

Research summary

Performance test

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Rupes sander LE71TE in combination with Rupes add-on filter

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*The TNO quality system is ISO 9001
certified.*



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In recent years, TNO has focused intensively upon innovative improvements to tools, processes and workplace design in the industrial environment. The main purpose of these efforts is to create low-dust production processes and tools. As well as construction, our product and process development activities have targeted the metal, aircraft and wood industries, working closely with industry organizations, trades unions, governments, employers, employees and manufacturers.

To describe innovative production processes and tools, and to assess their practical functionality, we have developed the TNO Performance Test. This checks that relevant statutory and in-house occupational exposure limits (OELs) for hazardous substances such as crystalline silica, hardwood dust and hexavalent chromium are not exceeded in areas where they may be inhaled by workers in the course of their everyday duties.

Inspectie SZW, the Dutch labour inspectorate, explicitly endorses the TNO Performance Test in its “Basic Inspection Module for Crystalline Silica” (Basisinspectiemodule Kwartsstof). That document states, “If you decide to conduct your working activities using the measures contained in a TNO Performance Test, as described on the TNO website (stofvrijwerken.tno.nl), I [the inspector] will regard exposure as being adequately managed”.

This means that an employer using the test is able to communicate unambiguously with the inspectors and that no additional exposure measurements need to be agreed. Moreover, it provides both the employer and its personnel with an objective measuring tool for the accurate assessment of proposed investments. Innovative manufacturers and suppliers of production processes and tools can also highlight their quality by complying with the test criteria.

Assessment criteria

The TNO Performance Test assesses exposure to hazardous substances in the “employee inhalation zone” in the workplace. The applicable norms for each substance, both statutory and in-house, are those contained in the database of Occupational Exposure Limits (Grenswaarde Stoffen op de Werkplek, GSW) maintained by the Social and Economic Council of the Netherlands (see http://www.ser.nl/en/oei_database.aspx).

Project description

For this project, TNO studied emissions of inhalable wood dust when sanding hardwood (meranti) using a Rupes sander LE71TE with an add-on filter.

System specifications

The tested system consisted of a Rupes sander LE71TE (or equivalent*) in combination with a Rupes add-on filter. The external filter is connected to the internal ventilator of the sander. Figure 1 shows the complete system.

* An “equivalent” tool system is one with specifications for power and rotational speed which are the same as or less than those of the model tested.



Figure 1. Rupes LE7TE with add-on filter.

Table 1 lists the key technical specifications of the system tested and its equivalents.

Table 1. Technical specifications of Rupes tool system.

Specification	LE71TE	LE21ACM	LE71T
Power [W]	200	200	200
Power supply [V]	230 (AC 50/60 Hz)	230 (AC 50/60 Hz)	230 (AC 50/60 Hz)
Rotational speed [min-1]	13,000	13,000	13,000
Pad dimension [mm]	130 x 80	130 x 80	130 x 80
Orbit [mm]	2	2	2

Specification	LS21A	LS71T	LS21AE
Power [W]	200	200	200
Power supply [V]	230 (AC 50/60 Hz)	230 (AC 50/60 Hz)	230 (AC 50/60 Hz)
Rotational speed [min-1]	13,000	13,000	13,000
Pad dimension [mm]	-	-	-
Orbit [mm]	2	2	2

Specification	LS71TE	LE21AM
Power [W]	200	200
Power supply [V]	230 (AC 50/60 Hz)	230 (AC 50/60 Hz)
Rotational speed [min-1]	13,000	13,000
Pad dimension [mm]	-	130 x 80
Orbit [mm]	2	2

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Table 2 lists the key specific test conditions.

Table 2. "Worst case" test conditions.

Material: hardwood (meranti)	Extractor system compartmentalization: "semi complete".
Process: 60 minutes of sanding	Cleaning protocol: filter cleaned every 15 minutes
Productivity: permanent operation.	Dust collection: in filter
Operator exposure period: eight-hour working day.	Dust filters: "open".
Direction of dust generation: perpendicular extractor system.	

Test results

Table 3 and Figure 2 summarize the test results.

Situation	RCS concentration (mg/m ³)
OEL, eight-hour time-weighted average	2.0
Permanent operation	8,32
"Heavy" use	4,16
"Light" use	1,04
Outdoor use	-
Practical use	-

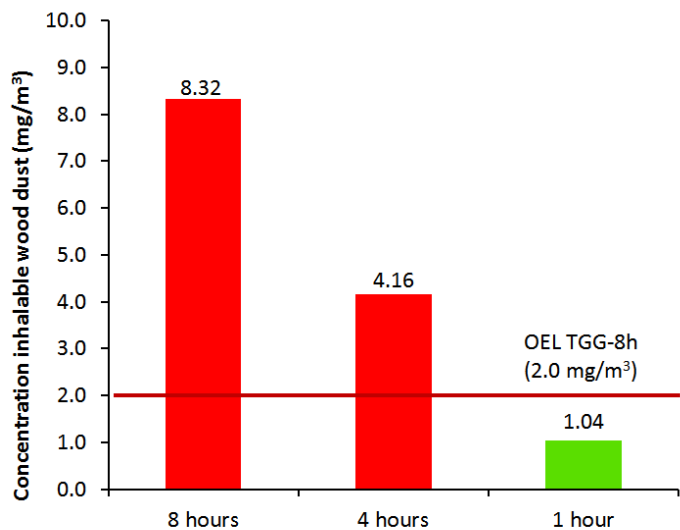


Table 3. Summary of measured data.

Figure 2. Exposure to wood dust at OEL.

Conclusion

TNO measured exposure to inhalable (hard)wood dust in the “employee inhalation zone” when sanding meranti hardwood using a Rupes sander LE71TE connected to a Rupes add-on filter.

In permanent operation (an entire eight-hour working day), average exposure was 8,32 mg/m³. This is above the statutory occupational exposure limit (OEL) of 2,0 mg/m³ (eight-hour time-weighted average), meaning that the system tested does not comply with the applicable standard for exposure to wood dust in this situation.

As well as “permanent operation” TNO has also defined two more realistic reference situations.

- Heavy use: four hours of operation per eight-hour working day.
- Light use: one hour of operation per eight-hour working day.

For heavy use, the system does not comply with the norm. For light use, the system complies with the norm.

The labels below present the system’s performance in graphic form. The round label shows the total “responsible operating time” in hours per eight-hour working day. The rectangular label provides more detailed information for the situations tested, with the green bars indicating what proportion of each type of use during an eight-hour working day remains within the OEL.

Label for sanding in (hard)wood

Reference: permanent operation.



- No measures
- 100% duration of operation (8 hrs sanding/8hrs)
- Heavy use (4 hrs sanding/8hrs*)
- Light use (1 hrs sanding/8hrs*)

* Given proportional duration during an 8-hour working day

