hours, meaning that the time-weighted average during the whole working day was clearly below the suggested OEL.

Stoffenmanager Nanotool

The cases 6 and 7 were pilot scale tasks, and therefore a lot of assumptions related to the exposure and conditions were made. However, the product properties were well identified. In both cases nanosized TiO_2 were used. The primary particle size was 21 nm. The hazard band of the nanoparticle in Stoffenmanager Nano is dependent on the primary size of the particle. The cutting point is 50 nm. In this case, the primary particle size is less than 50 nm and brings the used nanomaterials to the hazard band D. The concentration of the nanomaterial in the product was from 0.4 to 1.7%. In the spraying case, the nanomaterial was dispersed in the liquid and the product was like water. The nanomaterial was solid in the manufacturing of the depollutant mortar. The adding the additive was the dustiest task in the manufacturing mortar and this task was used in the risk assessment by using Stoffenmanager Nano tool.

The source domain was clear in both cases, and also the handling process was found from the list. The work was done near the breathing zone of the worker. During the spraying, no engineering controls were used, as the work was done outdoors. The worker used PPEs (respirator filter of FFP3 and gloves). In the manufacturing case, local ventilation was used in bagging, otherwise the natural ventilation was the only engineered control. The worker used PPEs (respirator filter of FFP3 and gloves). In these pilot cases, only one person was doing the task.

The hazard class was nearly the same (very high - average), but the exposure class was lower according to the Stoffenmanager Nanotool than based on expert judgement, in the case of spraying (Tables 9 and 10). The outcome of the Stoffenmanager Nano tool is depending on which kind of process handling (task) has been selected, how many workers are exposure and the frequency and duration of the task. In this case, the number of workers might have affected the class of exposure, which was assessed low in these cases.

Table 9. Risk assessment by using the Stoffenmanager Nano tool in the case 6

General data		
product		Case 6
nanoparticle		nano TiO2
concentration of the nanoparticle in the product		2
name risk assessment		T_Spraying self-cleaning coating sol gel
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	D	D
exposure class	1	1
risk score	II	II
Question		**Question**
entered data		Spraying or dispersion of a ready-to-use nanoproduct
source domain		Ready-to-use-product
Appearance		Particles dispersed in a liquid
product dustiness		-
product moisture content		-
dilution		Undiluted
viscosity		Liquids with low viscosity (like water)
fibers		No
fiber size		No
Hazardous properties		Unknown
nanoparticle type		TiO2 (Titanium dioxide)
Number of employees that can be exposed		1
Production or usage volume		-
Start date of product work period		-
End date of product work period		-
Actualisation date		-
task		Handling of liquids at high pressure resulting in substantial generation of visible mist or spray/haze
duration of the task		2 to 4 hours a day
frequency of the task		4 to 5 days a week
task in the breathing zone		Yes
Multiple employees		No
regular cleaning of the working room		No
regular inspections and maintenance		Yes
control measures at the source		No control measures at the source
segregation of the employee		No general ventilation
protection of the employee		Filter mask P3 (FFP3)

Table 10. Risk assessment by using the Stoffenmanager Nano tool in the case 7

General data		
product		Case 7
nanoparticle		nano TiO2
concentration of the nanoparticle in the product		1
name risk assessment		T-Manufacturing Depollutant mortar
Result risk assessment		
	task weighted	**time and frequency weighted**
hazard class	D	D
exposure class	2	1
risk score	II	II
Question		**Question**
entered data		Handling of bulk aggregated/agglomerated nanopowders
source domain		-
Appearance		Powder
product dustiness		Unknown
product moisture content		5 – 10 % moisture content
dilution		-
viscosity		-
fibers		No
fiber size		No
Hazardous properties		Unknown
nanoparticle type		TiO2 (Titanium dioxide)
Number of employees that can be exposed		1
Production or usage volume		-
Start date of product work period		-
End date of product work period		-
Actualisation date		-
task		Handling of products with medium speed or force, which leads to some dispersion of dust.
duration of the task		2 to 4 hours a day
frequency of the task		4 to 5 days a week
task in the breathing zone		Yes
Multiple employees		Yes
regular cleaning of the working room		No
regular inspections and maintenance		Yes
control measures at the source		Local exhaust ventilation
segregation of the employee		Mechanical and or natural ventilation
protection of the employee		Filter mask P3 (FFP3)

5.6 Conclusions of using the Stoffenmanager Nano tool

Editing product information

In Stoffenmanager Nano module 1.0 you have to insert the product information into the product database. Normally, this information is gathered from the MSDS, product's technical information data sheet etc. However, often the MSDS does not contain any information about possible nanoparticles in the product. Information needed to identify the nano component in the product is missing. So, it is quite difficult for the person carrying out the risk assessment to know if a product contains nanoparticles or not. It would thus be helpful, if it was mandatory to notify in the MSDS whether the product contains nanomaterial.

Does the product contain nanoparticles?

In most of the studied cases, the MSDSs of the products used were available. However, they did not contain any information about nanomaterials. This information was gathered from the manufacturer. In four out of six cases, it turned out that there was no nanomaterial in the product, even though the employers thought that they were using “nanoproduct” and thus the product might contain nanomaterial. In these cases, we wanted to use Stoffenmanager Nano tool, because this is the situation at the workplaces – you are not sure whether the product contain the nanomaterial or not.

In the case 5, it was assumed that the raw materials used for the production of the paints cannot be handled as nanopowders. The MSDS and Technical Sheets contained information about the particle size, and the amount of particles less than 1 or 2 µm was below 50%. According to the EU definition of nanomaterial, it was concluded that the raw material cannot be considered as a nanomaterial. Also the criteria of using Stoffenmanager Nano tool for nanopowders is that primary particle size should be between 1 to 100 nm and the surface area of the particle should be over 60 g/m3. These criteria were not fulfilled in the case 5.

There were two cases from Spain, where it was clear that the product contained nanomaterial.

What is the hazard of the nanomaterial?

If it is assumed that the product contains e.g. functionalized polymer nanoparticles, then one must decide what the potential inhalation hazard is. If you use hazard classes indicated for the whole product (e.g. H332 – Harmful if inhaled), you end up in the hazard band B. If you use the inhalation hazard “unknown” for the nanomaterial, you end up in the hazard band D. This is one big question related to the weaknesses of the Stoffenmanager Nanotool, where almost all the nanomaterials end up in the hazard classes D or E. However, the new version of the Stoffenmanager Nanotool, which is currently under development, is likely to contain more detailed criteria for hazard classification.

Performing inhalation risk assessment

In the studied cases, it was easy to choose the source domain (e.g. Spraying or dispersion of ready-to-use nanoproduct) and the handling/process task (e.g. Handling of liquids at high pressure resulting in substantial generation of visible mist or spray/haze). The choices for the source domain and the handling/process were well suited for the coating tasks. Frequency and duration of handling needed assumptions, because the activities varied a lot during workday and month/season. The cases differed from each other in the volume of working area, used local control measures, the number of workers and in the protection of worker. For example, in case 3, the spraying operation was performed in a separate paint shop and a well-ventilated spraying booth was used. The worker was using a half mask respirator. In the case 4, the enclosed, ventilated and automatized coating line was installed within a larger industrial hall equipped with mechanical ventilation. The description of these characteristics was easily made with Stoffenmanager Nano.

Result of the risk assessment

It is not a surprise that the result of the risk assessment is highly dependent on the hazard class (B – average, C – high or D – very high). For example in cases, where the exposure class is the

same (class 2 -average), the risk priority will be either III (low) or II (average), depending on the hazard class chosen.

Exposure to other chemicals

In the cases, where other hazardous chemicals were applied into the product, the chemical risk assessment was performed also with the generic Stoffenmanager tool. In the cases 3 and 4, the ordinary Stoffenmanager was used both for inhalation and skin exposure, because the product was classified with H332 (respiratory) and H315 and H312 (skin). For the inhalation exposure, the hazard class was B (average). For exposure classes, the two studied cases differed. Stoffenmanager gave exposure class estimate 2 (average) for manual spraying in the paint shop and class 3 (high) for the automated coating line case (case 4).

In case 5 (paint factory), the risk assessment was done by using the generic Stoffenmanager (Appendix 1). The problem in the paint factory is that there are large numbers of raw materials in each paint and it is hard and time-consuming to add every raw material to the tool and make a risk assessment for every material separately. For this reason, it is recommended to select one or two chemicals based on the hazardous properties and according to the used amount for the risk assessment. With the outcome for the chosen chemicals it is possible to estimate the whole situation in the selected site. However, this problem can be solved by using the Stoffenmanager Premium version.

Table11. The comparison of the expert evaluation, risk priority assessment by using the Stoffenmanager Nano Module 1.0 or the generic Stoffenmanager5.5

Workplace		**Case 1**	**Case 2**	**Case 2**	**Case 3**	**Case 4**	**Case 5**	**Case 5**	**Case 5**	**Case 6**	**Case 7**
Activity		**spraying with low pressure**	**spraying with high pressure**	**spreading by mopping**	**spraying with high pressure**	**spraying with high pressure**	**unloading pigment**	**producing paint A**	**producing paint B**	**spraying**	**manufacturing**
Expert evaluation											
nanoparticles above background concentration		no	yes	no	some short peaks	very few	no	at the same level	yes, for particles >300	yes	yes
hazard level		high *	low	low	low	low	average **	average **	average **	average	average
exposure level		1	3	1	1	1	1	1	1	2	2
risk level		high *	high	low	low	low	average	average	average	average	average
Stoffenmanager Nano 1.0 -tool											
nanomaterial		polymer?	polymer?	polymer?	?	?	no nanopowder	no nanopowder	no nanopowder	**TiO_2**	**TiO_2**
source domain		easy to find	easy to find	easy to find	easy to find	easy to find	not applicable	not applicable	not applicable	easy to find	easy to find
hazard class	task	D	D	D	B	B				D	D
	time	D	D	D	B	B				D	D
exposure class	task	2	3	2	2	2				1	2
	time	1	3	2	2	2				1	1
risk priority level	task	II	I	II	III	III				II	II
	time	II	I	II	III	III				II	II
Stoffenmanager (for chemicals)											
hazard class		D			B	B	A	A	A		
exposure class		3			2	3	4	3	3		
risk priority level		I			III	II	II	III	III		
other chemical substance		1-ethylpyrrolidine-2-one	some solvents	some solvents	xylene, ethyl benzene, polyisocyanate	xylene, ethyl benzene, polyisocyanate	ZnO,SiO_2, talc	dry powders	dry powders		
		* the product contained also CRM-compound									
		** a lot of different kind of powders, from which some are very hazardous e.g. quartz									

Expert evaluation: hazard level according MSDS and other toxicological knowledge; exposure level according visual observations, screening measurements and control measures; risk level according expert evaluation.

6. CONCLUSIONS

In the construction sector, there are a number of products that are called nanoproduct, but in the end, they might not contain engineered nanomaterial at all. Although this kind of products is out of the application domain of the Stoffenmanager Nano tool, we wanted to test the applicability of the tool in the activities using those products. At the workplace you might not know whether the product contain nanomaterial. In order to be on the safe side, the Stoffenmanager Nanotool can be used in risk assessment if you suspect that the nanomaterials are used at the workplace.

Hazard assessment by using Stoffenmanager Nano was the hardest part, because it was difficult to identify whether the products contained nanomaterial or not. In some cases, the company had assumed that they are using nanomaterial-containing products, but it was found out during the project that the products did not contain nanosized components, but nanotechnology was used for the production of the product. MSDSs of the products do often not give any details (hazardous properties, size or shape) about the nanomaterials and the portion of the nanomaterial in the product is hard to know. In this project, the products were not characterized, and we asked for information from the manufacturer if it was needed.

The source domains were clearly presented in the Stoffenmanager Nano tool. However, in the tasks and activities there could be more explanations and examples in the handling process part, e.g. example descriptions of work, and amounts of used product. In some cases, the duration and the frequency of the work was difficult to interpret, because the work shift varied according to workday and season. This kind of variation is rather common at construction sites. However, this problem is the same for every risk assessment tool.

The Stoffenmanager Nano tool gives quite similar results (risk level) in every case. One reason for that is that all nanomaterials are normally classified in classes C, D or E (most harmful substances). Even though the possible exposure is low, the risk priority level may be the highest one, if the substance belongs to the worst hazard class. However, we should keep in mind that the outcomes of the tool is not risk levels, but risk priority levels, meaning that in these cases one should be very careful with the substances and check that the control measures are working properly and the best practices are utilized at the workplace

One main advantage of using Stoffenmanager Nano tool is that the company and the workers have to study the MSDS or get other information about the used product and also consider how they are handling it. Often this has already a positive reaction to the work practices and attitude at the workplace. However, the risk assessment only with the Stoffenmanager Nano is not enough at the construction site, where the work environment is rather complicated, there are high numbers of different activities taking place at the same time, and the amounts of chemicals are often huge. The risk assessment should include also other activities and chemicals by using for example the help of experts or the generic Stoffenmanager or other available CB-tool.

7. REFERENCES

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8. LIST OF TABLES

9. LIST OF APPENDIXES

Appendix 1. Risk assessment in the paint factory by using the Stoffenmanager 5.5

hazard class (hc)		exposure class (ec)		risk priority (risk)	
A	low	1	low	III	low
B	average	2	average	II	average
C	high	3	high	I	high
D	very high	4	very high		
E	extreme				
-	n.a.				

Basic information	
Product	Gold Seal Zinc Oxide
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Unloading pigment ZnO
Result risk assessment	
Hazard class	A
Exposure class	4 (0,405)
Risk score	II
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of very large amounts of product
Duration of the task	0.5 to 2 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	No
Evaporation, drying or curing after activity	No
Volume of the working room	Volume under 100 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	Finntalc M15
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Unloading pigment talc
Result risk assessment	
Hazard class	A
Exposure class	4 (0,405)
Risk score	II
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of very large amounts of product
Duration of the task	0.5 to 2 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	No
Evaporation, drying or curing after activity	No
Volume of the working room	Volume under 100 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	Acematt OK 520
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Unloading pigment SiO2
Result risk assessment	
Hazard class	A
Exposure class	4 (0,405)
Risk score	II
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of very large amounts of product
Duration of the task	0.5 to 2 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	No
Evaporation, drying or curing after activity	No
Volume of the working room	Volume under 100 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	R660
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Production of paint A
Result risk assessment	
Hazard class	A
Exposure class	3 (0,117)
Risk score	III
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of products, where due to high pressure, speed or force large quantities of dust are generated and dispersed
Duration of the task	2 to 4 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	Yes
Evaporation, drying or curing after activity	No
Volume of the working room	Volume 100-1000 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	Polsperse
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Production paint A
Result risk assessment	
Hazard class	A
Exposure class	3 (0,117)
Risk score	III
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of products, where due to high pressure, speed or force large quantities of dust are generated and dispersed
Duration of the task	2 to 4 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	Yes
Evaporation, drying or curing after activity	No
Volume of the working room	Volume 100-1000 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	Finntalc M15
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Production of paint B
Result risk assessment	
Hazard class	A
Exposure class	3 (0,0585)
Risk score	III
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of products, where due to high pressure, speed or force large quantities of dust are generated and dispersed
Duration of the task	0.5 to 2 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	Yes
Evaporation, drying or curing after activity	No
Volume of the working room	Volume 100-1000 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	Nordkalk
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Production of paint B
Result risk assessment	
Hazard class	A
Exposure class	3 (0,1755)
Risk score	III
Working conditions	
H-phrases	
Dustiness product	Fine dust
Activity	Handling of very large amounts of product
Duration of the task	0.5 to 2 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	Yes
Evaporation, drying or curing after activity	No
Volume of the working room	Volume 100-1000 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	

Basic information	
Product	Quartz 200M
Location/Department	Paint factory
Product set	Stoffenmanager
Name risk assessment	Production of paint
Result risk assessment	
Hazard class	D
Exposure class	3 (0,1755)
Risk score	I
Working conditions	
H-phrases	H372: Causes damage to organs (state all organs affected, if known) through prolonged or repeated exposure (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard)
Dustiness product	Fine dust
Activity	Handling of very large amounts of product
Duration of the task	0.5 to 2 hours a day
Frequency of the task	4-5 days a week
Regular cleaning of work area	Yes
Regular inspection and maintenance	Yes
Activity in breathing zone	Yes
Multiple employees	Yes
Evaporation, drying or curing after activity	No
Volume of the working room	Volume 100-1000 m3
Ventilation working room	General ventilation (mechanical)
Control measures at the source	Local exhaust ventilation
Segregation of employee	The employee does not work in a cabin.
Protection of the employee	Filter mask P3 (FFP3)
Conclusion	
Control measures	▢ Control measures sufficient ▢ Control measures not sufficient ▢ Further investigation required
Responsible person	
Date risk assessment	