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10 Golden Rules for Dust Control

Rule 4: Immediately separate dust at the point of origin

Substitutes, low-dust methods, working in closed systems – often, despite exploiting all potentials and the use of the latest technology, dust cannot be prevented from escaping into the air in the workplace.

In this case it is particularly important to capture and extract the dusts directly at the point or origin or point of escape, in order to avoid further spreading.

Collection systems

The simplest variation of collection systems is collection devices (e.g. bowls, funnels or bags) for escaping or falling wastes. It is generally, however, necessary to exhaust the collection devices and adapt them to the particularities of the dust source.

Using a fan, an air flow is generated in the extraction system which carries along the dust particles and supplies them via the intake opening and ductwork to a separator (fig. 1). Essential for the good efficiency of the extraction system is the adaptation of the shape of the collection element and its arrangement to the respective type of release and spread of the dust particles.

Before selecting the collection system, the source of dust emission must be accurately observed. Frequently the dust particles possess an appreciable air speed generated as a result of mechanical machining procedures or air flows. The direction of the particle movement and the inherent kinetic energy are to be assessed. In doing so the following factors are of significance:

- density differences as a result of thermal flow (e.g. as a result of heating),
- pressure differences as a result of air displacement (e.g. pouring, transportation or filling procedures),
- dragging of air as a result of the movement of solid bodies (e.g. movement of grinding discs, milling and drilling machines),
- free jet effect (e.g. air jet when blowing with air),
- interfering movement of air (e.g. cooling air on electrical motors).

Collection systems are fundamentally divided according to the model, into open, semi-open and closed systems. The more open the system, the more problematic the collection of dust. The capturing equipment and the work processes must be coordinated in such a way that they do not interfere with each other. After all, only the dust and not the product should disappear into the extraction pipe.

A collection element must be designed in such a way that it is easily disassembled, mobile, pivoted or rotated in the event of a change of equipment or product, so that the changeover times are kept to a minimum.

As a result of targeted air supply (supply air support) the collection of dust can be considerably improved (fig. 2). When designing the system, attention should be paid that the supply air used does not become an interference flow.

Changing sources of dust

In some workplaces, for example, when welding, the use of collection systems in closed or semi-open design is often not possible. In such cases the open design has to be used. In order to achieve a comparable degree of collection nonetheless, higher extraction capacities are required since the suction effect very rapidly decreases with growing distance of the outlet opening from the dust source.

In practice a suction pipe with fitted funnel is frequently used. A substantially better degree of efficiency is achieved with a collection element where a flange or nozzle plate is fixed at the end of the suction pipe. In this case, the extraction effect of the air flow is increased by up to 30 % (fig. 3).

Even for hand-held machines and tools (e.g. right angle grinders, drill hammers or drilling machines) the industry now offers extraction systems. The dust collection system must be able to be adapted flexibly to the different conditions and nevertheless has to be very stable so that it also withstands extreme site conditions. In addition it should not substantially increase the net weight of the machine.

Separation of dust

If the extracted air is to be fed back to the work space (recirculation of air), it has to be adequately cleaned. For carcinogenic dusts, this should only take place using methods or appliances that comply with national standards.

The recirculated air should approximately reach fresh air quality. This is the case, for example for ventilation systems if the dust concentration in the air that is fed back (return air) does not exceed 1/5 of the occupational exposure limit and the proportion of return air in the supply air is not more than 70 %. For dusts containing silica and in particular for carcinogenic dusts, these values should once again fall distinctly below these figures. In each case, the respective national standards are to be observed.
An adequate dust removal effect can be assumed if a type-tested dedusting device is used or testing takes place on site. The system is to be used as intended according to the operating instructions of the manufacturer and the filter material is to be maintained or replaced after the prescribed lifetimes.

Mobile small dedusters can be operated with recirculated air if they have a test certificate according to Annex AA of the European standard EN 60335-2-69. They must correspond at least to the dust category "M" (e.g. for lead dust). For carcinogenic dusts the use of dedusters of category "H" is prescribed.

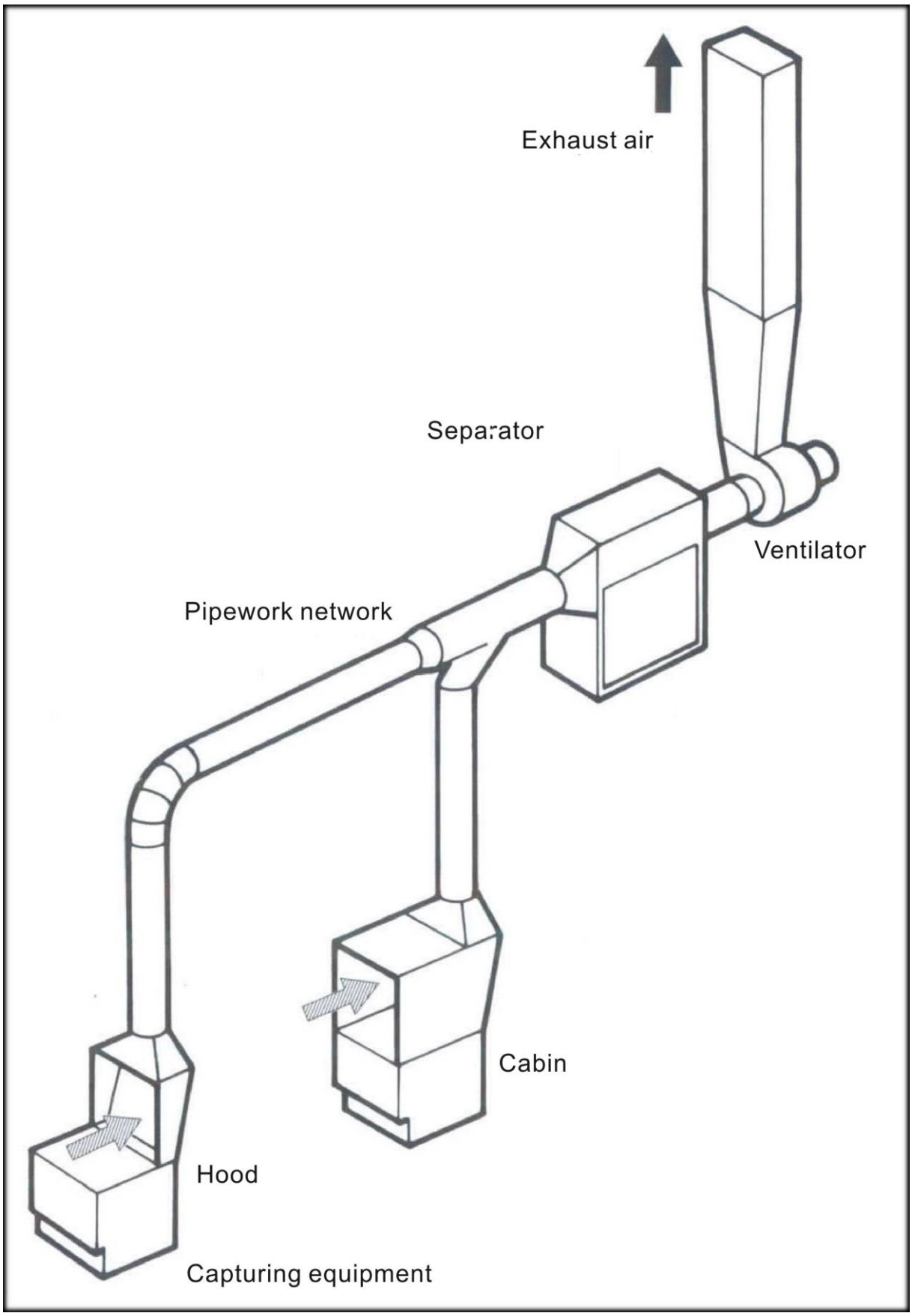

Fig. 1: Examples of collection systems

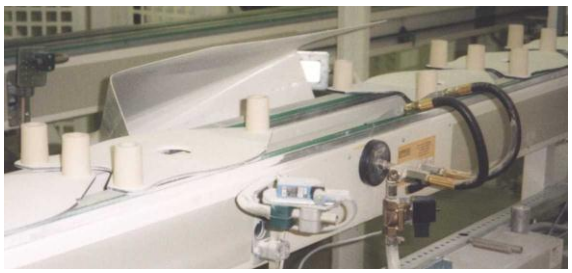

Fig. 2: Combined blowing/suction device for cleaning kiln furniture

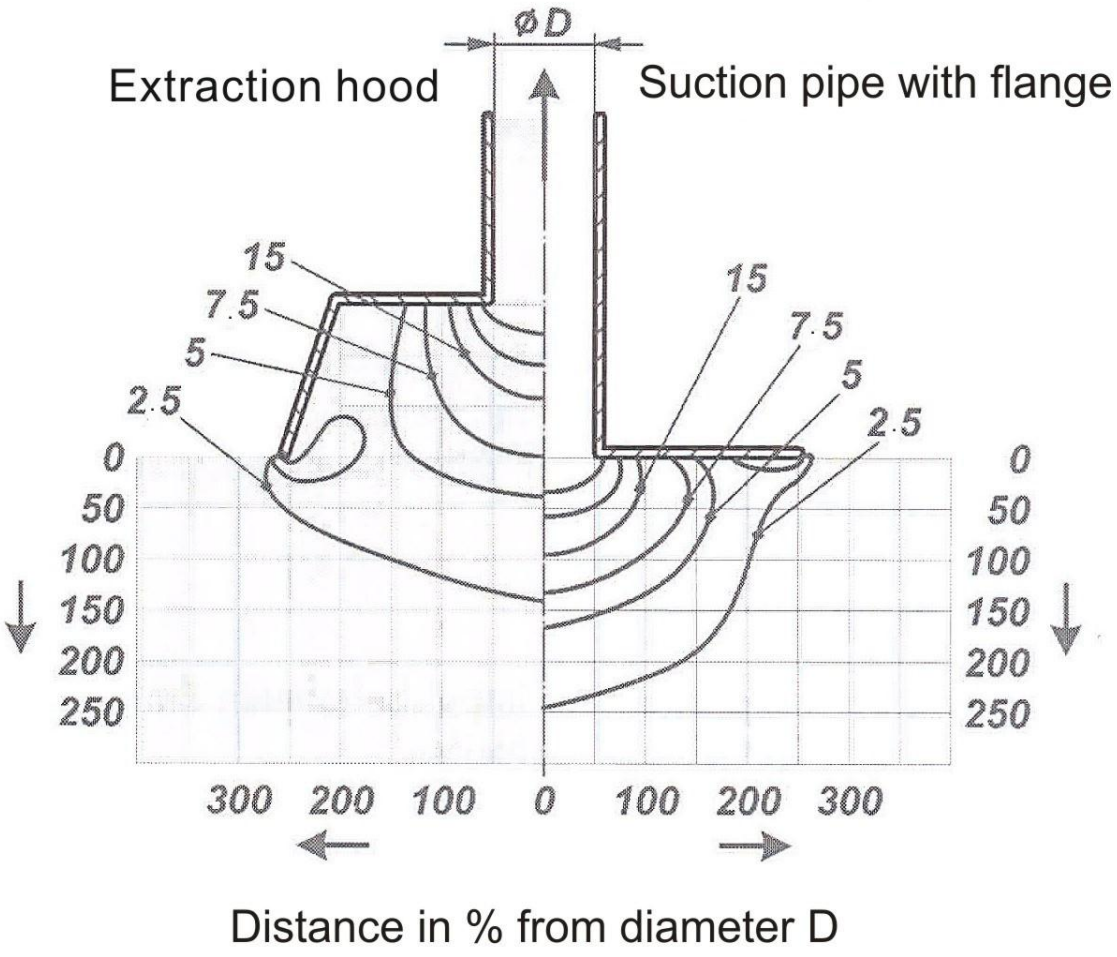

Fig. 3: Comparison of the suction capacity of extraction hood and suction pipe with flange