



RISK ANALYSIS OF THE FLAMMABILITY OF THE COLOUR DUSTS (HOLI POWDER)

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INTRODUCTION

Dust flammability

Some dust, depending on the chemical composition, moisture and the particle size distribution, can generate an explosive atmosphere when dispersed into the air.

Safety problems

Dust handling and use still pose a potential explosion hazard not only in many industrial facilities but also in some sectors of society.

CIVIL SAFETY PROBLEMS, HOLI DUST





INTRODUCTION

The use of Holi dust (colour dust) is extensive around the world since the popularity of the parties and events with this kind of show is increasing considerably.

Its highly flammable nature is poorly known.

<https://www.youtube.com/watch?v=y7lMj-3l6fc>

It is essential to have a better knowledge → preliminary study of the flammability of 6 different Holi dust, originating by six different manufacturers (samples 1, 2, 3, 4, 5 y 6)

1. Dust characterization
2. Screening test to evaluate the flammability of the 6 samples
3. A risk analysis in order to define if the use of Holi dust is risk-free



SOLID CHARACTERIZATION

To prevent accident → knowledge about the flammability characteristics of the Holi powder !

Humidity composition

Particle size distribution

Chemical

Flammability tests → Is it a flammable dust?



SCREENING TESTS

MINIMUM IGNITION TEMPERATURE IN VERTICAL OVEN: The test verifies if suspended dust ignites when getting in contact with a hot surface set at a certain temperature. By means of compressed air, the sample is suspended in the air and is then forced to pass through the vertical oven.

MINIMUM IGNITION ENERGY: this test allows to determine if suspended dust produces ignition, controlling the energy of an electric spark applied. Two electrodes create the electric spark that will get in contact with the suspended dust producing or not the ignition.

FLAME INDEX A 1000°C: flame is applied to a line dust during a period of 5 minutes or until the inflammation is observed. the flame index test intends to prove if dust results flammable and if the ignition spreads when a flame is applied. The dust is placed in the form of a line, and a flame having a temperature higher than 1000°C is put into contact with one of the dust line sides. Thus, the flame propagation along the line is observed.



RESULTS

SOLID CHARACTERIZATION RESULTS

Sample	Moisture (%)	Deviation (%)
1	2,0	0,01
2	14,2	0,10
3	10,8	0,11
4	11,5	0,11
5	10,3	0,13
6	10,9	0,13

Sample	d(0.1) μm	d(0.5) μm	d(0.9) μm
1	1.9	12.0	56.1
2	9.3	14.4	22.0
3	8.2	15.3	60.1
4	9.3	13.9	20.6
5	9.3	13.9	20.6
6	10.9	63.0	334.4

Sample	Chemical composition
1	Talcum
2	Cornstarch
3	Cornstarch
4	Cornstarch
5	Cornstarch
6	Cornstarch



RESULTS

SOLID CHARACTERIZATION RESULTS

Minimum Ignition Temperature in Vertical Oven

Sample	Ignition
1	NO
2	YES
3	YES
4	YES
5	YES
6	YES

Minimum Ignition Energy (MIE)

Sample	0,9g		1,2g
	100 mJ	300 mJ	300mJ
1	NO	NO	NO
2	NO	NO	NO
3	NO	YES	YES
4	NO	NO	NO
5	NO	YES	YES
6	NO	NO	NO

Flame Index (FI)

Sample	Combustion
1	NO
2	PARTIAL
3	PARTIAL
4	PARTIAL
5	PARTIAL
6	NO



RESULTS

RISK ANALYSIS

Evaluation criteria for the MIE and minimum vertical oven tests

Visual flame checking	Score
No flame	0
Weak flame	1
Normal flame	2
Big flame	3
Violent flame	4
Very violent flame	5

Results of the risk assessment for MIE and Vertical oven tests.

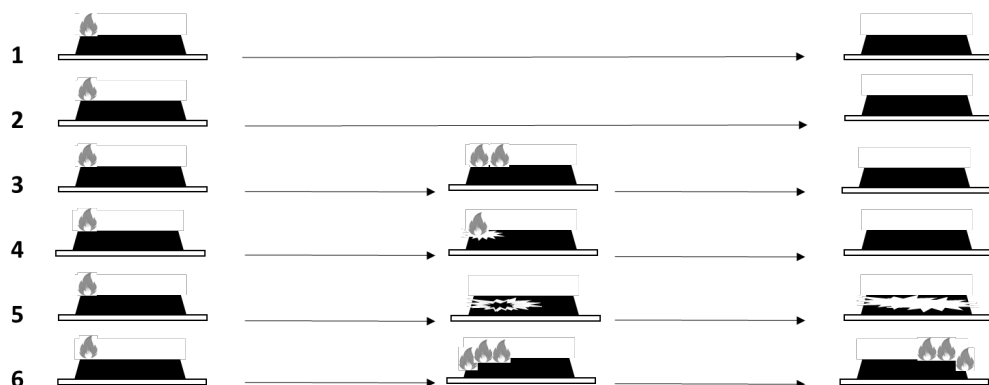
Sample	Vertical Oven	MIE 100 mJ	MIE 300 mJ	Vertical Oven
1	0	0	0	0
2	4	0	0	4
3	4	0	4	4
4	4	0	0	4
5	4	0	5	4
6	4	0	0	4



RESULTS

RISK ANALYSIS

Evaluation criteria for the Flame Index test



Results of the risk evaluation of the Flame Index test

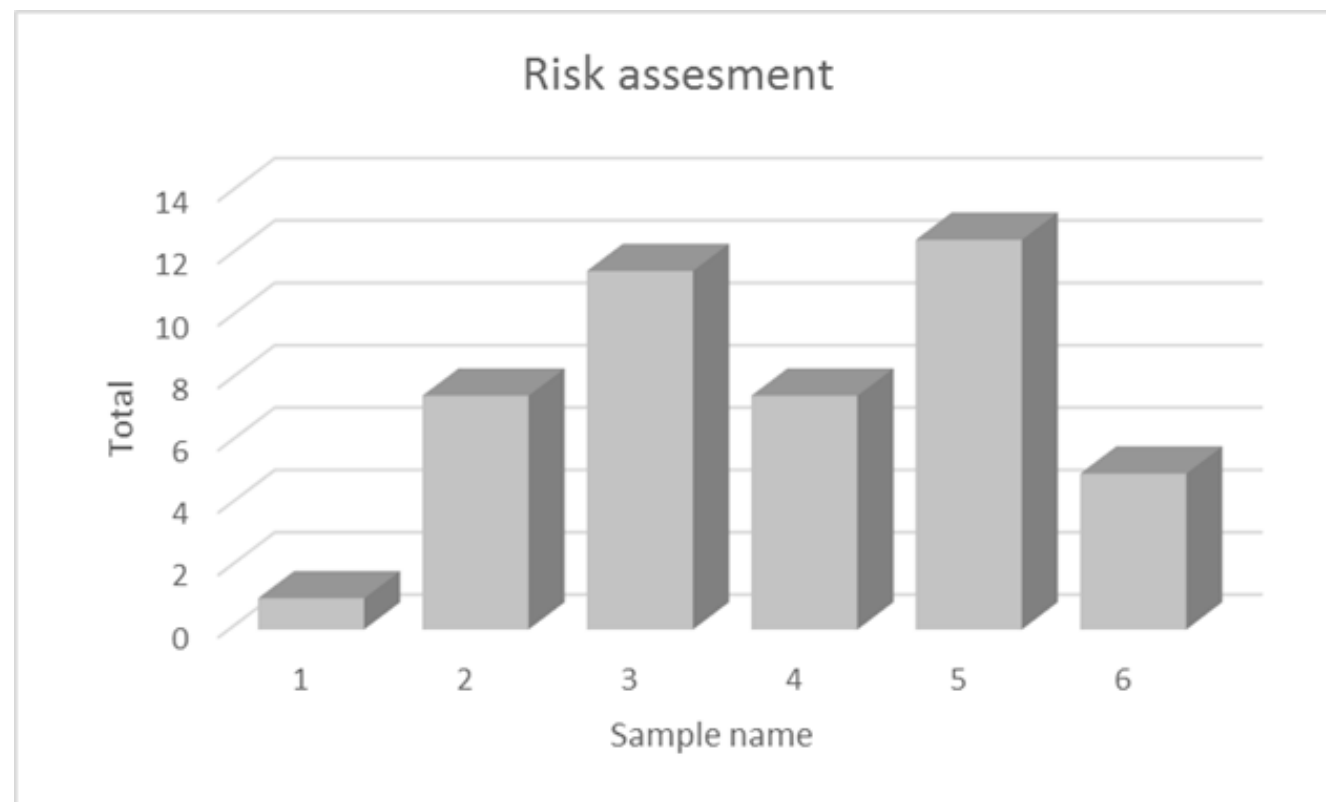
Sample	Combustion Class
1	1
2	3,5
3	3,5
4	3,5
5	3,5
6	1



RESULTS

RISK ANALYSIS

Sample	Total
1	1
2	7,5
3	11,5
4	7,5
5	12,5
6	5





CONCLUSIONS

ARE THE USE OF HOLI DUST FREE OF RISK? → NO!

When a sample obtains 1 point or less, the dust is not flammable enough. If a sample gets a score higher than 2, it can be confirmed its flammability.

The difference between the most flammable sample and the least flammable is remarkable.

Samples 2, 3, 4, 5 and 6 were flammable and are able to generate an explosive atmosphere.

Sample 1 dust is poorly flammable due to its high content in talcum.

Holi dust handling must be carried out carefully, becoming aware of its **flammable nature**, especially when it is used in confined atmospheres (indoor).

The composition of the Holi dust is fundamental regarding the flammability characteristics, being considerably safer the dust compositions based on talcum.



THANK YOU FOR YOUR ATTENTION

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