

Whitepaper  
**10 Process Safety Tips  
for Handling  
Chocolate Crumb  
Hazards**



Protecting against **dust explosions**: In chocolate production, even seemingly harmless ingredients can pose **risks**

Few of us associate danger with making chocolate, but if you think about it, Willy Wonka could have used some process safety tips for his factory. Of special concern in the real world is chocolate crumb, which is a compound ingredient used to make milk chocolate and a variety of other chocolate flavoured products.

Despite its innocuous sounding ingredients (sugar, cocoa liqueur and milk), the risk of dust explosion is very real, as witnessed by the growing number of incidents in this sector. Exacerbating the problem is a lack of sensitisation to the hazards posed and the fact that attention tends to be focused on occupational or food safety rather than on process safety in food processing.



Stricter **ATEX** and **DSEAR** regulations, coupled with increased manufacturer **awareness**, are tackling the issue

**Tighter regulations through ATEX and DSEAR are helping to address this issue, as well as growing awareness on the part of manufacturers. To help safeguard against dust explosion and other incidents, we have assembled a list of 10 tips to promote the safe processing of chocolate crumb.**



**Be aware of the sources of dust...**

... and their potential to form clouds or accumulate in layers. Dust issues arise from the handling of all powders used in the process - sugar, cocoa and/or milk powder - and from the drying, handling and milling of chocolate crumb. Dust layers form on equipment and in silos. Secondary explosions, consuming fugitive dust releases, often cause greater devastation than the primary explosion. The key to success is elimination of the dust layers "keep it in the pipe" or reduction in fugitive dust emissions through enhanced housekeeping.



**Be aware of fire hazards ...**

... arising from both the self-heating of crumb during drying or in storage as well as mishandling of the fuel oil used in steam generation or for producing evaporated or condensed milk. Chocolate crumb is prone to selfheating at modest temperatures. This self-heating can propagate to flaming combustion - resulting in a hazard in its own right; but also introducing a potential ignition source in the process which could ignite a dust cloud. Specialist test methods are available to specify the onset temperature conditions of self-heating reactions.



## Prevent dust releases and ignition risks by implementing engineering controls and monitoring systems



### **Rotate materials stored in silos frequently...**

This prevents self-heating materials from remaining in the centre of the silo where heat loss is lowest. The selfheating may be a function of the Maillard reaction continuing after drying and cooling.



### **Prevent dust releases through consistent monitoring and safety measures.**

This includes good engineering controls e.g. sealing, double layering of flexibles, high integrity flexibles and the use of local exhaust ventilation to minimise dust build up, among other prevention strategies.



### **Carry out Mechanical Equipment Ignition Risk Assessments (MEIRA).**

Mills, bucket elevators, fans, drag link conveyors, screw conveyors and mixers are some of the types of machinery that could pose an ignition risk and should be evaluated.





Ensure employee  
**awareness and compliance**  
with **regulations like ATEX**  
and **DSEAR** to minimise  
safety incidents



**Implement a structured condition-based monitoring programme.**

This may be a combination of vibration monitoring and thermal imaging, or explosion protection or carbon dioxide monitoring could be necessary.



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**Analyse silos and dust extraction devices to ensure adequate explosion protection.**

Not only must the protective measures suit the type of silo or dust extraction filter in order to be effective, an appropriate maintenance programme must also be in place. The risk of explosion propagation between pieces of equipment is part of proper explosion protection and should not be overlooked.

**As is abundantly clear from this consolidated list, knowledge and expertise are crucial to minimise process related risks that can harm people, assets and the environment. This is why manufacturers of chocolate crumb need to be aware of the complex challenges they face in this arena. Implementing strong process safety management systems and raising the competence and awareness of employees relative to process hazards can make a substantial difference in reducing safety incidents, especially alongside compliance with regulations such as ATEX and DSEAR.**

# DEKRA Organisational & Process Safety Contact

DEKRA Organisational and Process Safety are a behavioral change and process safety consultancy company. Working in collaboration with our clients, our approach is to assess the process safety and influence the safety culture with the aim of making a difference.

In terms of behavioral change, we deliver the skills, methods, and motivation to change leadership attitudes, behaviors, and decision-making among employees. Supporting our clients in creating a culture of care and measurable sustainable improvement of safety outcomes is our goal.

The breadth and depth of expertise in process safety makes us globally recognised specialists and trusted advisors. We help our clients understand and evaluate their risks, and we work together to develop pragmatic solutions. Our value-adding and practical approach integrate specialist process safety management, engineering, and testing. We seek to educate and grow client competence in order to provide sustainable performance improvement. Partnering with our clients, we combine technical expertise with a passion for life preservation, harm reduction and asset protection.

We are a service unit of DEKRA SE, a global leader in safety since 1925 with over 48,000 employees in 60 countries and five continents. As a part of the world's leading expert organisation DEKRA, we are the global partner for a safe world. We have offices throughout North America, Europe, and Asia.

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