

A PRACTICAL GUIDE FOR EHS/HSE PROFESSIONALS

WHAT REAL-TIME DUST MEASUREMENT TELLS YOU — EVEN WITHOUT MATERIAL CALIBRATION

SUMMARY

Dustlight is a body-worn optical (light-scattering) real-time dust monitor. Like every optical instrument, its response depends not only on how much dust is in the air, but also on the properties of that dust — particle size distribution, refractive index, shape and density.

To state an absolute concentration in mg/m^3 with high confidence for a specific material, an optical instrument needs a gravimetric reference and a material-specific correction factor.

This guide explains why a large share of the practical value is available before that step is taken — specifically for comparative measurements (before/after) and for locating and identifying sources of exposure. It also states plainly where the limits are.

01 — 02

Principle & before/after evidence

03 — 05

Finding sources, prioritising, valid conclusions

06 — 07

Limits, summary and first steps

01 THE UNDERLYING PRINCIPLE: A SCALE QUESTION, NOT A SHAPE QUESTION

Without a material-specific calibration, the unknown quantity is a single conversion factor between the optical signal and the true mass concentration.

If the dust population remains essentially unchanged — same material, same process, same site — that factor stays constant. The measurement signal remains proportional to mass concentration; only the proportionality constant is unknown. The practical consequence:

An unknown constant factor cancels out in every ratio.

Percentage changes, rankings, trends, decay times, inside-versus-outside comparisons and task attribution are therefore all valid without knowing the absolute value. The uncertainty affects the label on the vertical axis — not the shape of the curve.

And a large proportion of everyday occupational hygiene decisions are decisions about the shape of the curve.

02 BEFORE/AFTER — DEMONSTRATING THAT CONTROLS ACTUALLY WORK

This is the strongest application without material calibration, because the question itself is comparative:

- **Extraction / LEV:** Does on-tool extraction actually work, and how much does it achieve? Measure the same task with extraction on and off.
- **Water suppression** versus dry working.
- **Cab, enclosure and negative-pressure integrity:** the ratio between inside and outside.
- **Housekeeping:** vacuuming versus dry sweeping.
- **Change of tool, consumable or work sequence:** better, worse, or no measurable difference?
- **Clearance time** after a dust-generating task — a pure time measurement.

A relative reduction is a relative reduction, independent of the calibration factor.

For documenting the hierarchy of controls, for verifying an installation and for justifying an investment, this is precisely the evidence that is needed — and it is evidence a shift-long gravimetric sample cannot deliver, because a single filter cannot isolate the effect of a single intervention.

03 FINDING THINGS

A gravimetric sample yields one value per shift. It cannot show *when*, *where* or *from what*. High time resolution answers exactly these questions — and none of these answers depend on absolute accuracy:

Task attribution	Align the time series with the task log. It is a common finding that a small share of the shift accounts for a large share of the total dose. That one insight often redirects the entire control strategy.
Source localisation	Walk-through mapping: the peaks show where the dust originates.
Leaks and failures	Filter breakthrough, worn seals, leaking ductwork, carry-over between areas.
Unexpected exposure pathways	The worker with no dusty task who nevertheless shows elevated readings; exposure during bag emptying, maintenance, cleaning, vehicle movements, or in the break area.
Feedback to the workforce	Dust is invisible. A real-time signal makes it visible — and that changes behaviour. A conservatively set relative threshold is sufficient to trigger the right response, and it acts during the shift rather than weeks later in a laboratory report.

04 SCREENING AND PRIORITISING MEASUREMENT BUDGETS

Accredited gravimetric sampling at every workplace is rarely affordable. Selecting a few workplaces at random risks missing the actual problem.

Using real-time measurement to rank all workplaces first, and then directing the laboratory budget at the highest-ranked ones, is a better allocation of the same money — and the ranking only requires relative validity.

The reverse also applies: workplaces that read consistently close to background across many shifts are unlikely to sit near a limit value. That is a defensible basis for lower prioritisation.

05 ONE-SIDED CONCLUSIONS THAT REMAIN LEGITIMATE

If a deliberately conservative (worst realistic case) sensitivity factor is assumed and the measurement still lies far below the applicable limit value, that is a defensible indication of a low-exposure situation.

Important: **this logic works in one direction only.** A conservative assumption can support the statement “clearly not a problem”. It can never support the statement “compliant”. Compliance requires the applicable validated procedure.

06 WHERE THE LIMITS ARE

Stating these openly is part of using the instrument correctly:

Absolute compliance statements against a limit value (e.g. AGW in Germany, WEL in the UK, or the applicable national OEL) require the validated procedure prescribed in the relevant jurisdiction. Real-time measurement supports and prepares such assessments; it does not replace them.

No speciation. An optical measurement determines the respirable dust fraction — not the quartz content within it. The crystalline silica fraction must come from material knowledge or from laboratory analysis.

Comparisons across different materials or sites are not directly transferable, because the conversion factor differs. Compare like with like.

The constant-factor assumption has one genuine exception. It requires that only the *quantity* of the aerosol changes, not its *nature*. Water suppression is the classic example: it removes coarse particles preferentially and therefore changes the particle size distribution as well as the mass. Comparisons are most robust where the dust remains the same and only the amount changes.

07 IN ONE SENTENCE

**A GRAVIMETRIC MEASUREMENT TELLS YOU HOW MUCH
— ONCE, RETROSPECTIVELY.
A REAL-TIME MEASUREMENT TELLS YOU WHEN, WHERE,
WHY, AND WHETHER IT IMPROVED.**

Compliance documentation is one task. Actually reducing exposure is a different and larger one — and that second task runs almost entirely on relative data.

PRACTICAL STARTING POINTS

Three measurements that deliver results in the first week, without any calibration work:

01

Extraction on / extraction off

On your dustiest routine task — same operator, same material, comparable duration.

02

A full shift with a task log

Then align the time series against it. Identify the periods that dominate the total.

03

Inside versus outside

For one cab, enclosure or clean area.

Prepared for distribution by your Dustlight partner. For questions on measurement setup, evaluation and the applicable national requirements, please contact your local Dustlight partner.