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Use of plugs of bulk material in screw conveyors and product receivers for explosion isolation

Utilisation des bouchons de matériaux en vrac dans les convoyeurs à vis et les bacs de réception à des fins d'isolation contre les explosions

Schneckenförderer Explosions-Entkopplungssysteme

This Technical Report was approved by CEN on 13 June 2022. It has been drawn up by the Technical Committee CEN/TC 305.

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European foreword

This document (CEN/TR 17838:2022) has been prepared by Technical Committee CEN/TC 305 "Potentially explosive atmospheres - Explosion prevention and protection", the secretariat of which is held by DIN.

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Introduction

Screw conveyors are mechanical devices for the continuous movement, discharge or variable rate feeding of bulk materials in form of powder, granules or grain. They are often used horizontally or at a slight incline to discharge or feed silos, storage bins, filter units, mills or other equipment in many bulk handling industries.

Product receivers are silos, bins and hoppers used for temporary storage of bulk materials. The design of product receivers is determined by parameters such as storage capacity, throughput and overall height but also products properties such as powder cohesion, coefficient of sliding friction and permeability.

Both screw conveyors and product receivers can under certain conditions act as explosion isolation devices/systems in combination with the bulk material being handled by these pieces of equipment. This document presents the aforementioned conditions that are necessary to ensure explosion isolation. These conditions include dust properties and dust explosion properties, dimensions of the equipment and minimum requirements regarding the dimensions of the bulk material plugs.

1 Scope

This document describes the recommendations for the design and use of screw conveyors and product receivers which can in addition be used as a means for explosion isolation to prevent a dust explosion transmission into connected plant items by using the bulk material which is inside.

The recommendations given in this document are procedural measures since the properties of the bulk material affect the efficacy of this measure essentially (e.g. flow and explosion characteristics). Product receivers and screw conveyors cannot be considered as protective systems under the scope of the ATEX Directive.

As far as screw conveyors are concerned, the scope of this document is limited to rigid, tubular, singular screw conveyors which consist of a spiral blade coiled around a shaft held by external bearings (the rotating part of the conveyor is sometimes called “auger”).

NOTE Additional internal bearings can be necessary if the tubular screw conveyor exceeds a certain length.

This document includes limits of application where a plug of bulk material in a screw conveyor is not possible/sufficient to achieve explosion isolation and also application ranges where a plug of bulk material is not necessary to achieve explosion isolation.

This document does not address the mandatory risk analysis and ignition hazard assessment, which are performed for the application of the screw conveyors and product receivers. The mandatory risk assessment includes start-up and shut-down conditions, when potentially no plug of material is present to prevent explosion propagation. To mitigate this residual risk, it is possible to use as an extra measure, e.g. a traditional gate valve which prevents flame transmission and is able to withstand the expected maximum explosion pressure.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
screw conveyor
mechanical device for the continuous movement, discharge or variable rate feeding of bulk materials in form of powder and/or granules

Note 1 to entry: Screw conveyors are often used horizontally or at a slight incline to discharge or feed silos, storage bins, filter units, mills or other equipment in many bulk handling industries.

3.2
product receiver
enclosure such as silo, bin or hopper used for temporary storage of bulk materials