Hygienic design of dry solids equipment

EHEDG Dry Materials Handling Group

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Dry materials are different

- They flow differently, So we have to design for that
- Keeping the powders dry helps to reduce microbial growth
- Cleaning can be different compared to using liquids or wet processing
- Equipment design needs to be adapted to the cleaning needed for dry processing
- Several documents available from the DMHG

Powders flow differently

- Constuctions often vertically build.
- Self draining is not possible in non vertical pipes and inside unit operations
- The fact that dry powders do not promote microbial growth means that the surrounding air/gas needs to be dry too.
- Powder spills can be removed using vacuum cleaners
- CIP is often difficult for powder handling devices

Cleaning

- Dry cleaning only
  - Brooms, vacuum cleaners etc. can be used to clean out equipment, in case that low product cross contamination is allowed
- Controlled wet cleaning
  - Local wet cleaning of a surface, floor or dismanteled unit.
- Wet cleaning
  - We refer to washing in place, not CIP since that is often not achievable. This means proper checking and often some manuel actions needed. Validate this cleaning protocol!
- Drying after (controlled) wet cleaning
  - should be established in 2 hours to prevent microbial growth. Ovens for rapid cleaning are often used.

Cleaning

- So, often units cannot be automatically cleaned, so equipment needs to be taken apart from the processing line and cleaned in another area.
- So in dry processing lines and equipment, manual or controlled wet cleaning is often done. Full wet cleaning is also possible

Examples of equipment and units

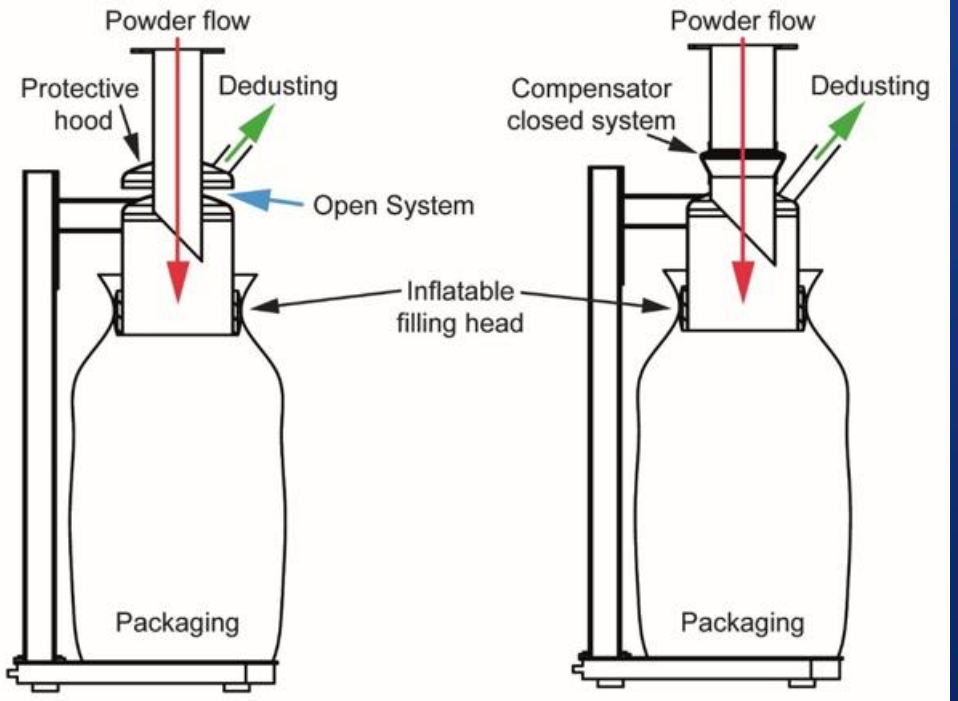

Figure 13 – Open and closed systems with a de-dusting capability

Hygienic design risk for filling devices	Possible solutions to overcome these risks
In open systems, contaminants may enter the product.	Proper zoning around the filling head. When an open system is chosen, the opening must be fitted with a protective hood. This cover must prevent the entering of foreign bodies into the open end of the bag.
In open systems, unfiltered air is drawn into the package during filling.	
In open systems, dust may be emitted into the environment.	Always use an open system with an effective de-dusting system
Product falling into the next packaging item or on to the floor (risk for cross contamination) during changeover of the bags or containers.	Minimize product built-up inside the filling-head and the hood, e.g. by smooth surfaces or appropriate surface treatment.
Systems with a hood as shown in Figure 13 still pose a hygienic risk due to the possible built-up of dust inside the hood which may fall into the bag.	Cover the filling head when not in use. Frequent cleaning of the area around the filling head (easy accessibility).
Leakage due to non-alignment of filling head and packaging (bag or container).	Use of proper connection devices (inflatable seals, spring connection, clamp connections).

Compensators

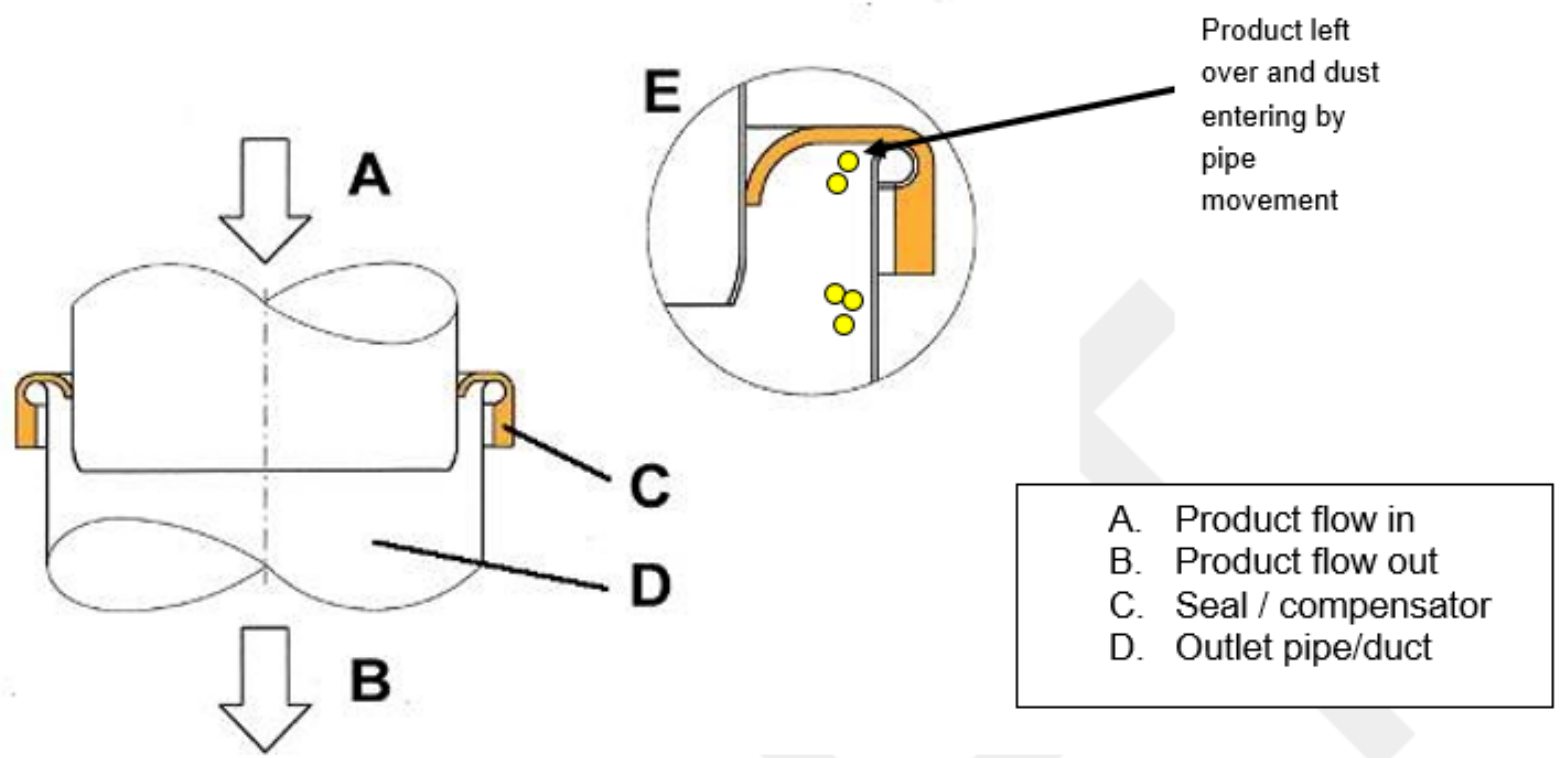

Figure 16 – Design of short stroke compensators

For wet cleaning, all compensation devices must be dismantled, wet cleaned and dried off-line.

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Flexible connections

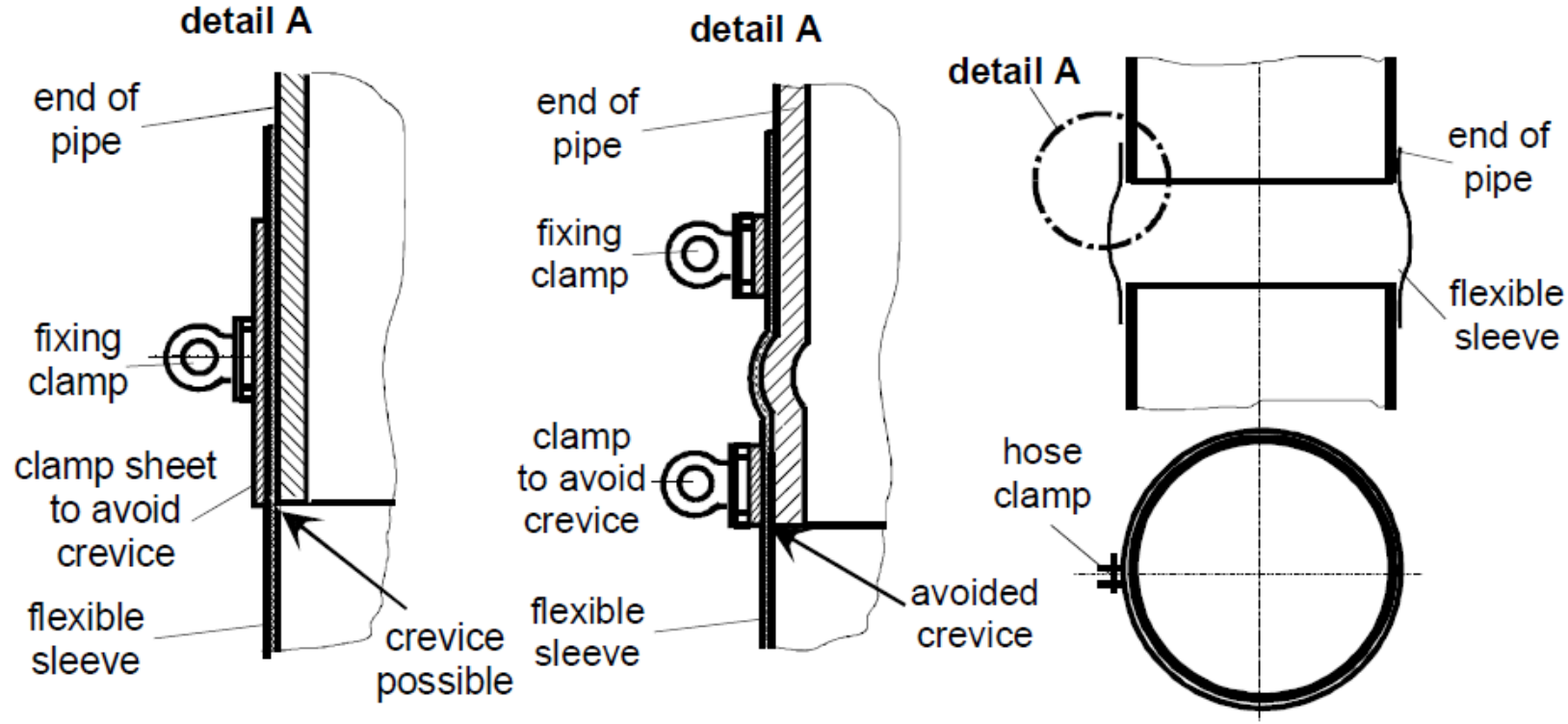

Fig. 5:
Examples of flexible connection duct ends (right). One ring clamp close end used for smaller diameters; crevice not totally avoidable (left). Application of two clamps, one of which is mounted directly at the end to avoid any crevice (middle).

Lighting

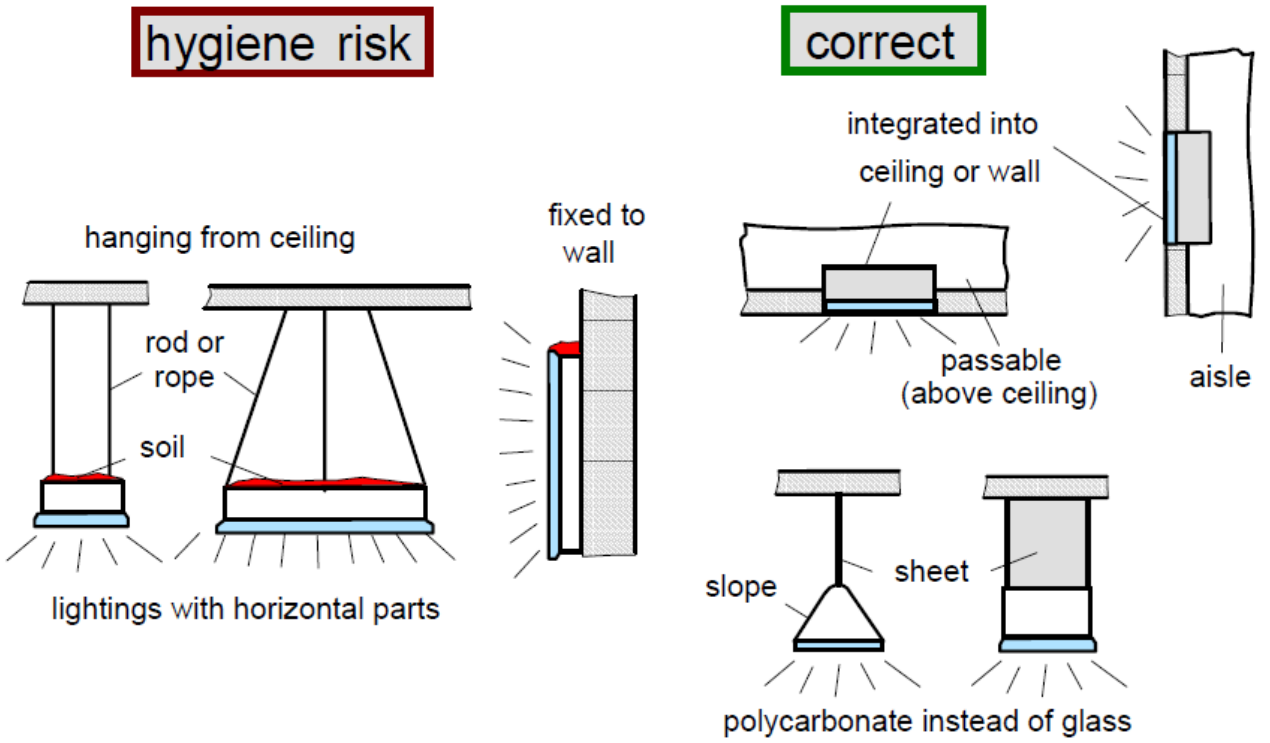

Fig. 3. Examples of hygienic lighting design

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Mounts

Picture 5: Mounting of rubber blocks

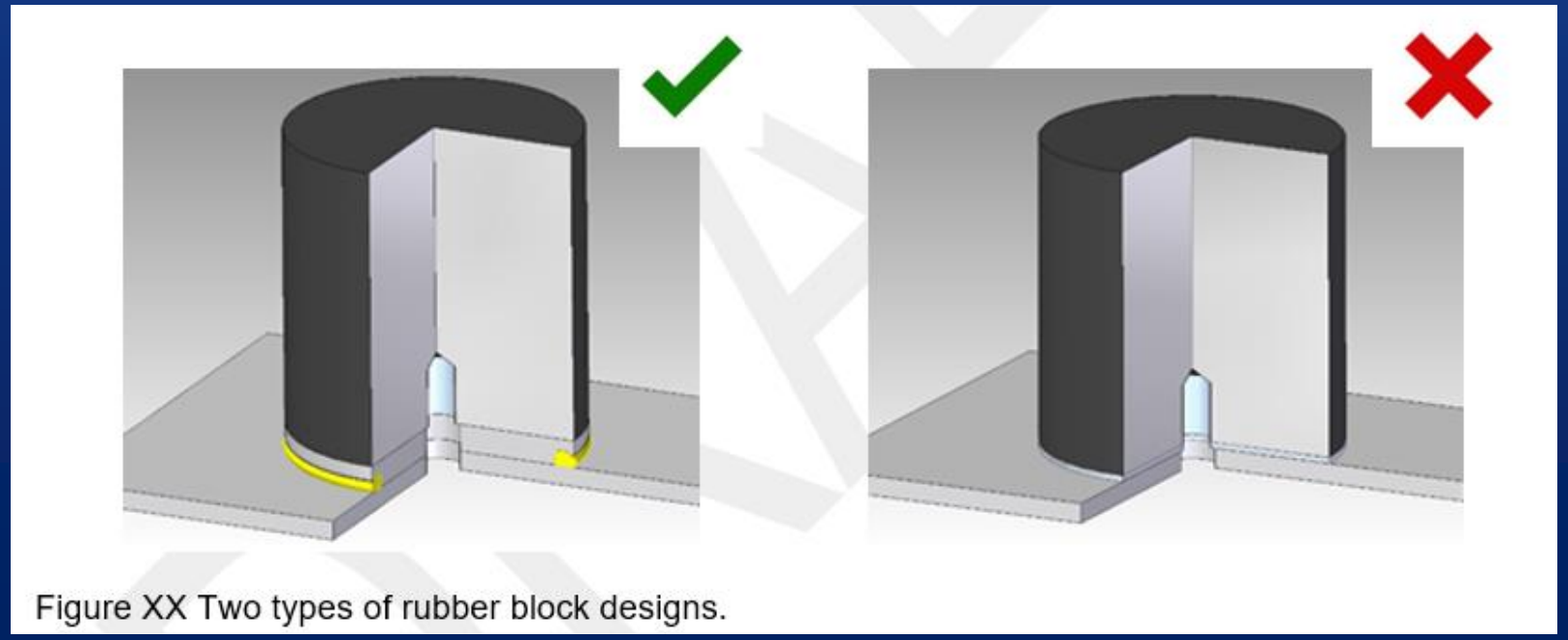

Figure XX Two types of rubber block designs.

Published documents on DMH

Doc. 22 Hygienic design criteria for the safe processing of dry particulate materials, March 2001

Doc. 26 Hygienic engineering of plants for the processing of dry particulate materials, November 2003

Doc. 29 **Hygienic design of packing systems for solid foodstuffs, December 2004**

Doc. 31 **Hygienic Engineering of Fluid Bed and Spray Dryer Plants, May 2005**

Hygienic Engineering of Discharging Systems for Dry Particulate Materials

Hygienic engineering of transfer systems for dry particulate materials

DOC 38 Hygienic Engineering of Rotary Valves in Process Lines for Dry Particulate Materials

DOC 40 **Hygienic Engineering of Valves in Process Lines for Dry Particulate Materials**

DOC 41 **HYGIENIC ENGINEERING OF DIVERTER VALVES IN PROCESS LINES FOR DRY PARTICULATE MATERIALS**

Documents in progres

Doc 53 Pack-off systems for dry material handling. To be published soon

Sieves and separators for dry matreial handling, in progress