Test results - EN 15051-2 Rotating Drum

Methods

The European standard EN 15051, rotating drum method, is intended to simulate handling processes, which involve multiple dropping of powdery bulk materials. The rotation of the drum releases dust particles from the solid sample material. The airborne particles are being transported in a well-controlled air stream to a filter assembly where the dust particles are collected. The mass of the collected dust is determined.

The sample [sample name] was divided into eight equal lots using a rotary riffler, which is especially designed to minimize the loss of any fine dust. One of these divided lots was used for determining the bulk density and the moisture content as well. The bulk density of the samples was determined by accurately weighing a volume of [volume] cm^3. These bulk density values were used to convert the sample mass to the required volume of approx. [volume] cm^3, and the sample was further divided into the required [volume] cm^3. A few grams of the sample were placed in the moisture analyser and heated to 105°C until a stable mass was reached. The relative mass loss so-obtained was quantified as moisture content as an independent triplicate.

The dust sampling system of the EN 15051-2 Rotating Drum method is constructed in such a way that the largest airborne particles are collected on a foam filter with 20 pores per inch foam. Smaller airborne particles pass through this filter and are collected on a second foam filter with 80 pores per inch foam. Only the smallest airborne particles pass through both foam filters and are collected on a glass fibre backing filter. The dust collected on the glass fibre backing filter is presented as the respirable fraction. According to the respirable convention, 98.7% of the particles collected by the EN 15051 methodology on this glass fibre backing filter then have an aerodynamic particle diameter ≤ 16 µm. The mass percentage of the airborne particles having an aerodynamic diameter ≤ 10 µm is calculated by expressing the average dustiness potential for the respirable fraction in kg/kg and by then multiplying that potential by 98.7%.

Additional information

The airborne dust is classified according to the aerodynamic particle size in the inhalable, thoracic and respirable fractions. The fractions correspond with 50% of the log-normal distribution of the conventions as displayed in Figure 1, which shows the inhalable, thoracic and respirable conventions according to the ISO 7708.

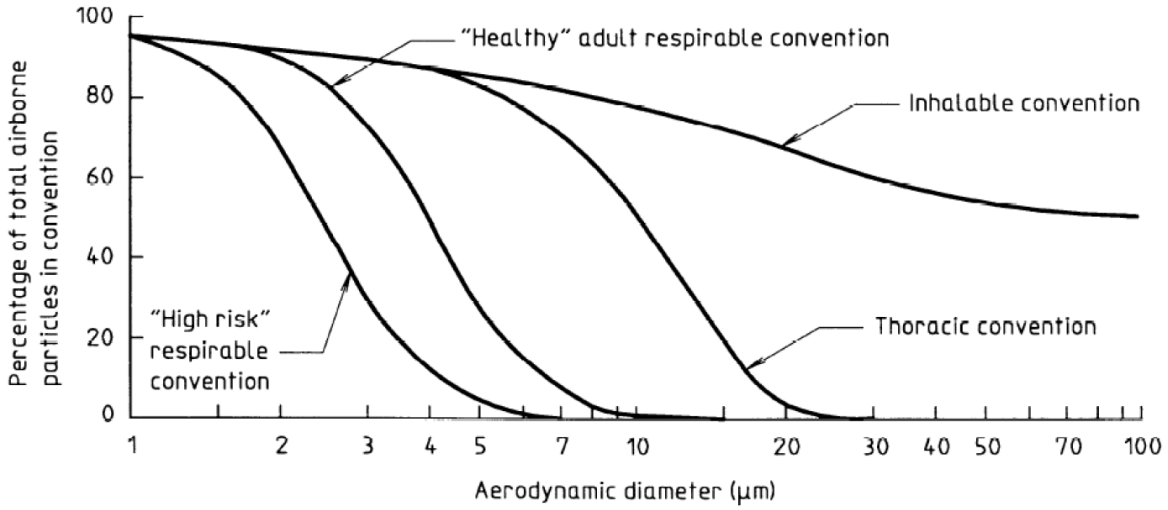

Figure 1. The inhalable, thoracic and respirable convention as percentage of total airborne particles.

The inhalable fraction is the mass fraction of total airborne particles which is inhaled through the nose and mouth. Experimental data on the inhalable fraction for particles with an aerodynamic diameter larger than 100 µm do not yet exist.
The thoracic fraction is the mass fraction of inhaled particles which penetrates beyond the larynx. The median value of the thoracic convention is 11.64 µm.
The respirable fraction is the mass fraction of inhaled particles which penetrate to the unciliated airways. These particles are considered to be most harmful and the presence of respirable particles is of particular health concern. The median value of the respirable convention is 4.25 µm and is applicable for healthy adults.

Results

The obtained results of the bulk density and moisture content are presented in Table 1 and are measured in accordance with EN 15051-1. According to EN 15051, the dustiness is assessed as the average of at least 3 tests up to a maximum of 6 tests, depending on the standard deviation. The dustiness mass of each health-related fraction is expressed in milligrams per kilogram (mg/kg). The investigations were performed with representative lots of the material at a laboratory temperature of [temperature]°C and a relative humidity [RH] %. The results are summarized in Table 2 and the standard classification is shown in Table 3.

Table 1. Bulk density and moisture content of the powder sample measured in accordance with EN 15051-1.

Sample name	Bulk density kg/m^3	Moisture content m/m%

[Sample name] has a bulk density of [d] kg/m^3 and a low moisture content of [X] m/m%.

Table 2. Summary of the dustiness data of **[sample name]** according to EN 15051-2, measured at a temperature of [temperature]°C and a relative humidity of [RH] %.

	[Sample name]						
	Sample mass	Inhalable fraction		Thoracic fraction		Respirable fraction	
	g	mg	mg/kg	mg	mg/kg	mg	mg/kg
1st test							
2nd test							
3rd test							
Average							
RSD%							
Classification							

Table 3. Dustiness classification in accordance with the EN 15051-2 standard.

Category of dustiness	Inhalable dustiness mass fraction, mg/kg	Thoracic dustiness mass fraction, mg/kg	Respirable dustiness mass fraction, mg/kg
Very low	<300	<80	<10
Low	300-650	80-300	10-60
Moderate	>650-3000	>300-1000	>60-210
High	>3000	>1000	>210

[Observations and discussions about the results and the sample]

Table 4 shows the mass percentage of the airborne particles having an aerodynamic diameter ≤ 10 µm. It can be concluded that the sample has less than [X] m/m% of airborne-made particles with an aerodynamic diameter ≤ 10 µm conform the EN 15051-2 methodology.

Table 4. Mass percentage of airborne particles with an aerodynamic diameter ≤ 10 µm of the [sample name] conform the EN 15051-2 methodology.

Sample name	Mass percentage ≤ 10 µm

Summary

Sample material:

Sample ID:

Testing method:

Sample amount:

Laboratory humidity:

Laboratory temperature:

Moisture content:

Bulk density:

Average dusting potential of three independent measurements:

	Dustiness	Classification
Inhalable fraction		
Thoracic fraction		
Respirable fraction		

Airborne particles with an aerodynamic diameter ≤ 10µm: [X] m/m%

End of the test report