



RISK ASSESSMENT BY A SMALL COMPANY USING STOFFENMANAGER NANO.

1. Case metadata

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Netherlands

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13841E Elimination of hazards

24361C Good practice

40256C Nanoparticles

40271B Nanotechnology

29241B Chemical hazards

18161E Chemical safety

19641D Risk Assessment

2. Organisations involved

TNO, Quality and Safety, PO Box 360, 3700 AJ, Zeist, The Netherlands

3. Description of the case

3.1. Introduction

Companies in the Netherlands working with manufactured nano objects (MNO) are expected to limit the potential risks of these materials, thereby fulfilling the general obligations of the occupational health and safety act related to labour-risks. This means they need to include an estimation of risk for the manufactured nano object (MNO) in their risk inventory and evaluation. This stems from the emerging general concern in occupational risk assessment and management for exposure to MNOs. However, currently the assessment of possible health risks as a result of nano-particle exposure is associated with significant uncertainties.

The Dutch labour inspectorate advises on the use of a 'control-banding' strategy, which is an approach for dealing with limited information. Control-banding strategies offer simplified qualitative guidance to minimise risks for workers that can be an expedient solution to deal with the current uncertainties. This qualitative guidance is based on the combination of the hazard of a substance and the potential exposure in the situation (Zalk & Nelson, 2008). Presently, there are a limited number of control-banding tools regarding exposure to nanoparticles that are available, and that are suitable for a limited number of exposure scenarios (ANSES 2010; Genaidy et al., 2009; Höck et al., 2008;

Kristensen et al., 2010; Maynard, 2006; Wardak et al., 2008; Zalk et al., 2009). Recently, the well-known and scientifically sound Stoffenmanager control-banding tool has been extended with a nano-specific module.

The Stoffenmanager Nano control-banding tool was developed to assess and rank the human health risks from inhalation of nanoparticles in the workplace and where necessary, to introduce effective control measures. In order to select high priority scenarios, the Stoffenmanager Nano combines the available hazard information of a substance with a qualitative estimate of inhalation exposure.

MNOs are banded depending on their toxicity. The first question asked is if the MNO is water soluble; if it is, then the risk assessment continues as if the particle is not nano. If it is insoluble in water, the banding tool next looks at the persistence and structure of the MNO – asking specifically if it is a persistent nanofibre. The third step involves the assignment of a hazard band – persistent nanofibres are assigned to the highest hazard band E. Other MNOs are classified on their specific hazard characteristics in one of five bands. A list of the most widely used MNO is assigned to hazard bands according to current toxicological knowledge and expert judgment. This predefined list currently includes approximately twenty MNOs. Other MNOs not on the list are ranked according to their parent material and are excluded from the two lowest of the five hazard bands (A and B). This is depicted in the Figures 1 and 2 below.

Figure 1: Hazard banding of Stoffenmanager Nano

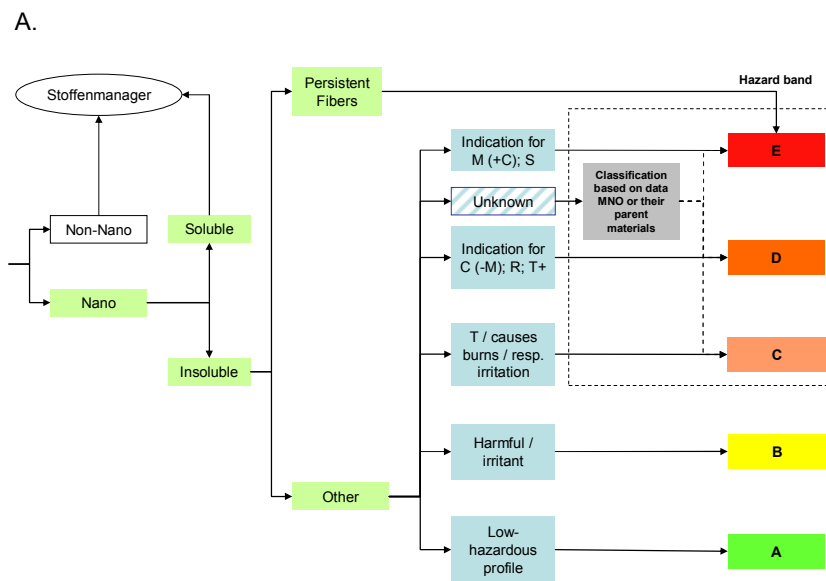
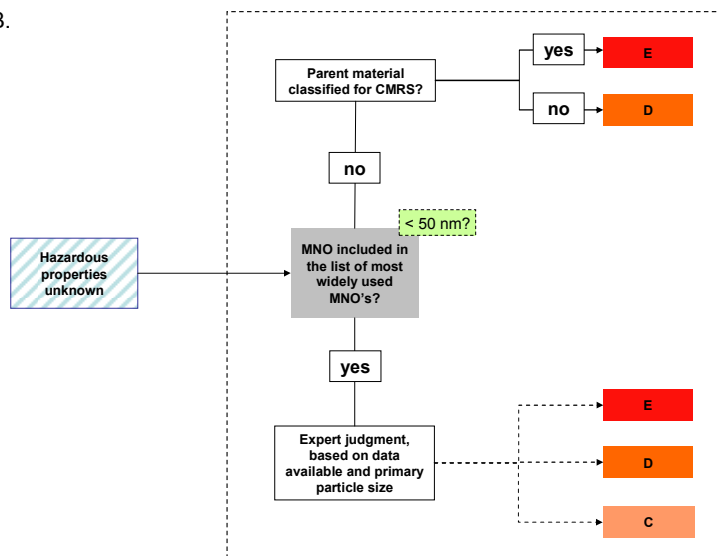


Figure 2:

B.



Exposures are categorised using specific parameters, such as the type of handling, the product, the work environment, and the amount of control. The output of the hazard banding and exposure categorisation is a risk ranking of high, moderate or low.

The combination of hazard (5 bands) and exposure (4 bands) into priority or risk bands for the Stoffenmanager Nano is presented in Figure 3.

Figure 3:

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

Priority bands in the Stoffenmanager. Hazard: A lowest hazard and E highest hazard. Exposure: 1 lowest exposure and 4 highest exposure. Overall result: 1 highest priority and 3 lowest priority.

This case describes the use of Stoffenmanager Nano by a small company handling nano containing products.

3.2. Aims

This case study describes the use of the control-banding tool, the Stoffenmanager Nano, by a small company. The use of this tool has a twofold goal: to develop a safe, risk management approach, and practice, when handling the nano containing products and to fulfil the obligations of the labour inspectorate.

3.3. *What was done, and how?*

The owner of a small company used Stoffenmanager Nano to assess the risks of nano containing products in his company.

The situation: A small company uses so-called 'ready to use' products and has to perform a risk assessment to ensure that there are low potential health risks for workers applying these products.

The company specialises in the maintenance of pleasure boats. The company uses several different products to maintain and repair various parts of mainly pleasure boats, e.g. polyester hulls or garden furniture, teak decks or other outdoor teak items etc.

The products are used about 10 times a year. The products are applied with a sponge for approximately half a day. When applying the products the worker always wears suitable gloves. Currently the product is only applied outside.

The safety data sheets of the products contain no information on the nano particles. From the product information sheets, it can be concluded the nano particles are dispersed in low concentrations in a liquid matrix. It is unknown which nano particles are included in the products. The product is a low viscous liquid.

The owner does not have a background in occupational hygiene. However, the web-based control-banding tool, Stoffenmanager Nano, offers guidance on how to perform the risk assessment. Operational quality of the tool is thus of major importance as the person performing the assessment lacks specific expertise in chemical risk assessment and risk management. This person should also have easily accessible and understandable information needed to use the Stoffenmanager Nano.

Stoffenmanager Nano can be used without knowing the identity of the MNO. However, in the current version this results in a high-risk score. Stoffenmanager advises the user to contact the supplier for information on the MNO. After an initial assessment by the small company, the supplier informed the owner that the products contain Titanium dioxide and silicon polymer nanoparticles (primary particle diameters are larger than 50 nm). This information was used in the risk assessment using Stoffenmanager nano.

The owner of the company used successfully the web-based tool without assistance by experts. The application of Stoffenmanager nano, in order to perform an assesment to ensure safe processes and products, was evaluated during interviews with various companies. Stoffenmanager Nano is an easy to access and easy to use programme. Some remarks for improvement are the following:

- information about the risks of nanomaterials is lacking;
- Stoffenmanager Nano does not request information about the shape, percentage of particles <100 nm, particle size distribution and agglomeration;
- Stoffenmanager nano is available in English but the drop out boxes are still in Dutch;
- to give guidance when an expert knowledge is needed.

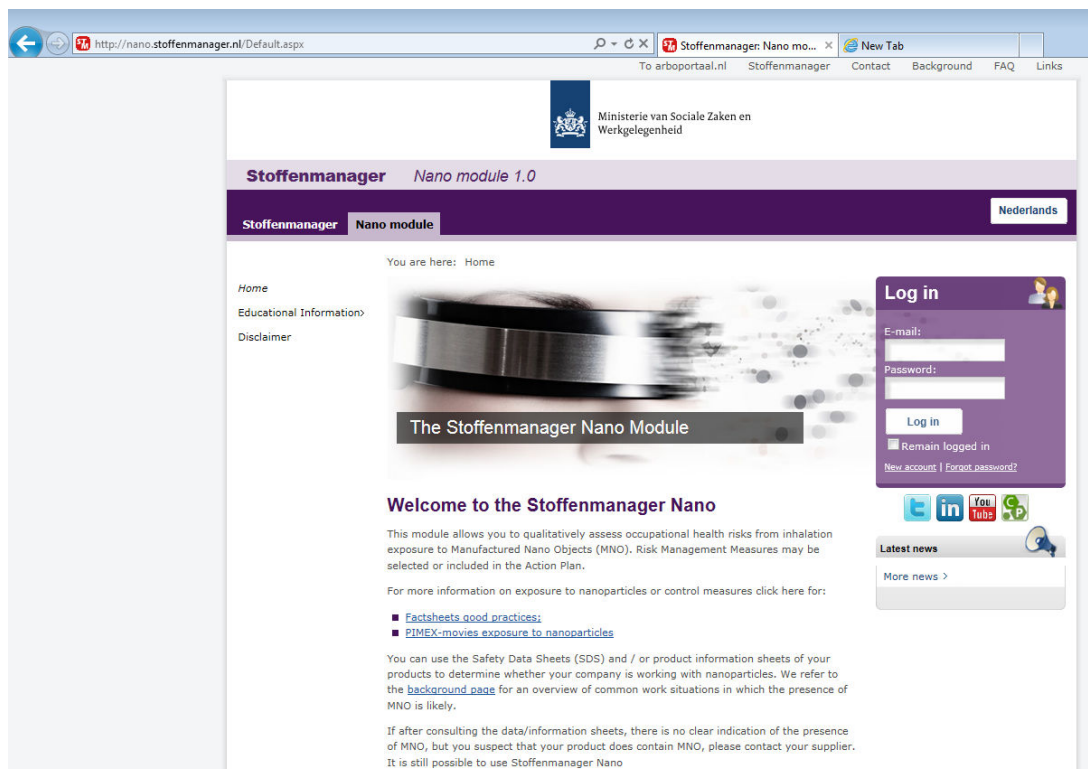
These remarks are taken into account to improve Stoffenmanager Nano which is an on-going process.

3.4. What was achieved?

The owner of a company using nano particles containing products has performed a risk assessment for the activities when handling the nano particles containing products. In principle no guidance is needed to use Stoffenmanager nano. Below the steps needed to be done for the risk assessment are described in a fictive case. First, the user has to go to the website of Stoffenmanager nano: www.nano.stoffenmanager.nl (see Figure 4). The user can choose the English or the Dutch version. After making the account and logging in, Stoffenmanager Nano could be used. Stoffenmanager nano provides a structured workflow and guides the user via step 1 to 6 to perform a risk assessment as follows:

- Step 1: general information (see Figure 5);
- Step 2: product characteristics (see Figure 6);
- Step 3: handling/transfer processes (see Figure 7);
- Step 4: working area (see Figure 8).;
- Step 5: local control measures and personal protective equipment (see Figure 9);
- Step 6: the risk assessment (see Figure 10);
- Finally, an overview of the risk assessment is presented by Stoffenmanager nano after saving and closing of step 6 (see Figure 11).

Figure 4: Website of Stoffenmanager nano



CASE STUDIES

Figure 5: Step 1 General

Create new risk assessment

+ Explanation

+ Step 1: General

i Name risk assessment: *

i Source domain: *

i Product type: *

+ Step 2: Product characteristics

+ Step 3: Handling / Process

+ Step 4: Working area

+ Step 5: Local control measures and personal protective equipment

+ Step 6: Risk assessment

Save Close

Figure 6: Step 2 Product characteristics

+ Step 1: General

+ Step 2: Product characteristics

i Product:

i Product name: *

i Supplier:

i Date PIS:

i Date MSDS:

i Product appearance: *

i Viscosity of the liquid: *

i Do you know the exact dilution of the product with water? ☐ Yes ☒ No

i Dilution with water:

i Nano Component:

i Name nano component: *

i Do you know the exact concentration of the nano component in the product? * ☐ Yes ☒ No

i Concentration: *

i Does the product contain fibers / fiber like particles? * ☐ Yes ☒ No

CASE STUDIES

Figure 7: Step 3 Handling/process

Create new risk assessment

+ Explanation

+ Step 1: General

+ Step 2: Product characteristics

+ Step 3: Handling / Process

i Characterize your task: • Werken met vloeistoffen op grote oppervlakken of grote werkstukken ▼

i Duration task: • 2 tot 4 uur per dag ▼

i Frequency task: • 1 dag per week ▼

i Is the task being carried out in the breathing zone of an employee (distance head-product <1 meter)? •
☒ Yes ☐ No

Please note: because you selected 'yes', the option 'the employee does not work in a cabin' was automatically selected at step 5. If however you do want to select a cabin, than select 'no' for this question.

i Is there more than one employee carrying out the same task simultaneously? •
☐ Yes ☒ No

+ Step 4: Working area

+ Step 5: Local control measures and personal protective equipment

+ Step 6: Risk assessment

Save Close

Figure 8: Step 4 Working area

Create new risk assessment

+ Explanation

+ Step 1: General

+ Step 2: Product characteristics

+ Step 3: Handling / Process

+ Step 4: Working area

i Is the working room being cleaned daily? •
☐ Yes ☒ No

i Are inspections and maintenance of machines/ancillary equipment being done at least monthly to ensure good condition and proper functioning and performance? •
☐ Yes ☒ No

i Volume of the working room: • Handeling wordt buiten uitgevoerd ▼

i Ventilation of the working room: • Geen ventilatiemaatregelen ▼

+ Step 5: Local control measures and personal protective equipment

+ Step 6: Risk assessment

Save Close

CASE STUDIES

Figure 9: Step 5 Local control measures and personal protective equipment

Create new risk assessment

+ Explanation

+ Step 1: General

+ Step 2: Product characteristics

+ Step 3: Handling / Process

+ Step 4: Working area

+ Step 5: Local control measures and personal protective equipment

Local control measures: •

Gebruik van product dat de emissie vermindert

Is the employee situated in a cabin? •

De werknemer bevindt zich niet in een cabine

Please note: because of your choice for 'yes' - the task is being carried out in the breathing zone' (step 3) the option 'the employee does not work in a cabin' was automatically selected at step 5. If however you do want to select a cabin, then return to 'is the task being carried out in the breathing zone' (step 3) and select 'no'.

Is personal protective equipment applied? •

Geen bescherming

+ Step 6: Risk assessment

Save

Close

Figure 10: Step 6 Risk assessment

Create new risk assessment

+ Explanation

+ Step 1: General

+ Step 2: Product characteristics

+ Step 3: Handling / Process

+ Step 4: Working area

+ Step 5: Local control measures and personal protective equipment

+ Step 6: Risk assessment

You have finished your risk assessment. A summary of the calculated exposure-hazard-class as well as the risk-score is shown. These scores are shown for the exposure during the task as well as a weighted score which takes the duration and frequency of the performed task into account. The exposure score during the task is a measure of expected exposure and the risk during the time the task is performed. In this case no time correction is taken into account for such tasks performed e.g. only for one hour a day or once a week. The 'weighted' score does take the frequency and duration of the task into account and gives an indication of the risk in the longer term. This will often result in a lower exposure score.

Product	Nano component	Hazard class	Time weighted exposure class	Time weighted risk score	Task weighted exposure class	Task weighted risk score
Compound X	coating X	D	1	II	1	II

Save

Close

CASE STUDIES

Figure 11: Overview (obtained after save and close)

The screenshot shows the 'Stoffenmanager Nano module 1.0' web application. The interface includes a navigation menu on the left with options like Home, Guide, My settings, Inhalation risk assessment, Basic information, Reports, Educational Information, and Disclaimer. The main content area is titled 'Inhalation risk assessment overview' and shows a table with one assessment entry. Below the table is a legend for hazard class (hc), exposure class (ec), and risk priority (risk).

Inhalation risk assessment overview

+ Explanation

New risk assessment

Name	Product	Nano component	hc	ec	risk
Test 1	Compound X	coating X	D	1	III

1

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

The owner of the company initially performed an assessment when the identities of the MNOs were not yet known. This resulted in a high-risk priority. Once the supplier identified the MNOs, the risk assessment of the current situation resulted in a low-priority risk.

When the owner iterated the assessment of the current situation with 'inside' instead of 'outside' as the location of the activities with the nano containing products, the risk priority could no longer be classified as low, unless the appropriate control measures were in place.

The conclusion from the assessment was that the application of the nano products needs to be performed outdoors and should not be transferred to the indoor facility without the appropriate control measures in place.

Overall, it can be concluded that the application of this easy and accessible tool gave the user insight into exposure and the required operational conditions and risk management measures that are required to manage the MNOs, thereby minimising potential health risks.

3.5. Success factors

The main success factors were:

- The Stoffenmanager nano tool is acceptable to the authorities and will effectively help to protect workers' health. This gives confidence to those persons who are unfamiliar with risk assessment.
- Stoffenmanager is freely available in Dutch and English. It is easy to use and does not require specific expertise.

3.6. Further information

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3.7. Transferability

This company used Stoffenmanager Nano as a basis for its risk assessment; other companies could also use the freely available Stoffenmanager nano.

As nanomaterial manufacturing expands, companies, particularly small businesses, seek guidance to help them ensure their processes and products are safe. Stoffenmanager nano prioritises potential health risks and, if required, offers guidance in selecting effective risk management measures. It helps to carry out structured and effective risk assessments.

4. References, resources:

- [Stoffenmanager Nano - Website](#)
- [B. Duuren-Stuurman, S. Vink, D. Brouwer, D. Kroese, H. Heussen, K. Verbist, E. Tielemans, M. van Niftrik, W. Fransman, TNO report \(V9216\)- Stoffenmanager Nano: Description of the conceptual control banding model \(2011\).](#)