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10 Golden Rules for Dust Control

Rule 1: Avoid the formation of dust in the first place

“Good" dust is dust which is not produced in the first place and cannot reach breathable air. If dust particles are distributed as a result of swirling up of deposits, improper storage or as a result of being carried off with work equipment or work clothes, it is already too late!

Fine, respirable dust particles have a diameter of 5 µm and less. They are so light that it could take several hours before they sediment on the floor or other surfaces (see fig. 1). In addition this fine dust-air mixture is virtually invisible to the human eye and thus elude our perception. It is therefore particularly important to make employees aware of the dangers and particularities when dealing with dusty materials and in the occurrence of dust.

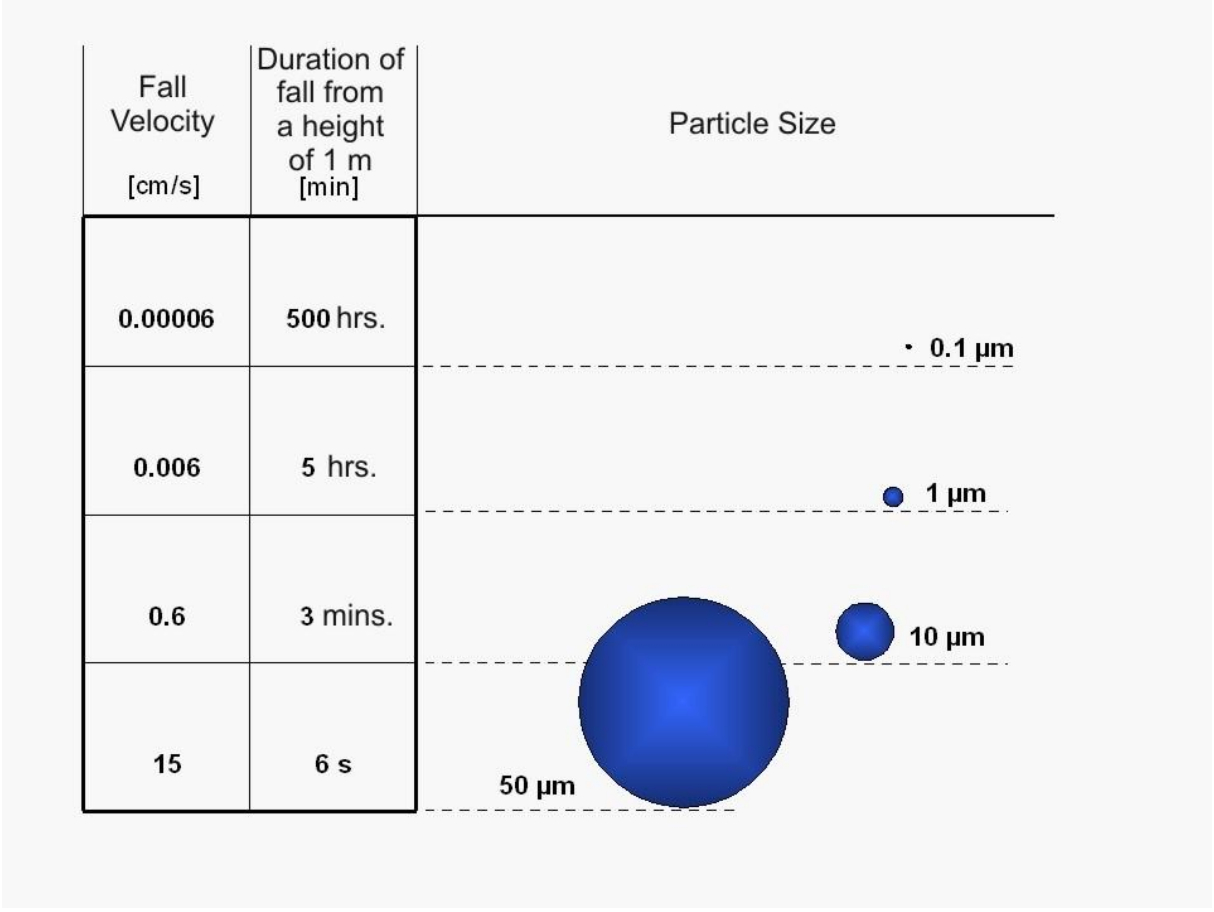

Fig. 1: Floating behaviour of dust particles (density 2 g/cm³) in air

Storage and transport

Dust protection must begin as early as at the start of production! Dust can be produced even as a result of improper storage. Dust-releasing materials and raw materials can be carried over to other work areas. **Preparation and storage in closed systems (e.g. silos, drums or closed raw material bunkers) is to be aimed at. Piled up material or material that is stored openly should be covered or at least kept moist.** Particularly in the storage area, it has to be ensured that the work processes are clearly regulated and that corresponding space and the necessary equipment are available for these processes. **The procedures are to be planned in such a way that the materials are subjected to as few transportation and process steps as possible.**

Fine-grained dry bulk materials are frequently stored in silos. In doing so there is the danger that the fine dry bulk materials in the silo are mixed with air during the discharging process due to inadequate design of the flow profile. As a result of this fluidisation there is a high level of dust formation. The entry of air into the dry bulk materials is minimised by the creation of a so-called silo mass flow discharge. In the process, the entire volume of dry bulk materials located in the silo is set in motion at the same time (comparable to a plug-flow). Before constructing a silo system the respective flow behaviour of the dry bulk goods must therefore be determined. **Particularly in the area of storage and transportation of fine-grained dry bulk** materials **it has to be ensured, as early as the system planning stage, that unnecessary release of the solid substance (intermixing of the dry bulk** materials **with air) is avoided.**

Grain size distribution

For a series of production processes the raw materials used, for example alumina and sands, are normally crushed in mechanical processing methods. **In doing so it should be ensured that the material is only ground up as fine as necessary.** The larger the individual grain diameters, the lower the amount of dust. As a side effect, energy can be saved as a result of the reduced mechanical effort for the crushing.

Machining methods

Even in the selection of methods for material processing, matters of dust and health protection are to be regarded. When using fast-running machining equipment a lot of fine dust is produced with a very high energy input (fig. 2). The dust particles are not only mechanically accelerated by the machining procedure but gain considerable thermal energy as a result of shear and friction forces. This leads to additional spreading of the particles**. For this reason, instead of fast-running, dust-producing machining methods, slow-running and coarse machining methods are to be selected.** If this is not possible for reasons of process-technology, **wet instead of dry machining methods** can be used as an alternative.

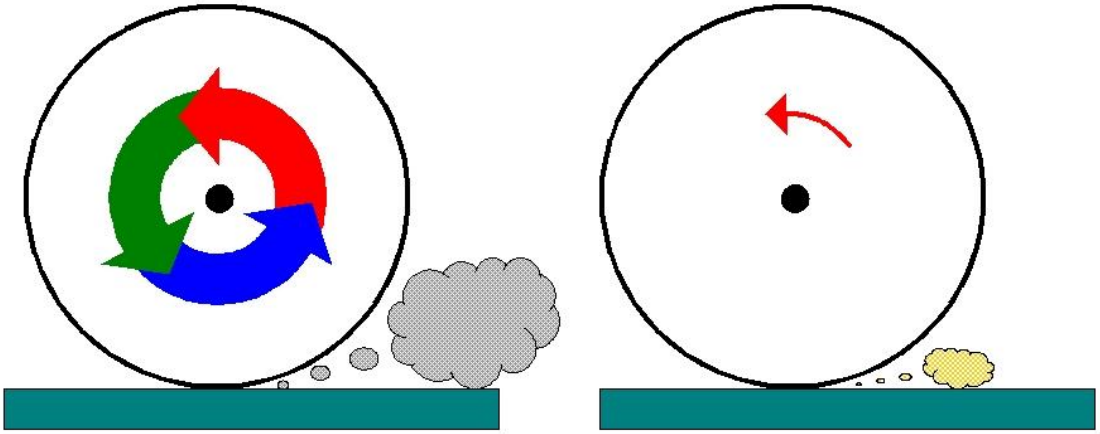

Fig. 2: Fast-running processing methods should be replaced as far as possible by slow-running methods

Filling procedures

Manual filling or decanting using a shovel is, in principle, a process technology step from the Stone Age. An important principle for the prevention of dust can be nicely presented with this example. The longer the "flight phase" of the material, the better the particles are enclosed by air and the further they are carried into the surrounding air. By reducing the discharge height (i.e. pouring off the shovel directly at the discharge cone) the swirling up of dust is considerably reduced. This principle can be applied to all material transfer points. **Discharge heights at filling and pouring points are therefore to be kept as low as possible.**