LEV
LOCAL EXHAUST VENTILATION
2024

10th & 11th September 2024

Hosted by

BOHS
British Occupational Hygiene Society

DSEAR and LEV

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DSEAR & LEV

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DSEAR

Dangerous Substances and Explosive Regulations 2002

- Implements safety requirements of the Chemical Agents Directive (CAD)
- relates to the substance and processes

Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 1996 (EPS)

- Implements ATEx
- relates to the equipment

- HSE enforce DSEAR

HSE

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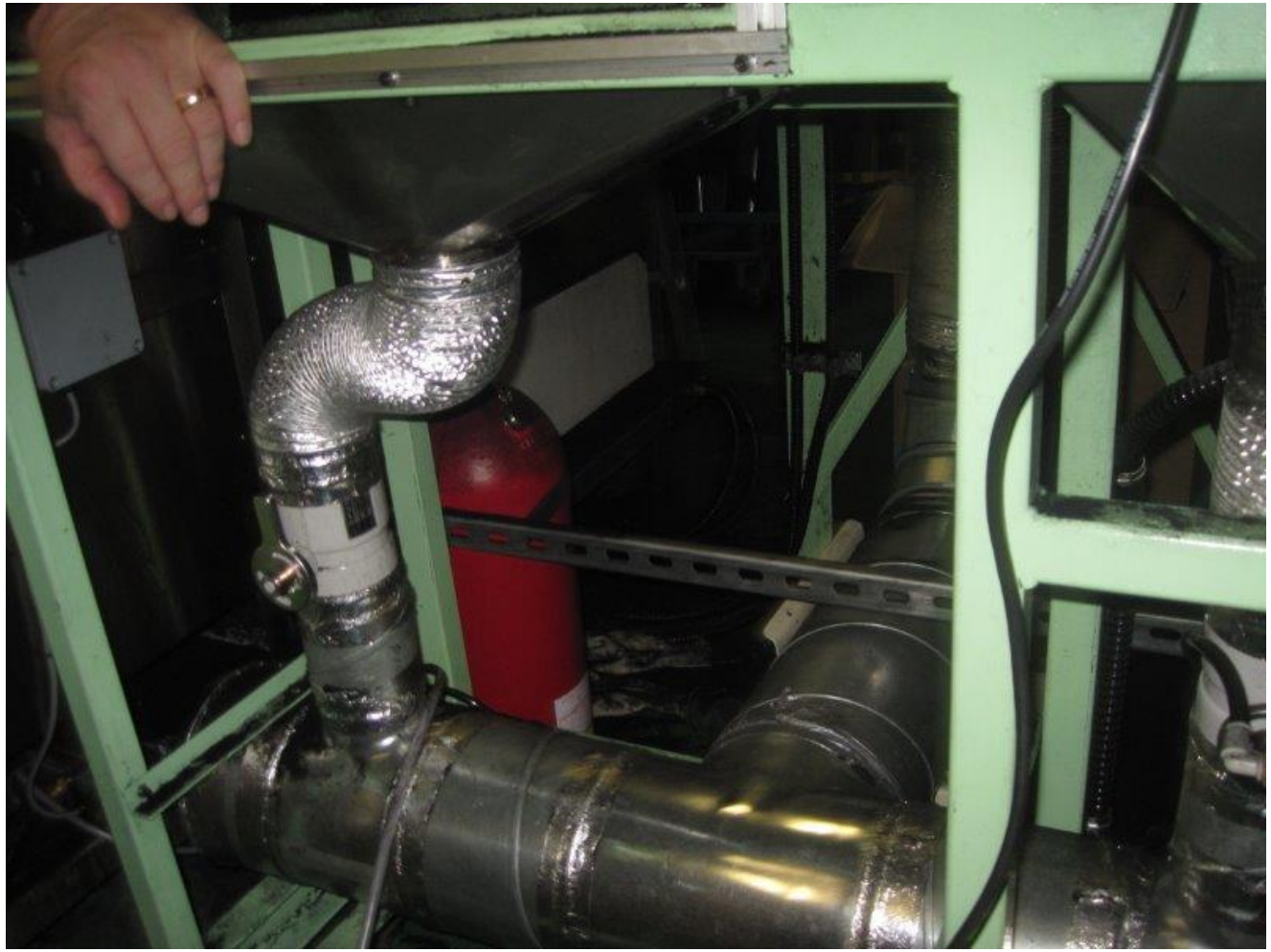
2014

- Car parts manufacturer
- 19-year-old employee was left with first degree burns and placed in a coma
- Had his head in machine when dust explosion occurred
- Company fined £800K + costs



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DSEAR/ATEX PRINCIPLES FOR LEV SPECIALISTS

PRESENTER: **DR STEPHEN ROSS**

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What is Fire?

The oxidation of a fuel evolving heat, particulates, gases and non-ionizing radiation

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What is an explosion?

Very rapid oxidation generating an overpressure that compresses the gas ahead of it;

Flame front compresses the vapour ahead of it above its auto-ignition temperature

Explosions

- Deflagration – subsonic ~0.5 bar (flash fire)
- Detonation – supersonic 4500 mph ~ 20 bar

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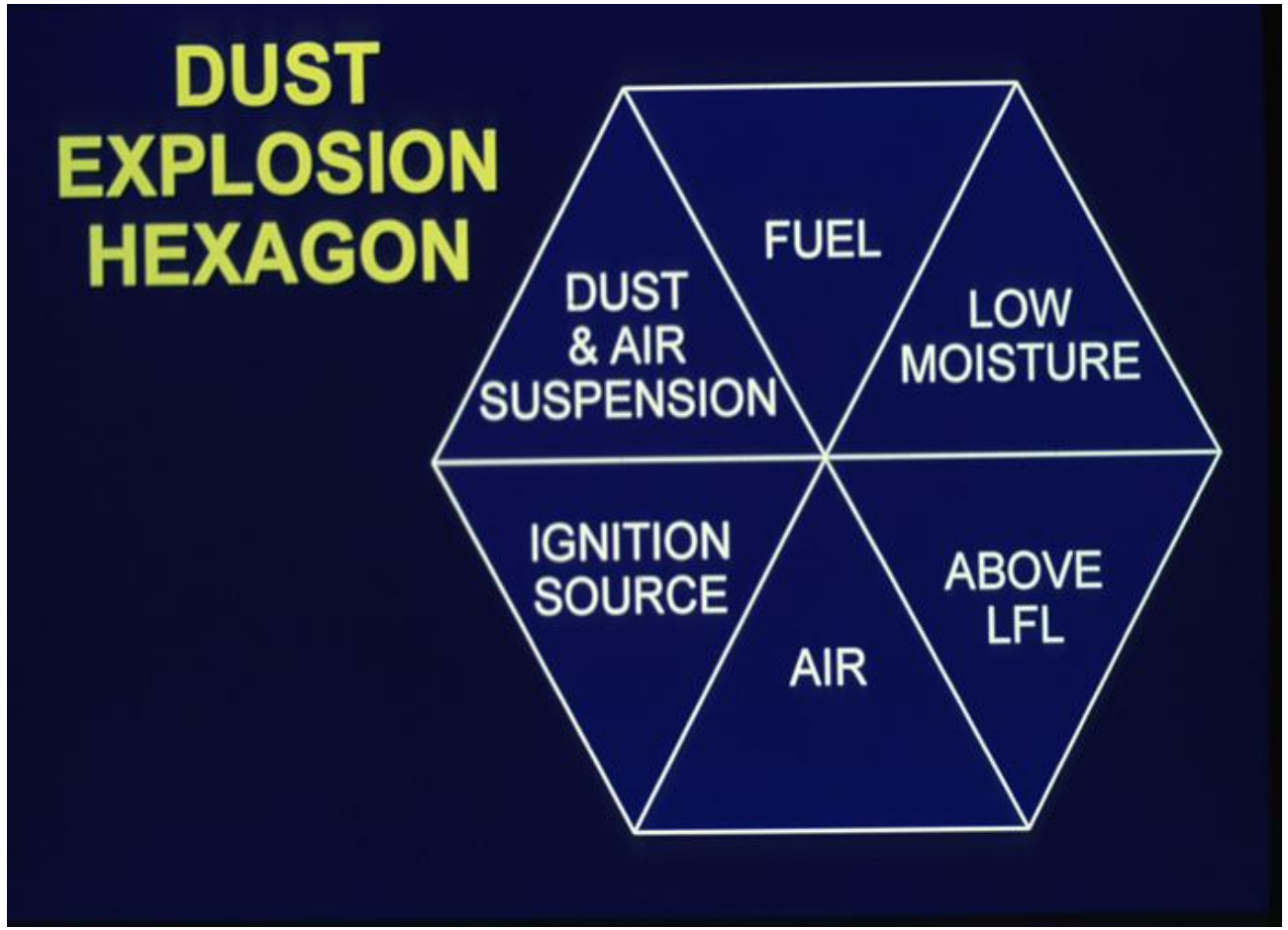
Dust Explosions



Particle size normally less than 500 micron

20 g/m^3 up to 6 Kg/m^3

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REG 6

- 1. Every employer shall ensure that **risk** is **either eliminated or reduced** so far as is reasonably practicable.
- **Substitution** so far as is reasonably practicable, replacing it with a substance or process which either **eliminates** or **reduces** the risk.
- **….We start with the substance not the ignition source - Not ATEx**
- **!!!!!**

Reg 6 (4) Hierarchy

- reduction of the quantity of Dangerous substance to a minimum;
- avoidance or minimising release/control of the release
- prevention of formation of an explosive atmosphere, including application of appropriate ventilation;
- any release is suitably collected, safely contained, removed to a safe place, or otherwise rendered safe

AND then…

avoidance of—

- ignition sources including electrostatic discharges; …..**here is where ATEX comes in!**
- adverse conditions
- segregation of incompatible dangerous substances.

And for mitigation

- Reduction to a minimum of the number of employees exposed;
- avoidance of propagation of fires or explosions;
- provision of explosion pressure relief arrangements;
- provision of explosion suppression equipment- NOT FIRE SUPPRESION
- plant constructed so as to withstand the pressure likely to be produced by an explosion
- provision of suitable personal protective equipment.

Schedules

1. General safety measures- includes

   "*Designing, constructing, assembling, installing, providing* and using *suitable* work processes"

2. Classification of areas
3. *Selection of equipment*
4. Marking of areas
5. Other Legislation regarding marking of containers and pipes

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Static Hazard

Minimum Ignition Energy

- Acetone 1 mJ
- Toluene 0.2 mJ
- LPG 0.46 mJ
- Hydrogen 0.019 mJ

Problem when relative humidity drops below 40 percent

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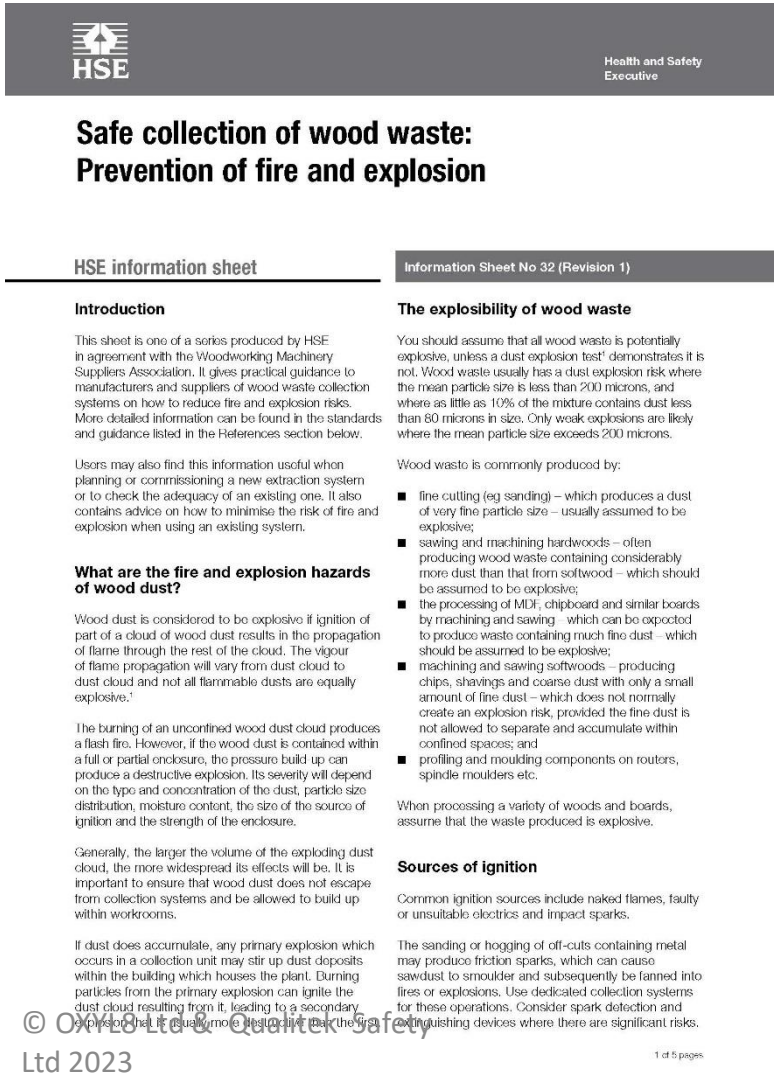
- 0.04mJ - Spark threshold, visible in darkness
- 1.2 mJ - Winter doorknob spark, small snap, can be felt (will ignite most vapours)
- 3.7 mJ - Fairly nasty spark, louder snap. Ouch!

HSE WIS 32- Wood dust



HSE

Health and Safety Executive

Safe collection of wood waste: Prevention of fire and explosion

HSE information sheet

Information Sheet No 32 (Revision 1)

Introduction

This sheet is one of a series produced by HSE in agreement with the Woodworking Machinery Suppliers Association. It gives practical guidance to manufacturers and suppliers of wood waste collection systems on how to reduce fire and explosion risks. More detailed information can be found in the standards and guidance listed in the References section below.

Users may also find this information useful when planning or commissioning a new extraction system or to check the adequacy of an existing one. It also contains advice on how to minimise the risk of fire and explosion when using an existing system.

What are the fire and explosion hazards of wood dust?

Wood dust is considered to be explosive if ignition of part of a cloud of wood dust results in the propagation of flame through the rest of the cloud. The vigour of flame propagation will vary from dust cloud to dust cloud and not all flammable dusts are equally explosive.[1]

The burning of an uncontined wood dust cloud produces a flash fire. However, if the wood dust is contained within a full or partial enclosure, the pressure build up can produce a destructive explosion. Its severity will depend on the type and concentration of the dust, particle size distribution, moisture content, the size of the source of ignition and the strength of the enclosure.

Generally, the larger the volume of the exploding dust cloud, the more widespread its effects will be. It is important to ensure that wood dust does not escape from collection systems and be allowed to build up within workrooms.

If dust does accumulate, any primary explosion which occurs in a collection unit may stir up dust deposits within the building which houses the plant. Burning particles from the primary explosion can ignite the dust cloud resulting from it, leading to a secondary explosion that is usually more destructive than the first.

The explosibility of wood waste

You should assume that all wood waste is potentially explosive, unless a dust explosion test[1] demonstrates it is not. Wood waste usually has a dust explosion risk where the mean particle size is less than 200 microns, and where as little as 10% of the mixture contains dust less than 80 microns in size. Only weak explosions are likely where the mean particle size exceeds 200 microns.

Wood waste is commonly produced by:

- fine cutting (eg sanding) – which produces a dust of very fine particle size – usually assumed to be explosive;
- sawing and machining hardwoods – often producing wood waste containing considerably more dust than that from softwood – which should be assumed to be explosive;
- the processing of MDF, chipboard and similar boards by machining and sawing – which can be expected to produce waste containing much fine dust – which should be assumed to be explosive;
- machining and sawing softwoods – producing chips, shavings and coarse dust with only a small amount of fine dust – which does not normally create an explosion risk, provided the fine dust is not allowed to separate and accumulate within confined spaces; and
- profiling and moulding components on routers, spindle moulders etc.

When processing a variety of woods and boards, assume that the waste produced is explosive.

Sources of ignition

Common ignition sources include naked flames, faulty or unsuitable electrics and impact sparks.

The sanding or hogging of off-cuts containing metal may produce friction sparks, which can cause sawdust to smoulder and subsequently be fanned into fires or explosions. Use dedicated collection systems for these operations. Consider spark detection and extinguishing devices where there are significant risks.

1 of 5 pages

It's just guidance !!---- but failure to follow it can put you in breach of DSEAR Remember section 3 of HASWA your duty to 3rd parties

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Characterization of the Explosiveness of Wood Dust”
Journal of Process Safety and Environmental Protection
(169, 2023, 252-259)

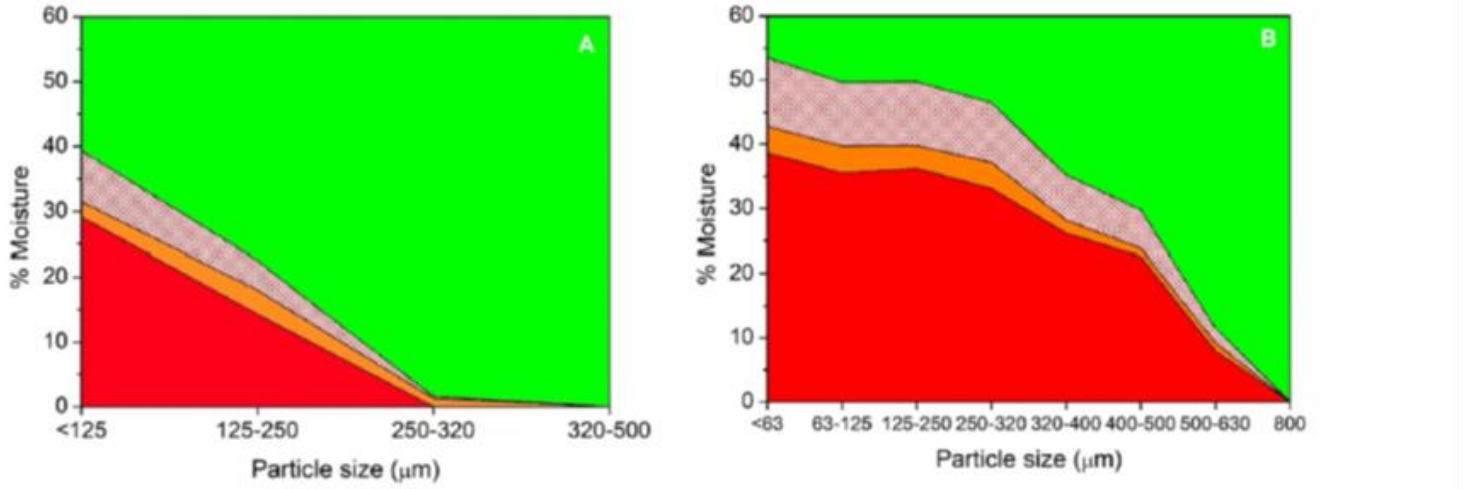

Fig. 2. Evolution of the hazard of the samples related to moisture and particle size. Explosion Zone (red), Ignition Zone (orange), Safety Margin Zone (red dots) and Non-Explosion Zone (green). A - Group 1, samples collected directly from cutting processes. B - Group 2, samples collected from suction ducts or dust deposited around machines in the facilities. The tests were carried out with a sample concentration of 584.90 g/m^3.

- >40% moisture does not present an explosive dust issue regardless of how fine the dust is.
- 40% - 30 % moisture content - possible to get fine dust to explode but very weekly, with a KSt value of only 12 bar m/s
- wood dust at up to 7.9% moisture with a particle size of 630 micron can produce an explosion.

Installation? ☹

Equipotential Bonding

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Should TExTs consider DSEAR?

YES

But TExT examiners are not expected to be DSEAR experts but should have an awareness

WHY?

CAD

- These will include, in order of priority:
- (a) design of appropriate work processes and engineering controls and
- use of adequate equipment and materials, so as to avoid or minimise
- the release of hazardous chemical agents which may present a risk
- to workers' safety and health at the place of work;
- (b) application of collective protection measures at the source of the
- risk, such as adequate ventilation and appropriate organizational
- measures;
- (c) where exposure cannot be prevented by other means, application of
- individual protection measures including personal protective
- equipment

DSEAR ACOP L138

- **Appendix 2**-Employers will have duties to control the risks from those substances under both sets of regulations but the solutions for both are likely to be common

- **Sect 395** Verification can be carried out through a variety of means e. g. by examination ……..of documents, visual inspection, or physical checks and measurements. Much of the work may be a normal part of the **commissioning process**. (*as for L5 sect 177*). Examples of the work involved include: checks that **mechanical ventilation systems** produce the air flows intended

Section 120

…taken into account including:

- (b) the design standards for the installation together with those for inspection and maintenance;
- references HSG258

Both DSEAR And COSHH ACOPs Reference HSG258

- Who is this aimed at?
- Section 3. Where employers use or intend to **use LEV** they must ensure that it is **appropriate for the task, installed and operated correctly** and subsequently maintained so it continues to operate as when originally installed.
- It does not say "Where employers use or intend to use LEV for COSHH"

LEV systems under DSEAR

- Need to be commissioned
- Need to be inspected and maintained in accordance with the design standards (DSEAR references HSG258)
- DSEAR does not have a schedule for examination frequency, but 12 months would seem reasonable unless RA requires more frequent.

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