

PROCESSING HARDWOOD WITHOUT CREATING DUST



TNO innovation
for life

Between 2,000 and 3,500 people die every year in the Netherlands from occupational diseases, including those resulting from exposure to carcinogenic substances. That number can and must be reduced. Prevention is crucial, as is focusing attention on behaviour on the shop floor and taking precautions. TNO helps companies develop dust-free equipment and working conditions.

The governmental authorities have defined legal threshold values to safeguard employees' health. These limits determine the maximum amount of a hazardous substance to which an employee may be exposed. The Social Affairs and Employment Inspectorate (SZW) has the task of enforcing these limits, with the aim of bringing down the number of work-related cancer cases drastically.

TNO is working on prevention using the latest available systems and technology. We develop tools and design production processes for intrinsically safe and healthy work. Many tools are a source of carcinogenic dust that poses a threat to employees and their working environments. Appropriate control measures can reduce the emissions of these substances drastically and protect the employee effectively.

Designing and producing dust-free tools and production processes is in the first instance a task for the manufacturers. They can call upon TNO, which has wide-ranging expertise in this area. For instance, we develop innovations such as extraction of hazardous substances at the source and filter systems. This lets employers protect their staff effectively by introducing dust-free equipment and processes in the company.

MORTALITY FIGURES FOR WORK-RELATED CANCER

Some 100,000 to 150,000 people in the EU are diagnosed with cancer every year, having been exposed to carcinogenic substances such as respirable quartz, hardwood, or welding fumes while at work. About 80,000 people die as a result each year in the EU. These premature deaths equate to almost 1.2 billion years of life lost.

Cancer patients experience a reduced quality of life, require medical care, and are often unable to work or are forced to work less. As well as the individual suffering, there is also a public expense. The cost of health care and reduced productivity as a result of occupational cancer in the EU is estimated to be four to seven billion euros per year. When the pain and suffering caused by illness and the potential for premature death are added into the equation, the total public expense amount increases to approximately 350 billion euros per year.

If we convert the estimates from the EU, which has over 500 million inhabitants, into a number of deaths for occupational cancer in the Netherlands (17 million

inhabitants), we get a figure of 2,000 to 3,500 deaths a year. By comparison, there were 621 road traffic deaths in 2015, and smoking is estimated to have led to the deaths of almost 20,000 people in 2015. The number of fatal accidents in the construction industry in the same year was 27. These figures show that exposure to carcinogenic substances is a major risk factor, which is all the more reason to tackle this problem at the source.

We have identified three sectors in which the exposure to carcinogenic substances is high and where workers are therefore exposed to a health risk: the construction sector, the wood processing industry, and metalworking. The key carcinogenic substances here are respirable quartz, hardwood dust, welding fumes, and hexavalent chromium.

EXCEEDING THE LEGAL LIMITS

When tools are used for processing wood and wooden panels or sheeting, the levels of exposure to carcinogenic wood dust are extremely high. The legal threshold values are exceeded in many cases (see Table 2).

DUST-FREE WORKING: REQUIRED IF EMPLOYEES ARE TO BE PROTECTED AGAINST OCCUPATIONAL CANCER

TABLE 1: WOOD DUST (HARDWOOD) OVERVIEW OF THRESHOLD VALUES AND RISKS OF CANCER

The definition given by the International Agency for Research on Cancer (IARC): processing hardwood is a carcinogenic process (on the list of carcinogenic substances and processes published by the Dutch Ministry of Social Affairs and Employment, 30 December 2016)				
	Threshold value (mg/m ³)	Exposure 'in practice' (mg/m ³)	Risk estimate (number of deaths from cancer)	
			Deaths per 1000 employees	Comments
TWA-8h limit value for the Netherlands (after 1-Jan-2007)	2			
Target value – Health Council of the Netherlands	0.06	0.06 5.8	0.04 4	Report –Health Council of the Netherlands No. 2000/08OSH, The Hague, 18 July 2000
TWA limit value for Europe (2016)	3			3 COM(2016)248 final (carcinogens or mutagens at work)
SZW Inspectorate enforcement policy (Netherlands, 2017)				
Step 1. 'Obligation to minimize': the employer is required to apply state-of-the-art technology				
Step 2. Checks on 'visible' dust, which if present means halting the project and issuing fines				

TABLE 2: EXCESS FACTORS FOR VARIOUS WOODWORKING PROCESSES FOR SHEET MATERIAL

	Type of equipment	Material	Concentration (mg/m ³)*	Excess factor**
	Sander (eccentric)	Wood	280	140
	Saw (plunge cut circular saw)	Sheet material	206	100
	Sanding belt	Wood	158	80
	Saw (plunge-cut circular saw)	Sheet material	152	80
	Flat sander	Wood	128	65
	Planer	Wood	109	55
	Saw (bench saw)	Wood	84	40
	Saw (jigsaw/flip over saw)	Sheet material	30	15
	Mill	Wood	23	10

* Concentration measured in Worst Case Room, in the respiration zone of the employee, tools running at 100 %, room volume 15 m³ and air supply 150 m³/hour.

** Excess factor with respect to the Dutch legal limits for respirable wood dust (hardwood) (2 mg/m³)

The TNO has carried out experimental investigations in the Worst Case Room, a special test room, simulating an unfavourable situation: equipment switched on for 100 % of the time, without measures being taken and in a small working space. This results in the legal limit value for wood dust (hardwood) being exceeded for sanding, sawing, planning, and milling, as well as other processing activities, by factors ranging from 10 up to no less than 140. If we then apply innovative technological solutions, the exposure is greatly reduced (see Table 3). A reduction in exposure by factors of 10 to 1,400 with respect to the unfavourable situation (in which these technological solutions were not used) is possible by choosing the right tools and using them correctly. This represents a major opportunity for businesses to encourage safe working with hardwood.

**PREVENTION
DRASTICALLY
REDUCES THE
NUMBER OF
VICTIMS OF
OCCUPATIONAL
CANCER**

USING THE RIGHT DUST-FREE EQUIPMENT

The TNO recommends the following step-by-step plan for controlling the release of wood dust:

Step 1: Choose softwood instead of hardwood (such as birch, beech, oak, ash, alder, maple, poplar species, hornbeam, elm, chestnut, cherry, lime, walnut species, plane, willow, and the tropical hardwoods balsa, ebony, iroko, kauri, mahogany, mansonia, meranti, rosewood, and teak)

Step 2: Choose prefabricated construction methods

Step 3: Choose dust-free equipment or processes (see dustfreeworking.tno.nl). When using hand-held and other tools, the exposure to wood dust is acceptable, even in worst case scenarios, if the proper measures are taken. The legal limit values for wood dust were not exceeded when measured in the TNO's Worst Case Room.

TABLE 3: PREVENTION FACTORS FOR VARIOUS PROCESSING ACTIVITIES FOR WOOD AND SHEET MATERIALS

	Type of equipment	Material	Prevention factor*
	Sander (eccentric)	Wood	150 – 300 times
	Saw (circular saw)	Sheet material	150 – 500 times
	Sander	Wood	120 – 1,400 times
	Saw (plunge-cut circular saw)	Sheet material	10 – 80 times
	Sander (flat sander)	Wood	200 – 1,400 times
	Planer	Wood	130 – 1,300 times
	Saw (crosscut saw)	Wood	10 – 130 times
	Saw (bench saw)	Wood	20 – 200 times
	Saw (jigsaw)	Sheet material	15 – 50 times
	Mill	Wood	15 – 200 times

* The prevention factor is the measured concentration without precautions divided by the measured concentration with precautions taken.

ENFORCEMENT

The SZW Inspectorate has the task of enforcement, they check workplaces for releases of visible dust towards the respiratory zone of the worker in activities such as sanding, sawing, planing, and milling. If dust is released towards the respiratory zone during the activities, this suggests that appropriate measures are either absent or not working properly. In both situations, the company must take action. The Inspectorate can impose fines if necessary or can even halt the work.

Further information about the enforcement policy as adopted by the SZW Inspectorate can be found on www.inspectieszw.nl.

CHOOSE PREVENTION: USE DUST-FREE EQUIPMENT

DUSTFREEWORKING.TNO.NL

HEALTHY LIVING

Our ambition is a healthy and productive population. For this healthy living of the future, we develop innovations for safe and healthy working. Prevention is key.

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