Workplace limits and air recirculation guidelines

Standard for clean air

Do your systems comply with the emission limit "Technical Rules for Hazardous Substances" (TRGS) and are all requirements for clean air recirculation adhered to?

Explanation

TRGS 900 contains a list of emission limits for the air within the workplace. Adherence to these emission limits serves as health protection for employees. The air quality in the workplace must ensure that no limit is exceeded. Therefore, several measures are required in many instances. For dusts which do not have any emission limits and which are not regulated otherwise, the "MAC, maximum allowable concentration" applies.

General limit value

A new regulation was effective in May 2001. It differentiates between inhalable substances (E) and inhaled particulate matter. (A).

The following table indicates the new regulation (source: list of materials TRGS 900).

Material identity	Emission limit (mg/m³)
General limit value:	
E-Fraction [1]	10,0
A-Fraction [2]	1,25

[1] Inhalable proportions (collective dust): particles > and < 10 µm
[2] Inhaled particulate: particles < 10 µm

Clean air recirculation of non-carcinogenic substances

The reduction and differentiation of the limit values affects the residual dust amount in the cleaned air return. The concentration in the clean air may only be 1/5 of the MAC value (see: VDI 2262, sheet 3).

Since only particulate matter is expected on the clean air side of the separator, only a max. admissible return concentration of 1/5 from 3.0 mg/m³ = 0.6 mg/m³ is allowed.

Clean air recirculation involving carcinogenic matter

Basically, air recirculation is not permissible for carcinogenic dusts according to TRGS 560. (Carcinogenic category 1a and 1b). TRGS 560 does not apply for carcinogenic dusts in category (potential risk).

Examples of applications with carcinogenic matter in category 1a and 1b:

- Welding of stainless steel (CrVI-compounds)
- Grinding of stainless steel (Nickel)
- Extraction of quartz particulates (< 4 – 10 µm)

Example of applications involving carcinogenic materials, category 2:

- Grinding of GPR/CFC components

VDI 2262-3 applies (see clean air recirculation of non-carcinogenic dust on page 1)

DGUV 109-002, published in 2020, continues to prohibit the recirculation of carcinogenic dusts into the work environment:

- Air can only be recirculated in an exceptional case if it is "not operationally possible" or "unrealistic" to operate with exhaust air or by a heat recovery system. Exhaust air ductwork cannot be installed physically due to an existing crane.
- The operator shall ensure an adequate fresh air supply (the return air portion in the workplace must be at max. 50 % of the entire supply air). Please see example in back.
- Annual inspection of its working order (residual dust measurement not obligatory).
- Switching to exhaust air operation in the summer no longer required.

Separation efficiency of 99.995 % is claimed

The following issue must be considered regarding separation efficiency;
The concentration of the carcinogenic substance in the workplace may not increase substantially from the supplied air. TRGS 560 claims a separation efficiency of 99.995 % (dust category H).

(We hereby assume a total separation efficiency, with regard to all particle sizes, available for the applicable process).

Significance of the TRGS 560 for new and existing systems

Since the TRGS 560 is directed to system operators, the requirements basically apply to both new and existing systems.
This means that cleanable filter systems have to be equipped with a H13 secondary filter.

We furthermore recommend a differential pressure monitoring of the secondary filter stage to react accordingly in the event of a failure of the main filter stage.

Cleanable filter device with H13 secondary filter stage

Requirement for carcinogenic Quartz dust in accordance with TRGS 559

TRGS 559 requires that the dust concentration in the recirculated cleaned air may not exceed a residual dust concentration of 0.005 mg/m³ referred to Quartz dust. Our KLR-bran filter elements ensure a residual dust content of < 0.1 mg/m³. If the Quartz dust content in the separated dust is smaller < 5 %, the requirement of a Quartz dust concentration of 0.005 mg/m³ is fulfilled and this means that the purified air can be recirculated back into the workroom without an additional secondary filter stage.

Requirements for carcinogenic welding dust according to TRGS 528

During the welding of stainless steel for example emerge carcinogenic Cr(VI)-compounds. On clean air recirculation, TRGS 528 requires a W3 allowance which smaller air pollution control systems partly have. The operator therefore has to coordinate with the Employer's Liability Insurance Association in the planning stage already, if clean air recirculation with H13 secondary filter stage will be accepted even without formal W3 certificate.

Arguments for the downstream H13 secondary filter stage for Employer's Liability Insurance Association's approval:

- Considerably higher total separation efficiency (99.995 % compared to 99 % at W3).
- Safety in the event of a failure of the main filtration stage: Carcinogenic dust can enter the workplace unnoticed without a secondary filter stage.
- The operator is obliged to reduce the concentration of hazardous materials. This is ensured with the use of a secondary filtration stage.

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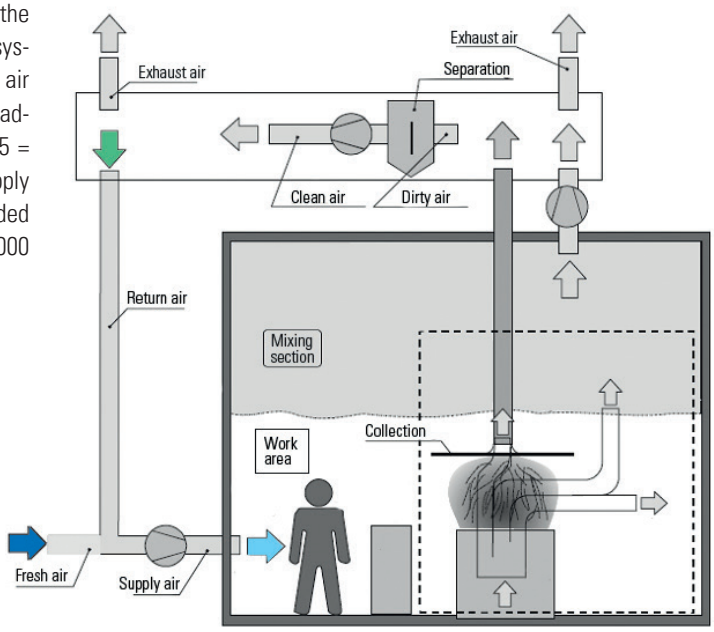
Example involving carcinogenic dusts:
Production plant L x B x H = 20 x 50 x 5 = 5000 m^3

Due to the operating conditions in the production plant, an air handling system is not installed. The natural air exchange of 1/h is considered as adequate. Fresh airflow: 20 x 50 x 5 = 5000 m^3/h. That is 50 % of the supply air. Only a max. of 50 % may be added as clean air from a separator (5000 m^3/h).



1. Fresh airflow: 20 m x 50 m x 5 m x 1/h = 5 000 m^3/h
2. Supply air = 10 000 m^3/h
3. Max. return airflow = 5 000 m^3/h

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