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Hazard assessment for the product transfer with the Powder Transfer System (PTS)

Customer

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Objective

The objective of this note is to assess the hazard due to electrostatic discharges during emptying a FIBC with the Powder Transfer System from Dietrich Engineering Consultants. The product from the FIBC, Biotin, will be transferred to a reactor filled with flammable solvent. The reactor has to stay inert during the transfer operation.

Equipment

The main body of the PTS consists of a stainless steal vessel with a volume of 47 l and a diameter of 300 mm. The connection between the vacuum system and the product layer forms a filter membrane made by conductive PTFE. The transfer hose is made by conductive PE-X inside and conductive EDPM outside.

Product

Biotin is a fine powder with a Minimum Ignition Energy between 1 mJ and 3 mJ. The Median of the grain size distribution is about 48 μm. The powder bulk resistivity is not known. The product delivered in the FIBC consists no flammable solvents.

Hazard

The powder bulk resistivity is not known but it is very likely that the product is non-conductive. During the transport through the hose an electrostatic charging will occur. This can cause electrostatic discharges.

Spark discharge:
If there are any conductive but not earthed objects present, electrostatic spark discharges will be the consequence.

Brush discharges:
The electrostatic charges distributed on a non-conductive product leads to brush discharges, which can not be avoided. The energy of this discharge type is very low, only on the presents of a flammable solvent an ignition hazard exists.

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Propagating brush discharge:
If there are any non-conductive coatings available in the apparatus, the possibility of a propagating brush discharge exists. If the breakdown voltage of the coating is less than 4 kV no hazard exists for a pure powder. As well depositions of powder on the surface of the apparatus can behave like a non-conductive coating.

Cone discharge:
Cone discharges can be neglected for the given product as long as the diameter of the vessel is less than 2 m.

Conclusions

A safe handling of the Biotin transfer between the FIBC and the reactor is possible with the Powder Transfer System from Dietrich Engineering Consultants, if the following conditions will be fulfilled:

- All conductive parts of the Powder Transfer System are earthed, especially the conductive filter membrane and both surfaces (inside and outside) of the conductive hose.
- No coatings with a breakdown voltage of more than 4 kV exists as well no depositions of Biotin.
- The main vessel of the PTS will be discharged with nitrogen.

With best regards

INSTITUTE OF SAFETY & SECURITY

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