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.

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).

<table>
<thead>
<tr>
<th>Material identity</th>
<th>Emission limit (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General limit value:</td>
<td>10.0</td>
</tr>
<tr>
<td>E-Fraction ¹</td>
<td>1.25 ²</td>
</tr>
<tr>
<td>A-Fraction ²</td>
<td>³</td>
</tr>
</tbody>
</table>

¹ Inhalable proportions (collective dust): particles > and < 10 µm
² Inhaled particulate: particles < 10 µm
³ A transition period with the old limit value of 3.0 mg/m³ applies until the end of 2018 for reasoned exceptional cases

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.

The operator should ensure a suitable fresh air supply (air recirculation may max. be 66 – 70 %). See example in back.
Clean air recirculation involving carcinogenic matter

Basically, air recirculation is not permissible for carcinogenic dusts according to TRGS 560. (Carcinogenic category 1 and 2). TRGS 560 does not apply for carcinogenic dusts in category 3 (potential risk).

Examples of applications with carcinogenic matter in category 1 and 2:
- 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 3:
- Grinding of GPR/CFC components

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

The new TRGS 560 directive

Since the beginning of 2012 a new TRGS directive applies to maintain the air free of carcinogenic dusts. Some modifications were made:

- 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).
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.

TRGS 559 requires that the dust concentration in the recirculated cleaned air may not exceed a residual dust concentration of 0.015 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 < 15 %, the requirement of a Quartz dust concentration of 0.015 mg/m³ is fulfilled and this means that the purified air can be recirculated back into the workroom without an additional secondary filter stage.

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.
The return air percentage may be 66% of the entire supply air for non-carcinogenic dust and max. 50% for carcinogenic dust. The balance should be added as fresh air. The design of a ventilation system depends on the air load parameters and should be carried out in adherence with applicable rules (e.g. VDI 3802). If an air handling system not be installed, we assume an air exchange rate of 1/h.

Examples of non-carcinogenic dusts:
Production plant L x B x H = 20 x 50 x 5 = 5000 m³
Production plant L x B x H = 20 x 50 x 5 = 5000 m³

Case 1: Due to operating conditions in the production plant, the air handling system with surface-related air exchange rate of $V_{zu} = 30000$ m³/h installed. Only a max. of 66%, of which 20000 m³/h may be returned as exhaust air from a separator. An additional 10000 m³/h of fresh air should be added.

Case 2: 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 m³/h. That is 33% of the supply airflow. Only a max. of 66% may be added as clean air from a separator (10000 m³/h).

Example involving carcinogenic dusts:
Production plant L x B x H = 20 x 50 x 5 = 5000 m³

Case 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 m³/h. That is 50% of the supply airflow. Only a max. of 50% may be added as clean air from a separator (5000 m³/h).