

2020

# COMBUSTIBLE DUST INCIDENT REPORT

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## **EXPLOSION AT FOOD WASTE RECYCLING PLANT INJURES FIVE**

Rose Hill, NC

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## **LESSONS LEARNED FROM TWO 2012 BRITISH COLUMBIA SAWMILL EXPLOSIONS**

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**DUST  
SAFETY  
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# MEET THE PROFESSIONALS

## DUST SAFETY MEMBER COMPANIES, REPORT SPONSORS AND PARTNERS

### MEMBER COMPANIES



### PARTNERS





## LETTER FROM THE AUTHOR

**DR. CHRIS CLONEY**

*Managing Director, DustEx Research Ltd.*



### ***Growth through community, connection and communication...***

As we turn towards what is hopefully the latter stages of the global Covid-19 pandemic, one thing is clearer than ever - the solution to the question “how do we keep people safe” needs to include an engaged community that is connected with effective communication.

Gone are the times when you could create a nice looking slide deck, stand on your soapbox and talk ‘at people’ to get them to change - if it ever existed at all.

Moving through 2021 and beyond, our role at DustEx Research is two-fold:

First is to create the communities, connection points, and communication channels to drive change in industries handling combustible dust. The [Dust Safety Academy](#) and [Dust Safety Professionals](#) platforms are products of this effort last year.

Second is to identify the unaddressed challenges causing loss of life and to design or partner on projects to address these challenges. Recent examples include the [Dust Safety Share Concept and Working Groups](#), the recent [CSB Dust Hazard Learning Review](#) and recent [NFPA Research Foundation Work on Dust Collection Systems](#).

Connecting these two roles together gives us the right people working together on the right problems at the right time.

By reading this report, visiting [DustSafetyScience.com](#), being a member of the [Dust Safety Academy](#), or using the [Dust Safety Professionals](#) portal, you are part of that community.

I want to close out by saying thank you for supporting our work and contributing to our mission of at least one year with zero fatalities globally by 2038. It means a lot to myself and to the DustEx Research team to have your support, and I know that together we will achieve our goals.

Stay Safe,

Chris

P.S. Have feedback on the incident reporting? Email me at [chris@dustsafetyscience.com](mailto:chris@dustsafetyscience.com).

***“My new normal is to continually get used to new normals”***

*- Unknown*

***“They told me a mask and gloves were enough to go to the grocery store... they lied, everybody else had clothes on”***

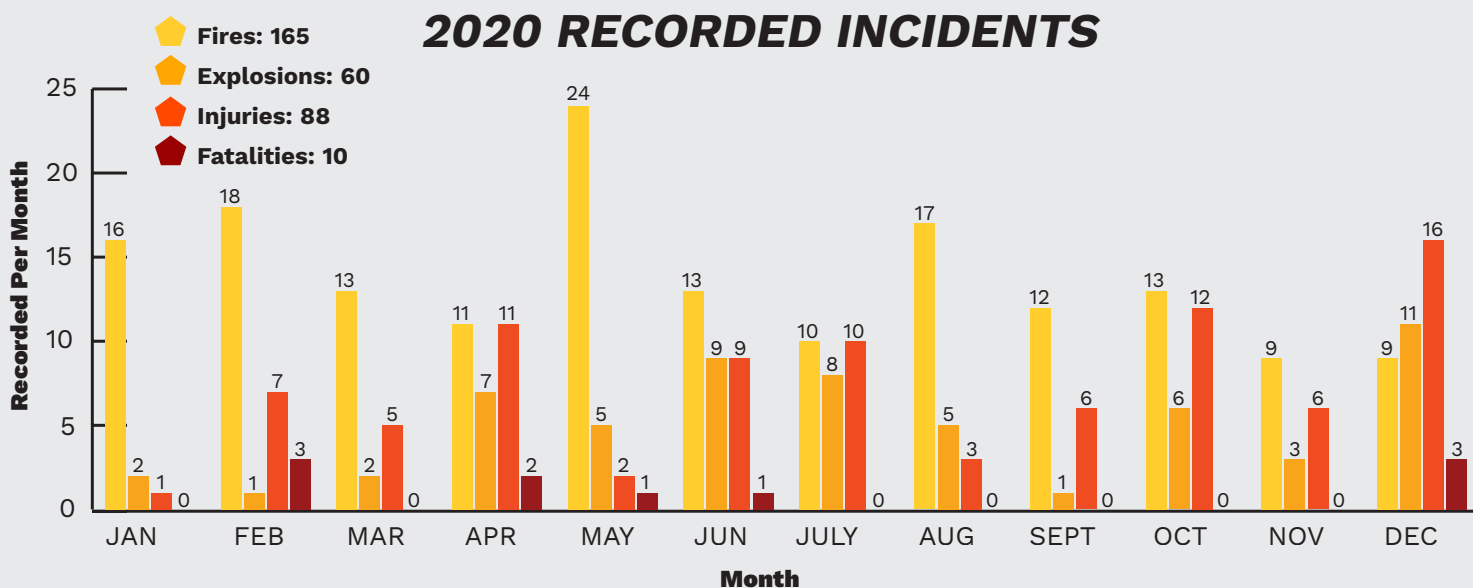
*- Unknown*



## INCIDENT DATA OVERVIEW

	UNITED STATES					CANADA					INTERNATIONAL			
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020	2017	2018 <sup>†</sup>	2019	2020
Fires	--	117	158	175	116	--	15	17	22	14	37	38	53	35
Explosions	31	28	37	37	26	2	4	4	1	7	36	27	37	27
Injuries	22	52	40	42	35	0	9	1	4	2	102	73	72	51
Fatalities	3	6	2	1	1	0	0	0	0	0	7	21	7	9

† A fatal grain dust explosion at a pet food facility in Treviglio, Italy on April 1, 2018 was added to the incident data from the last report.



## LOSS HISTORY - UNITED STATES

Loss history from dust explosions in the United States over the last five years is given in the following table. This data has been collected in the incident database and reported in the 2016 to 2020 combustible dust incident reports.

YEAR	EXP./YEAR	INJ./YEAR	FAT./YEAR
2016	31	22	3
2017	28	43	6
2018	37	30	2
2019	37	27	1
2020	26	23	1
5 year average	31.8	29.0	2.6

This data gives an average of 32 dust explosions, 29 injuries and 2.6 fatalities per year, over the last five years. Note that dust fires are excluded in this analysis.

## 2020 GLOBAL LOSS OVERVIEW

In 2020, 70% of the fatalities recorded occurred due to dust explosions. Of the injuries, 73% occurred due to explosions and 27% occurred due to fires. Some of the more severe incidents include:

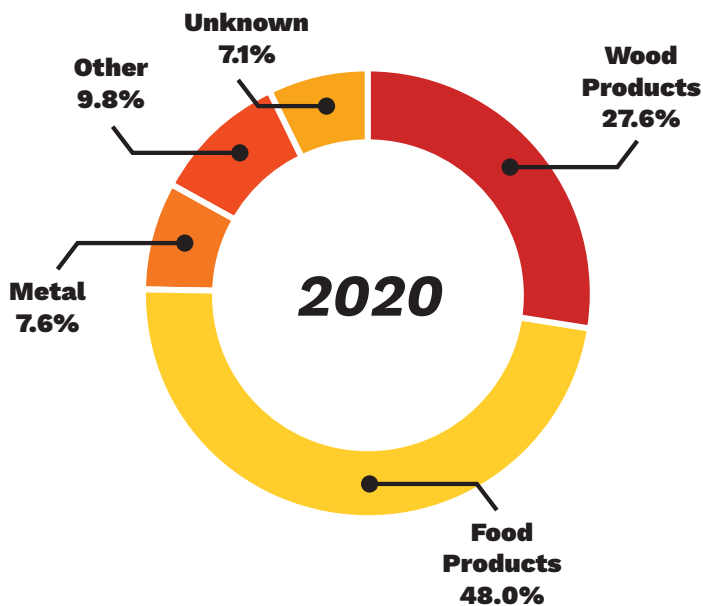
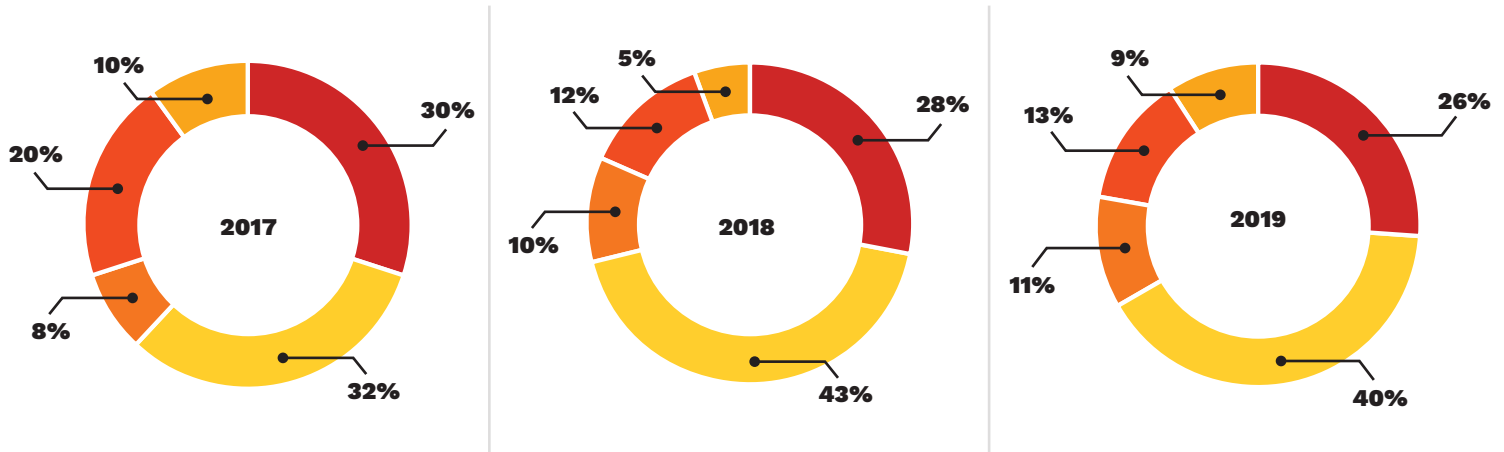
- [Five injured in food recycling dust explosion](#) (Rose Hill, NC)
- [One killed, three injured in dryer explosion](#) (Belle, WV)
- [One killed, four injured in feed plant explosion](#) (Shanxi, China)
- [One killed, four injured in dried sludge explosion](#) (Bristol, UK)

Limited information has been available for damages from dust explosions and fires. From the information that is available the following incidents resulted in more than \$1,000,000 in losses:

- [Wood chipping fire causes \\$2M in damages](#) (Ramseur, NC)
- [Paper products fire causes \\$2M in damages](#) (Mooresville, NC)
- [Sawmill destroyed by fire](#) (Cap-Pelé, New Brunswick)
- [Food plant fire causes \\$3M in damages](#) (Sibley, IA)

## MATERIALS INVOLVED

◆ Wood Products   
 ◆ Food Products   
 ◆ Metal   
 ◆ Other   
 ◆ Unknown



## DISCUSSION POINTS

From the global incident data, food and wood products made up over 75% of the fires and explosions recorded. These materials also resulted in 57% of the injuries and 40% of the fatalities. A breakdown of the fires, explosions, injuries and fatalities for each type of material is given as follows:

	FIRES	EXP.	INJ.	FAT.
WOOD	47	15	18	3
FOOD	80	28	32	1
METAL	10	7	13	1
COAL	4	0	0	0
PAPER	3	1	0	0
PLASTIC	1	1	1	0
SULFUR	2	1	5	0
TEXTILE	0	0	0	0
OTHER	4	5	13	5
UNKNOWN	14	2	6	0
<b>TOTAL</b>	<b>165</b>	<b>60</b>	<b>88</b>	<b>10</b>

The one fatality from metal dust and two injuries involved aluminum alkyl, while three of the injuries involved titanium. The other injuries from metal dusts involved four incidents where the type of metal was not specified.

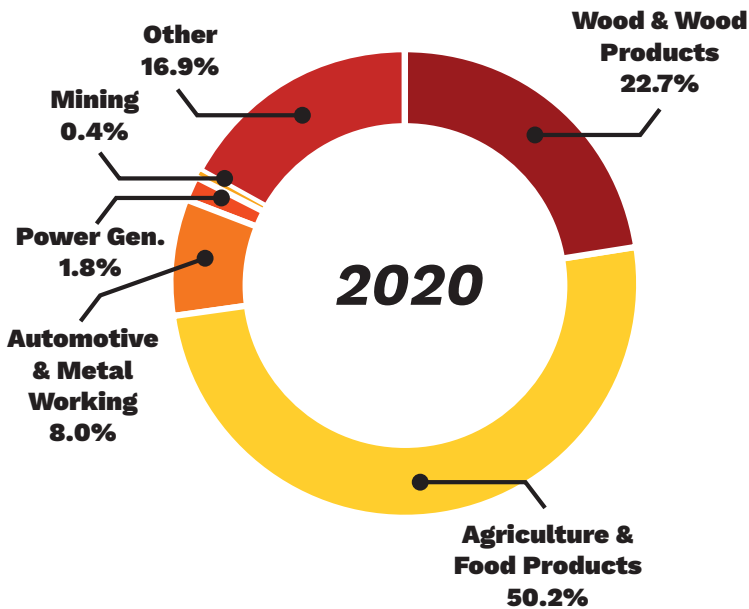
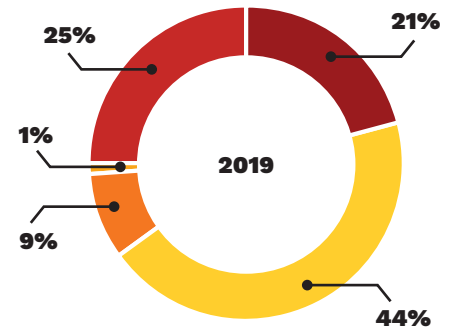
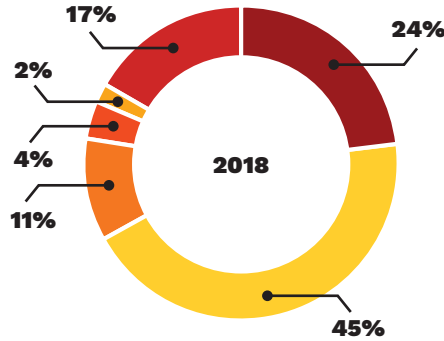
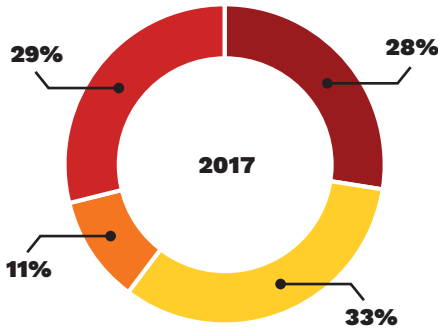
Two fatalities occurred in an explosion where unspecified raw materials were being added to a reactor, one fatality occurred when smashing unspecified chemicals in a tank, four fatalities occurred during a dried sludge explosion and one occurred in a bleach powder drier explosion.

### 2020 DETAILED ANALYSIS

Wood	27.6%	Sulfur	1.3%
Food	48.0%	Plastic	0.9%
Metal	7.6%	Other	4.0%
Coal	1.8%	Unknown	7.1%
Paper	1.8%		

## INDUSTRIES INVOLVED

◆ Wood & Wood Products    
 ◆ Agriculture & Food Products    
 ◆ Automotive & Metal Working    
 ◆ Power Generation    
 ◆ Mining    
 ◆ Other



### DISCUSSION POINTS

As shown in the historical data, wood processing, wood products, agricultural activity and food production make up a large portion of the overall fire and explosion incidents. Since 2017, wood and wood products have ranged from 21% to 28% of the incidents, while agricultural activity and food production has ranged from 33% to 44%.

As shown in the detailed incident breakdown, the “other” category includes pulp & paper, high schools, and educational facilities. Industries not broken out in the detailed breakdown include incidents in metal recycling, rail maintenance, display stand manufacturing, jewelry, surfactant manufacturing, plastic bottle manufacturing, chemical processing, phosphate production, waste treatment, composites manufacturing, and textiles.

Combined, the overall “other” category of industries makes up 28% of the injuries and 50% of the fatalities reported in 2020. Wood and wood products, agriculture and food processing, and automotive and metal working make up 19%, 43% and 8% of the injuries, respectively. Wood and wood products, and agriculture and food processing make up 30% and 20% of the fatalities, respectively.

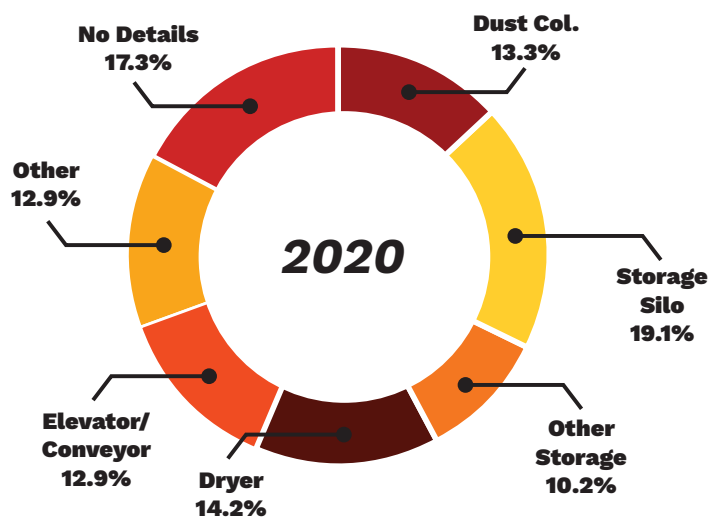
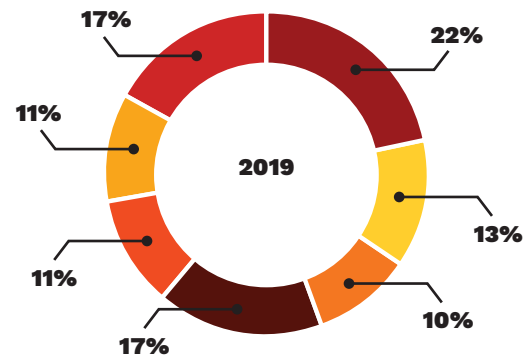
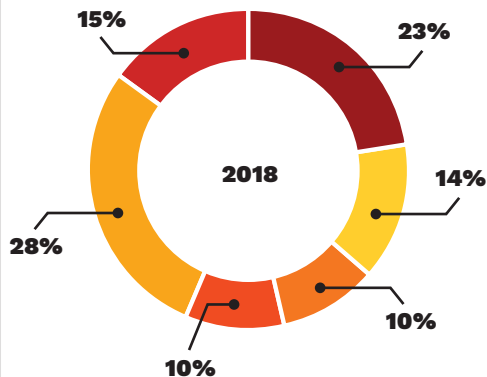
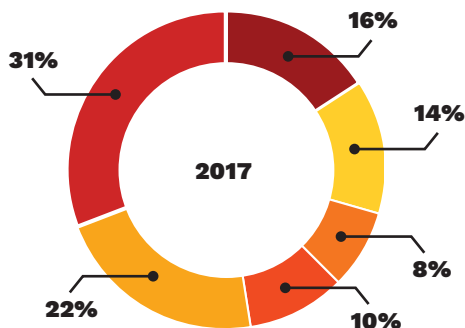
#### 2020 DETAILED ANALYSIS

<span style="color: #8B0000;">◆</span> Wood & Wood Pro.	22.7%	<span style="color: #FFD700;">◆</span> Mining	0.4%
<span style="color: #FFD700;">◆</span> Agriculture	32.9%	<span style="color: #8B0000;">◆</span> Pulp & Paper	3.1%
<span style="color: #FFD700;">◆</span> Food Processing	17.3%	<span style="color: #8B0000;">◆</span> Schools and Edu.	1.3%
<span style="color: #FF8C00;">◆</span> Metal Working	4.4%	<span style="color: #8B0000;">◆</span> Ethanol	0.9%
<span style="color: #FF8C00;">◆</span> Automotive	3.6%	<span style="color: #8B0000;">◆</span> Other	11.6%
<span style="color: #FF4500;">◆</span> Power Generation	1.8%		



## EQUIPMENT & CAUSES

◆ Dust Collector 
 ◆ Storage Silo 
 ◆ Other Storage 
 ◆ Dryer 
 ◆ Elevator/Conveyor 
 ◆ Other 
 ◆ No Details



buildings), dust collection systems, dryers and elevators. The breakdown between fires, explosions, injuries and fatalities for different pieces of equipment are summarized the following table for 2020:

	FIRES	EXP.	INJ.	FAT.
DUST COLLECTOR	27	3	4	0
STORAGE SILO	30	13	24	1
OTHER STORAGE	17	6	8	0
DRYER	23	9	5	1
ELEV./CONV.	22	7	3	0
OTHER	19	10	19	3
NO DETAILS	27	12	25	5
<b>TOTAL</b>	<b>165</b>	<b>60</b>	<b>88</b>	<b>10</b>

### DISCUSSION POINTS

In 2020, storage silos demonstrated the highest percentage of combustible dust incidents with 30 fires and 13 explosions reported. This is a higher percentage than the 2017 and 2018 reports which found that dust collection systems had the highest percentage of incidents. In 2020, only 13% of the fires and explosions occurred in dust collection systems.

As demonstrated in previous reports storage silos had the largest number of injuries. This is followed by other storage (e.g., small bins, hoppers and storage

Although equipment labeled under “Other” only had 13% of the total incidents, these incidents resulted in 22% of the injuries and 30% of the fatalities. Some of these included a spark that ignited varnish vapours and sawdust while doing maintenance on a staining machine, an explosion and fire in the ducting and mill of a pellet manufacturing process, an explosion of a combination of titanium and calcium powder in a chemical processing unit, a dust fire and a dust explosion occurring while using a welding machine in a dusty area, an explosion in a raw material feed tank into a reactor, and an explosion in a plastic extruder system.

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## 2020 OSHA CITATIONS

ISSUE DATE	INDUSTRIAL ACTIVITY	STATE	VIOLATIONS	INT. PEN.	CUR. PEN.	INSPECTION	STATUS	CITATION LINK
Jan 24	Metal Coating Manufacturer	AL	5	\$32,116	\$20,875	1419821.015	Closed	<a href="#">More Info</a>
Jan 24	Vitamin Manufacturing	NJ	20	\$46,268	\$46,268	1418803.015	Pending Abatement	<a href="#">More Info</a>
Jan 24	Vitamin Manufacturing	NJ	20	\$46,268	\$46,268	1418803.015	Pending Abatement	<a href="#">More Info</a>
Jan 29	Packaging Supplies Manufacturing	MA	3	\$8,202	\$5,400	1420273.015	Closed	<a href="#">More Info</a>
Feb 3	Plastic Fabrication	IL	3	\$10,795	\$6,477	1432893.015	Closed	<a href="#">More Info</a>
Feb 7	Woodworking and Finish Carpentry	PA	7	\$9,253	\$6,477	1423279.015	Pending Abatement	<a href="#">More Info</a>
Feb 20	Dry Mix Manufacturing	NY	7	\$12,183	\$7,919	1444328.015	Closed	<a href="#">More Info</a>
Mar 18	Rubber Products Manufacturing	OH	3	\$17,812	\$17,812	1438470.015	Under Contest	<a href="#">More Info</a>
Mar 23	Hardwood Flooring Manufacturing	WI	5	\$22,859	\$11,429	1448694.015	Payment Plan	<a href="#">More Info</a>
Mar 31	Mushroom Farming	PA	1	\$8,848	\$7,000	1461015.015	Closed	<a href="#">More Info</a>
Apr 6	Carbon Fiber Products Manufacturing	WV	2	\$6,940	\$6,940	1456419.015	Under Contest	<a href="#">More Info</a>
Apr 7	Logistics	GA	2	\$18,892	\$9,446	1436889.015	Payment Plan	<a href="#">More Info</a>
Apr 16	Wood Product Manufacturing	ME	2	\$7,712	\$3,856	1439879.015	Payment Plan	<a href="#">More Info</a>
Apr 22	Spice Supplier	NJ	15	\$72,868	\$51,000	1440107.015	Open	<a href="#">More Info</a>
May 7	Food Dehydration	IL	4	\$22,554	\$11,000	1448575.015	Closed	<a href="#">More Info</a>
May 8	Steel Production	PA	7	\$18,352	\$10,000	1444579.015	Closed	<a href="#">More Info</a>
Jun 8	Chemical Additive Manufacturing	WV	2	\$8,675	\$4,338	1452323.015	Pending Abatement	<a href="#">More Info</a>
Jun 9	Woodworking and Finish Carpentry	WI	1	\$3,277	\$1,000	1463075.015	Payment Plan	<a href="#">More Info</a>
Jul 22	Furniture Manufacturing	GA	4	\$14,574	\$5,000	1474773.015	Pending Abatement	<a href="#">More Info</a>
Jul 24	Grain Milling	NY	1	\$9,639	\$9,639	1459566.015	Under Contest	<a href="#">More Info</a>
Jul 27	Electronic and Regular Waste Recycling	WI	7	\$45,804	\$27,808	1458858.015	Pending Abatement	<a href="#">More Info</a>
Jul 29	Automotive Parts Manufacturing	PA	1	\$10,603	\$6,400	1459940.015	Pending Abatement	<a href="#">More Info</a>
Aug 4	Plastic Fabrication	OH	7	\$36,266	\$21,760	1468639.015	Payment Plan	<a href="#">More Info</a>
Sep 4	Machined Parts Manufacturing	WI	1	\$9,446	\$6,000	1469325.015	Pending Abatement	<a href="#">More Info</a>

**Inspections Resulting In Citations: 24**  
**Total Citations: 130**

**Total Initial Penalties: \$500,206**  
**Total Current Penalties: \$350,112**

**Initial Penalty/Citation: \$3,848**  
**Initial Penalty/Inspection: \$20,842**

\*Information was collected from OSHA Data & Statistics by searching for “dust” within inspection details from citations made using the General Dusty Clause.





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## **HOT WORK EXPLOSION AT FOOD WASTE RECYCLING PLANT IN ROSE HILL, NORTH CAROLINA**

**MARCH 11, 2020**

**Five Injuries**

---

### ***BACKGROUND***

The company involved is a food waste recycling company who creates animal feed products. It was founded in 1949 and has outlets throughout the eastern United States. At the time of the explosion contractors were on site and believed to have been performing hot work activities.

### ***INCIDENT DESCRIPTION***

The explosion happened in the plant's finished product area, which was described as a "dusty area" by company representatives. It was also suggested that hot work permits had not been issued prior to welding and cutting equipment in the area.

During the hot work activities an explosion occurred. Little information is available on the extent of equipment damage from the explosion inside the facility.

### ***OUTCOME***

Five workers were injured during the explosion, resulting in three medical helicopters being brought in. They were airlifted to a regional burn center, some of them with third-degree burns. It is unclear how many of those injured were part of the external contracting team.

**Incident Database:** [Welding in Dusty Area of Food Recycling Plant Causes Explosion](#)

## **METAL DUST EXPLOSION AT A STEEL MANUFACTURER IN PLUM BOROUGH, PENNSYLVANIA**

**APRIL 4, 2020**

**Three Injuries**

---

### ***BACKGROUND***

The company involved is a steel manufacturer that specializes in the treatment of liquid steel. It has sales and/or production sites in the US, Mexico, Europe, the Middle East, Africa, and Asia. The company's product line includes calcium bearings, aluminum rods, carbon, sulphur, iron, lead, bismuth, and other types of cored wires.

### ***INCIDENT DESCRIPTION***

On April 4th, 2020 an explosion and fire was reported at the steel manufacturing company.

According to the Unity Volunteer Fire Department, workers inside the facility were dealing with a combination of titanium and calcium powder. A machine with both of these chemicals inside caught fire and exploded.

About a dozen people were inside of the facility at the time and evacuated. They called Allegheny County Dispatch to report the incident as well as the type of chemicals involved so firefighters could be aware of the hazards.

The machine's suppressor system helped to prevent the spread of the fire. Fire crews had the fire contained in about 45 minutes.

### ***OUTCOME***

Three workers were taken to the hospital with non-life threatening inhalation-related injuries. An OSHA investigation search turned up previous violations involving combustible dust from 2017.

**Incident Database:** [Explosion and Fire at Steel Manufacturer Leaves Three Injured](#)



## **METAL DUST EXPLOSION AT A CHEMICAL PROCESSING LAB IN SEOSAN, SOUTH KOREA**

**MAY 19, 2020**

**One Fatality and Two Injuries**

---

### ***BACKGROUND***

The company involved is a chemical company headquartered in Seoul, South Korea. It was founded in 1947, has 62 locations across the globe, and specializes in the production of petrochemicals and ABS, a plastic used in the manufacturing of automobiles, home appliances, and IT devices.

### ***INCIDENT DESCRIPTION***

On May 19, 2020, an explosion and fire was reported at a chemical research lab in Seosan, South Korea.

One person was killed and two others injured when the explosion occurred in the site's packing room at about 2:20 p.m. According to one source, ignition took place when air contacted aluminum alkyl, a pyrophoric fine powder material, while another source claimed that the powder exploded due to high pressure as it was being transported.

Crews managed to put out the flames by 3:30 p.m. The facility was shut down so the company could investigate the incident.

The deceased person was identified as a 39-year-old researcher. The other two workers suffered second-degree burns and were taken to an area hospital for treatment.

### ***OUTCOME***

No further information is available on the follow up after this incident.

**Incident Database:** [One Killed and Two Injured in Explosion at South Korean Chemical Lab](#)

## **WOOD DUST EXPLOSION AT PELLET PLANT IN JAFFREY, NEW HAMPSHIRE**

**JUNE 23, 2020**

**One Injury**

---

### ***BACKGROUND***

The company in the incident is reported as a wood pellet production company. It was founded in 1992 in Massachusetts and moved to New Hampshire in 1995.

### ***INCIDENT DESCRIPTION***

On June 23, 2020, a dust explosion and fire was reported at the wood pellet plant in Jaffrey, New Hampshire.

First responders arrived at the plant at around 9:30 p.m. They found heavy smoke conditions in the pellet mill manufacturing area and determined that fire was in two areas of the mill. Although the pellet conveyor system had been severely damaged, all employees had been evacuated and accounted for.

After the flames were extinguished, fire crews found several smaller fires in the roof's steel beams. They had ignited due to an accumulation of wood dust. Firefighters remained on scene for approximately two and a half hours.

The Peterborough Fire Chief said that combustible wood dust had apparently caught fire during the pellet-making process, injuring one employee who had to be treated for minor injuries at a local hospital.

**Continued on next page....**

The Jaffrey Fire Chief stated that the facility was shut down to carry out cleaning and repairs. The cause of the fire is under investigation.

## **PREVIOUS INCIDENTS & CITATIONS**

This facility also experienced dust fires on May 12, 2019 and October 23, 2011. The early fire required response from more than 100 firefighters.

On March 13, 2013, an OSHA violation was reported for multiple alleged combustible dust-related citations, four months after the company agreed to pay \$100,000 to settle violations stemming from the October 2011 fire.

**Incident Database:** [Dust Explosion at Wood Pellet Plant Leaves One Employee Injured](#)

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## GRAIN DUST EXPLOSION AT RICE PROCESSING FACILITY IN STUTTGART, ARKANSAS

**OCTOBER 15, 2020**

**Three Injuries**

---

### **BACKGROUND**

The company where this incident took place is a rice miller and marketer headquartered in Stuttgart, Arkansas. It was founded in 1921 and manages more than 125 million bushels of grain, equivalent to roughly 25 percent of the total United States crop.

### **INCIDENT DESCRIPTION**

On October 16, 2020, an explosion was reported at a rice processing facility in Stuttgart, Arkansas.

When firefighters arrived, they were met by a supervisor who told them that there had been an explosion and the sprinkler system had been activated on the first floor but not the upper ones. Crews made their way to the third floor, extinguishing hot spots as they found them.

At the top of the grain bins, they found a long, open room filled with smoke and dust. Around 15 ducts were separated from the bins and seriously damaged. When firefighters found multiple hot spots on the floor and on top of the ducts hanging from the ceiling, they pulled the ductwork down to eliminate the spread of the flames.

The cause of the explosion is under investigation, but a company representative stated that it appeared to have been caused by a spark igniting grain dust in the rice storage building.

### **OUTCOME**

Three workers suffered minor injuries, for which they received hospital treatment. A building used to store rough and milled rice experienced significant damage.

**Incident Database:** [Explosion at Rice Processing Facility Leaves Three Workers Injured](#)

## **GRAIN DUST EXPLOSION AT GRAIN ELEVATOR IN SUPERIOR, NEBRASKA**

**OCTOBER 31, 2020**

**Three Injuries**

---

### ***BACKGROUND***

The company involved is an agricultural cooperative founded in 1908. It is headquartered in Aurora, Nebraska and has over 80 locations across several states.

### ***INCIDENT DESCRIPTION***

On November 1, 2020, an explosion was reported at an agricultural cooperative in Superior, Nebraska.

The Nuckolls County Sheriff's Office got a 911 call of the explosion at around 4:15 p.m. Local fire departments and co-op personnel worked overnight and most of the day Sunday hauling water to the scene in tanker trucks. Highway 8 was temporarily closed down during the firefighting efforts but opened back up later.

Fire crews were on scene for over 24 hours. However, the Hastings Tribune reported that the following day, they were called back at about 5:17 a.m. to deal with some flare-ups.

An investigator for the Nebraska State Fire Marshal's Office concluded that the incident originated in the grease and grain shaft between the bearing and the north side of the head bonnet at the top of the south elevator leg, which led to other explosions. The heat for ignition was from the failure of the bearing on the north side of the head pulley of the south leg of the elevator.

### ***OUTCOME***

Three people were injured and required hospital treatment.

**Incident Database:** [Multiple Injuries Reported in Grain Elevator Explosion at Nebraska Co-op](#)

## **DRIED SLUDGE EXPLOSION AT WASTEWATER TREATMENT PLANT IN AVONMOUTH, BRISTOL**

**DECEMBER 3, 2020**

**Four Fatalities, One Injury**

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### ***BACKGROUND***

The company involved is a regional water and sewerage business serving 2.8 million customers across the south west of England. At its wastewater treatment plant in Avonmouth, biosolids are treated and turned into organic soil conditioner.

### ***INCIDENT DESCRIPTION***

On December 3, 2020, an explosion was reported at a wastewater plant in Avonmouth, Bristol, in the UK.

Three employees and one contractor were killed when a silo that held treated biosolids exploded. A fifth person was injured but their injuries were not reported as life-threatening.

The Avon Fire and Rescue Service was called to the scene at 11:22 a.m. Six fire engines and rescue dogs soon arrived.

According to a police services representative, the explosion occurred in a silo holding organic matter from sewage before it “is recycled to land as an organic soil conditioner.”

One witness said he had heard a “boom and echo” and at first thought a car accident had occurred.

On December 4, it was confirmed that a 16-year-old apprentice was among four people killed in the explosion. It added that a crowdfunding campaign would be launched to support the families of those who were killed.

### ***OUTCOME***

No further information is available on the follow up after this incident.

**Incident Database:** [Four Workers Killed in Silo Explosion at UK Wastewater Treatment Plant](#)

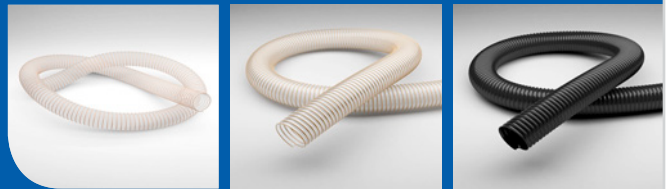
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**DSS097:**

## **LESSONS LEARNED FROM TWO BRITISH COLUMBIA SAWMILL EXPLOSIONS IN 2012 WITH DAVID MURRAY**



### **INTRODUCTION**

In this episode of the Dust Safety Science Podcast, David Murray, Corporate Safety HR and Environment Manager for a British Columbia Lumber and wood products company, and co-chairperson of the Manufacturing Advisory Group (MAG) in British Columbia, shares lessons learned from two British Columbia sawmill explosions that occurred in 2012.

David has over 15 years of experience in the BC woodworking industry. He has held various safety coordinator and manager roles. Last June, he wrote an article for Dust Safety Week hosted by Canadian Biomass Magazine titled *Lightning Doesn't Have To Strike: Lessons Learned from the 2012 BC Combustible Dust Explosions*.

This article shared some key insights into ways that industries handling combustible dust can make their facilities safer. In this episode, David delves further into the subject by answering the following questions:

- What happened during these 2012 sawmill explosions?
- How did the industry respond to the challenge?
- Has any headway been made in combustible dust safety since 2012?
- What were the first steps?

### **WHAT HAPPENED DURING THESE 2012 SAWMILL EXPLOSIONS?**

In January 2012, an explosion occurred at the Babine Forest Products sawmill, injuring many and tragically killing two employees. A few months later in April, a

Lakeland sawmill exploded and killed two employees and injured many others.

“Industry stakeholders such as myself were caught completely off-guard by these two tragic events,” David says. “The first explosion came truly as a complete surprise. The second explosion proved those who believed the first one was an isolated event (to be) wrong.”

Wood mill employers, employees, regulators, and associations all reacted with confusion. What caused these explosions? What was to be done about them?

The employer group under the MAG pulled together a combustible dust taskforce that included a steering committee of the major CEOs, a union president, and a technical working group consisting of company safety experts and combustible dust experts from the insurance brokerages.

The major output from the MAG combustible dust taskforce was the MAG dust audit and its system. A scalable combustible dust program was designed with the necessary training infrastructure and control measures to mitigate combustible dust risk. To be a MAG member company today, a company needs to implement and maintain that MAG dust audit.

### **HOW DID THE INDUSTRY RESPOND TO THE CHALLENGE?**

David said that no one could have predicted the magnitude of the 2012 explosions. Once the problem was researched and understood, he felt that addressing it was

going to be difficult. Even his first draft of a combustible dust mitigation program had to be adjusted to allow for alternative depth thicknesses than the original NFPA requirements.

“One has to remember that most sawmill machinery were uncontained creators of high volumes of fine secondary wood dust that collected everywhere in the upper reaches of each facility,” he says. “The engineered controls for removing sawdust were at a macro level. Only the highest-speed machines that produced a great volume of that fine dust had dust extraction equipment like baghouses and cyclones.”

## **HAS ANY HEADWAY BEEN MADE IN COMBUSTIBLE DUST SAFETY SINCE 2012?**

David acknowledged that “the impossible was made possible.” Wood product manufacturers in BC have the necessary control measures in place to prevent an explosion from happening. They include:

- Assessments
- Training
- The required level and type of cleanup
- Inspections
- Stakeholder collaboration
- Regulatory consultation and oversight
- Control devices
- Audits
- Investigations
- Reporting

“It’s a long list and it’s not exhaustive, but these are all things that need to be in place and at a certain level in order to actually prevent an explosion from occurring,” he says.

## **WHAT WERE THE FIRST STEPS?**

David said that all stakeholders started by sharing a combustible dust mitigation program amongst themselves while they waited for the results of the explosion investigations. WorkSafeBC, the BC Safety Authority, (now Technical Safety BC) and the Office of the Fire Commissioner in BC issued several blanket orders for BC sawmills to implement, and each were designed to address the findings from their investigations.

- WorkSafeBC began several phases of targeted combustible dust inspections.
- The BC Safety Authority required a hazardous locations assessment that categorized the dust risk throughout facilities
- The BC Fire Commissioner required fire department inspections of all sawmills and eventually the creation and implementation of a fire safety plan.

These three regulators worked with the industry and the unions to develop fire explosion prevention training. “I think that some of the products that they developed were quite great,” David says.

## **CONCLUSION**

“Truly, to prevent similar catastrophes from occurring, the safety system must measure and prioritize the prediction of potential serious injury and fatality events,” David says. He also recommends that:

- Stakeholders running the safety system build and maintain trusting effective and cooperative relationships conducive to keeping workers safe.
- All measures be taken to avoid complacency. “Complacency is almost like combustible dust: an insidious danger,” he warns. “[It] causes people to convince themselves that a terrible event cannot happen to them.”

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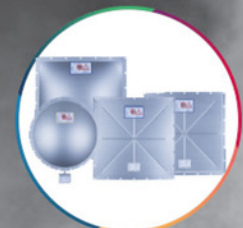
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**DSS109:**

## **CASE STUDY – THE TRUE COST OF IGNORING YOUR COMBUSTIBLE DUST CHALLENGES**



### **INTRODUCTION**

We've devoted many podcast episodes to case studies, due to insights they can provide and the lessons we can take away. Today, we'll be talking about a facility that had multiple incidents over time and what the true cost of ignoring your combustible dust challenges can be.

We had been watching this facility for a while. It had experienced multiple fires and explosions in the past and we often track these facilities over time to see how they're making out. Unfortunately, we recently learned that they were shutting down. However, reviewing the company's history can illustrate the true cost of ignoring your combustible dust challenges.

### **COMPANY BACKGROUND**

We're not going to name the company in this episode. Instead, we'll be going over the general information about this case. We have a handful of fire investigation reports and have some OSHA citations that helped us put a timeline together.

The facility was built in late 2016. They had three to four dozen employees and were located in a town of about 2,000 people. In the three-year period that it was operating, they had at least six fires. One of them resulted from a dust explosion that injured a worker with first and second degree burns and sent them to the hospital.

They had five OSHA inspections, three with citation penalties. There was a lot of equipment damage from these

fires. They had challenges with building permits. They had challenges with lawsuits. Challenges with fines from their municipality. All of these difficulties were due fire and explosion safety issues, particularly combustible dust.

### **WHAT HAPPENED?**

A few months after opening in December 2016, they had a fire that destroyed their wet scrubber. There is not a lot of information on this fire but it played a big role in the negative public image that began to grow due to the very bad smell coming from the plant. This eventually led to a lawsuit filed against the company by the community.

A few months later, in June 2017, they had a baghouse fire, which resulted in \$200,000 in damages. A month later, in July, they had a dust explosion that injured a worker and resulted in OSHA fines. In October that same year, they had a consultant come in to do a walkthrough and review of their combustible dust program. This party tested their dust, found it explosible, and recommended isolation and explosion protection on the dust collector. They couldn't see venting on the dust collector but were told that explosion doors were on the top of the unit. Regarding housekeeping, there was a program for the cleaning of the floor but dust had built up on the walls and elevated surfaces. The report stated that the facility had an elevated risk of flash fire and dust explosion hazards.

Unfortunately, in February 2018, they had another scrubber fire that destroyed the scrubber again. In March, there were OSHA citation penalties related to



combustible dust. In May and November and December of 2018, they had fires again in their dust collection system. In December 2019, an article came out saying that they were shutting down.

### **A CLOSER LOOK AT THE INCIDENTS**

We obtained some information about these incidents from fire investigation reports that are publicly available.

The fire in the baghouse occurred in June 2017, a few months after their wet scrubber was destroyed in a fire. What happened is that they shut down the process to repair a mixer and those repairs took longer than anticipated.

Having that auger shut down for so long allowed more wet material into the process. This wet material stuck to the sides of the drum dryer and started to burn off. In this case, and in many of the other fires that they experienced, those burning embers were sucked into the conveyance system and eventually ended up in the dust collector, where they caused a fire.

It does mention in the fire marshal's report that there was a spark detection system. It did detect the sparks going into the dust collector but failed to activate a suppression system because the electrical breaker tripped. The report estimates the loss at \$200,000 for the baghouse. It also notes that there already had been multiple fires at this facility and most appeared to have a similar origin and cause. Again, it doesn't specifically say what these fires are, but it does hint at these scrubber fires and earlier issues that were of similar origin and nature.

A month later, in July of 2017, they had a dust explosion that injured an employee. We couldn't find much information on this event other than that it had happened, but looking at the consultant report, it appears that the explosion occurred in the ducting between the dust collector and the fan. The report adds that the company went on to add explosion vents to that section of ducting.

The fire marshal report notes that there were five fires already at this facility. We've accounted for at least three. There are two others that happened sometime between this incident and when the facility closed.

In one case, the maintenance staff reported burning dust underneath the fan unit that was located on ground level. Earlier in the day, they had removed some of the material with shovels and it appeared discoloured. Eventually, they noticed the fire in this area and in the fan system. They put it out by pouring water into the dust collection unit. It doesn't state how much the loss was for this equipment fire.

In November of 2018, a similar fire occurred. What is startling is how it looks like a big section of the fire marshal's report was copy and pasted from the May incident. The part about the fan, the processing operation and how the fire started is in the exact same words. That's how routinely they were seeing fires at these facilities and now the fire marshal was copying and pasting from one report to the other because it's like the same thing happened again.

This report also addressed the difficulties the fire department was having. The building itself was still on temporary permit as a building under construction so the fire department didn't have the ability to enforce the fire code. The facility was still governed by the building code officials.

Later in December 2018, there was a fire in the dust collector again. According to the report, this fire started when the workers were moving filters from the baghouse. One employee had used a grinder to cut the bolt holding the filters in place and that ended up igniting a fire in the baghouse hopper down below.

### **CONCLUSION**

This final incident shows the level of awareness and the level of safety at this facility. They had had all these fires and an injured employee, but they were still doing things like having hot work going on inside the dust collector while combustible material was around. The proper level understanding of the hazards and the risk associated with these materials still wasn't there. The sad thing is that there are likely other facilities that operate under similar conditions, and until dust safety is better understood, more businesses like this one will likely be closing down.

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	<p><b>REMBE® GmbH Safety + Control</b></p> <p>Gallbergweg 21 59929 Brilon, Germany</p> <p>Phone: +49 2961 7405-0 Email: <a href="mailto:info@rembe.de">info@rembe.de</a></p>	<p>REMBE® is a specialist in explosion safety and pressure relief. As an independent German company, they supply safety systems for industrial plants. REMBE takes a comprehensive approach, primarily developing its own products and providing consultancy and engineering services to customers around the world.</p>



## DSS MEMBER COMPANIES



### Sigma-HSE

Unit 2, Moorside Point  
Moorside Road, Winchester,  
Hampshire SO23 7RX, UK

Phone: +44 (0)1962840570  
Email: [info@sigma-hse.com](mailto:info@sigma-hse.com)



Sigma-HSE is an International Process Safety company with ISO/IEC 17025 testing. We provide fire and explosion data for example, 20L, MEC, MIE, LIT, LOC, Electrostatic data and ARC, DSC for thermal screening. Our Process Safety Engineers offer ATEX, Seveso, HAZOP, QRA, SIL, LOPA, and cost-effective solutions.



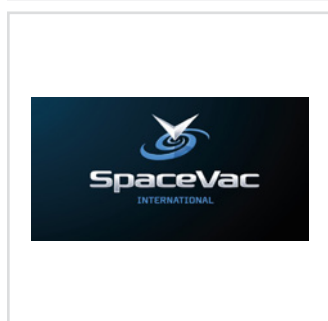
### SINTROL Dust Monitors

Ruosilantie 15 00390  
Helsinki, Finland

Phone: +358 50 463 5452  
Email: [info@sintrolproducts.com](mailto:info@sintrolproducts.com)



Sintrol manufactures high quality, low maintenance dust monitors for the detection and monitoring of dust concentration. Historically the most common applications for Sintrol dust monitors have been inline industrial dust measurement solutions for process control, filtration leak detection and emissions monitoring.



### SpaceVac International

Unit 3 JBJ Business Park,  
Northampton Road Blisworth,  
Northants, United Kingdom,  
NN7 3DW

Phone: +0 1604 968 668  
Email: [info@spacevac.us](mailto:info@spacevac.us)



SpaceVac is the world's leading high-level cleaning system – enabling operators to remove high-level dust from inaccessible areas from the safety of the ground floor. SpaceVac's innovative cleaning technology can be brought into hazardous and explosive atmospheres using our ATEX certified conductive cleaning system.



### XP Products

800 West 5th Ave, Suite 201G  
Naperville, IL 60563

Phone: (630) 464-3800  
Email: [engineering@xpproducts.com](mailto:engineering@xpproducts.com)



The XP Products Explosion Proof Drum Kit is an innovative alternative to traditional rotary valves for providing a means of explosion isolation. In addition, XP Products DHA services group specializes in protecting your facility from the effects of combustible dust explosions.



Want to connect with industries  
handling combustible dust?

Become a member of our Dust  
Safety Professional network!

Email [marketing@dustsafetyscience.com](mailto:marketing@dustsafetyscience.com) to inquire about current availability.

## CASE STUDIES

*Fire & Risk Alliance*



***Enterprise Approach for Optimized Combustible Dust Risk Management***

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*IEP Technologies*



***Spray Dryer Explosion Protection in Food Ingredients Plant***

[READ THE CASE STUDY](#)

*CV Technologies*



**COMBUSTIBLE DUST HAZARDS IN MILLING SYSTEMS**

***Combustible Dust Hazards In Milling Systems***

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*CST Industries*



***CST Helps Iconic Candy Company Mitigate Dust Danger***

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*Dustcon Solutions*



***Reducing Electrical Classification & Housekeeping burden through Preventative Maintenance***

[READ THE CASE STUDY](#)

## WOOD & WOOD PRODUCTS

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 13	German Pellets	Port Arthur, TX	Fire	Wood Dust	0	0	Silo	No Details	
Feb 20	May Furniture	Ramseur, NC	Fire	Wood Dust	0	0	Wood Chipper	\$2 Million	
Feb 21	Equustock	Kingsbury, NY	Fire	Wood Dust	0	0	Unknown	No Details	
Feb 25	Maine Wood Concepts	New Vineyard, ME	Fire	Wood Dust	0	0	Silo	No Details	
Mar 8	Enviva Holdings	Greenwood, SC	Fire	Wood Dust	0	0	Silo	No Details	
Mar 12	Havco Wood Products	Scott City, MO	Fire	Wood Dust	0	0	Silo	No Details	
Mar 13	Unknown	White Marsh, MD	Fire	Wood Dust	0	0	Dust Collector	No Details	
Apr 12	Agri Wood Products Inc.	Waco, TX	Fire	Wood Dust	0	0	Storage Shed	No Details	
Apr 13	Swanson Bark & Wood Products	Longview, WA	Fire	Wood Dust	0	0	Unknown	No Details	
May 4	Columbia Forest Prod.	Presque Isle, ME	Fire	Wood Dust	0	0	Wood Chipper	No Details	
May 8	Swanson Group	Springfield, OR	Fire	Wood Dust	0	0	Chip Storage Unit	No Details	
May 12	Crossville Hardwoods	Crossville, TN	Fire	Wood Dust	0	0	Hopper	No Details	
May 14	Fletcher Trucking	Brainerd, MN	Fire	Wood Dust	0	0	Dust Collector	No Details	
May 15	Crossville Hardwoods	Crossville, TN	Fire	Wood Dust	0	0	Hopper	No Details	
May 25	Bear Mountain Forest Products	Cascade Locks, OR	Fire	Wood Dust	0	0	Sawdust Storage Shed	No Details	
May 29	Griffin Lumber Sawmill	Cordele, GA	Fire	Wood Dust	0	0	Unknown	No Details	
Jun 1	Quality Hardwood Sales Inc.	Nappanee, IN	Explosion	Wood Dust	2	0	Staining Machine	No Details	
Jun 23	New England Wood Pellet	Jaffrey, NH	Explosion	Wood Dust	1	0	Pellet Manufacturing Machine	No Details	
Jul 2	REV Forestry Services	Freeland, PA	Fire	Wood Dust	0	0	Conveyor Belt	No Details	
Aug 5	Darlington Veneer Co.	Darlington, SC	Fire	Wood Dust	0	0	Boiler	No Details	
Sep 23	Amos Hill Associates	Edinburgh, IN	Fire	Wood Dust	0	0	Dust Collector	No Details	
Nov 7	Unknown	Irwindale, CA	Explosion	Wood Dust	0	0	Silo	No Details	
Nov 14	Unknown	South Mahoning, IN	Fire	Wood Dust	1	0	Engine	No Details	
Dec 11	Aspen Wall Wood	Dolores, CO	Fire	Wood Dust	0	0	Unknown	No Details	

INCIDENT SUMMARY - INCIDENTS: 25 | FIRES: 22 | EXPLOSIONS: 3 | INJURIES: 4 | FATALITIES: 0

## AUTOMOTIVE & METAL WORKING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 8	Iowa Spring Man. Inc.	Adel, IA	Fire	Metal Dust	0	0	Dust Col.	No Details	
Feb 14	Metal Tech. Casting	Auburn, IN	Fire	Metal Dust	0	0	Conveyor Belt	No Details	
Feb 19	Polaris Industries Inc.	Huntsville, AL	Fire	Metal Dust	0	0	Air Filter	No Details	
Apr 4	Affival Inc.	Plum Borough, PA	Explosion	Titanium	3	0	Chemical Processing Machine	No Details	

## AUTOMOTIVE & METAL WORKING CONTINUED

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Apr 14	U.S. Steel	Gary, IN	Fire	Mag. Dust	0	0	Unknown	No Details	
May 12	Metal Standard Corp.	Holland, MI	Fire	Metal Dust	0	0	Dust Collector	No Details	
May 18	ARE Inc.	Massillon, OH	Fire	Unknown	0	0	Dust Collector	No Details	
Jun 4	TeckLane Man.	Springdale, PA	Fire	Metal Dust	0	0	Forklift	No Details	
Jun 11	Troxel	Moscow, TN	Fire	Metal Dust	3	0	Ventilation System	No Details	
Jul 15	Etnyre Int. Ltd.	Oregon, IL	Fire	Unknown	0	0	Dust Collector	No Details	
Jul 16	MBL Manufacturing	Ottawa, IL	Fire	Unknown	0	0	Unknown	No Details	
Sep 2	Michigan Precision Industries	Deerfield, WI	Fire	Metal Dust	1	0	Dust Collector	No Details	
Oct 8	Fisher Dynamics	Evansville, IN	Fire	Unknown	0	0	Dust Collector	No Details	
Oct 17	IMS Engineered Products	Des Plaines, IL	Fire	Unknown	0	0	Dust Collector	No Details	
Nov 14	Clarios LLC	Kernersville, NC	Fire	Unknown	0	0	Dust Collector	\$800,000	
Dec 9	Wolverine Advanced Materials	Blacksburg, VA	Explosion	Metal Dust	0	0	Ductwork	No Details	
Dec 10	Carlisle Tire	Clinton, TN	Fire	Rubber Dust	0	0	Dust Collector	No Details	

**INCIDENT SUMMARY - INCIDENTS: 17 | FIRES: 15 | EXPLOSIONS: 2 | INJURIES: 7 | FATALITIES: 0**

## AGRICULTURE

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 2	Aurora Cooperative (Sedan)	Edgar, NE	Fire	Grain Dust	0	0	Grain Bin	No Details	
Jan 4	Unknown	Farmington, NY	Fire	Grain Dust	1	0	Silo	No Details	
Jan 6	Unknown	Roscoe, IL	Fire	Grain Dust	0	0	Silo	No Details	
Jan 8	United Quality Cooperative	Ross, ND	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Jan 24	Border Ag and Energy	Bottineau, ND	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Jan 30	Colson Farms	Blunt, SD	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Feb 4	Farmers Grain and Feed	Addison, WI	Fire	Grain Dust	0	0	Grain Dryer	\$190,000	
Feb 12	ADM Grain	Clinton, IA	Fire	Grain Dust	0	0	Unknown	No Details	
Feb 12	Bengston, Æ Farmer, Æ Market	Robertsdale, AL	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Feb 15	Comley, Æ Country Creamery	Mexico, NY	Explosion	Grain Dust	0	0	Silo	\$10,000	
Feb 19	Bunge North America	Red Oak, IA	Fire	Grain Dust	0	0	Processing Stacks	No Details	
Feb 24	The Andersons	Kearney, NE	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Mar 8	Agtegra Cooperative	Bowdle, SD	Fire	Grain Dust	0	0	Grain Bin	No Details	
Mar 30	Bluegrass Farms of Ohio Inc.	Jeffersonville, OH	Fire	Grain Dust	0	0	Grain Bin	No Details	
Mar 31	Unknown	Chicago, IL	Fire	Grain Dust	0	0	Silo	No Details	
Apr 14	Unknown	Waterford, VA	Fire	Grain Dust	2	0	Grinder	\$300,000	



## AGRICULTURE CONTINUED

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Apr 16	ADM	Ottawa Lake, MI	Fire	Grain Dust	0	0	Silo	No Details	
Apr 22	Nevada Grain (Mennel Milling Company)	Nevada, OH	Explosion	Grain Dust	0	0	Grain Bin	No Details	
May 19	CHS, Inc.	Kalispell, MT	Fire	Grain Dust	0	0	Grain Elevator	No Details	
May 25	Prestage Farms	Clinton, NC	Fire	Wood Dust	0	0	Silo	No Details	
Jun 7	Unknown	Denis, IA	Fire	Grain Dust	0	0	Grain Bin	No Details	
Jun 11	Unknown	Liberal, KS	Explosion	Grain Dust	0	0	Grain Elevator	No Details	
Jun 12	Conserv FS, Inc.	Creston, IL	Fire	Grain Dust	0	0	Warehouse	No Details	
Jun 25	AGP Grain Marketing	Lincoln, Ne	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Jul 7	Kleen Acres Alpaca Farm	Columbia, PA	Explosion	Grain Dust	0	0	Grain Dryer	No Details	
Aug 18	Summitville Feed and Grain	Summitville, TN	Fire	Grain Dust	0	0	Conveyor Belt	No Details	
Aug 21	Port of Corpus Christi	Corpus Christi, TX	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Aug 23	Unknown	Arcata, CA	Explosion	Grain Dust	0	0	Hay Pile	No Details	
Aug 25	Ag Partners	Royal, IA	Explosion	Grain Dust	0	0	Grain Elevator	No Details	
Aug 29	PNW Farmers Cooperative	Rosalia, WA	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Aug 31	Unknown	Dwight, IL	Fire	Grain Dust	0	0	Grain Bin	No Details	
Sep 1	Unknown	Thompson, ND	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Sep 10	CHS Sunflowers	Grandin, ND	Fire	Grain Dust	0	0	Conveyor Belt	No Details	
Sep 18	Unknown	St. Jacob, IL	Fire	Grain Dust	0	0	Grain Dryer	\$5,000	
Sep 20	Co-Alliance	Goodland, IN	Fire	Grain Dust	0	0	Conveyor Belt	No Details	
Sep 26	Midwest Grain Systems	Kensington, MN	Fire	Grain Dust	0	0	Unknown	No Details	
Sep 30	Unknown	Bargersville, IN	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Oct 3	Metcalfe's Triple M Farms	Janesville, WI	Fire	Grain Dust	0	0	Grain Dryer	\$420,000	
Oct 6	Unknown	Cambridge Springs, PA	Fire	Grain Dust	0	0	Grain Bin	No Details	
Oct 6	Unknown	Magnolia, DE	Fire	Grain Dust	0	0	Grain Silo	No Details	
Oct 8	Grow Smart	Willow Springs, MO	Fire	Grain Dust	0	0	Drive Belt	No Details	
Oct 12	Mid-Wood, Inc.	Bowling Green, OH	Fire	Grain Dust	0	0	Grain Bin	No Details	
Oct 31	Aurora Co-op	Superior, NE	Explosion	Grain Dust	3	0	Grain Elevator	No Details	
Nov 7	Unknown	Albion, WI	Fire	Grain Dust	0	0	Grain Silo	No Details	
Nov 16	Hoefler Farm	New Vienna, IA	Fire	Grain Dust	0	0	Unknown	\$25,000	
Nov 19	Cooperative Producers, Inc.	Hastings, NE	Fire	Grain Dust	0	0	Unknown	No Details	
Dec 29	Farmers Elevator and Exchange	Wapello, IA	Fire	Grain Dust	0	0	Storage Building	No Details	
Dec 30	Bunge North America	Homer, IL	Explosion	Grain Dust	0	0	Grain Elevator	No Details	
Dec 31	West Central Agri Services	Adrian, MO	Explosion	Grain Dust	1	0	Grain Bin	No Details	

INCIDENT SUMMARY - INCIDENTS: 49 | FIRES: 40 | EXPLOSIONS: 9 | INJURIES: 7 | FATALITIES: 0

## FOOD PROCESSING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 13	CHS, Inc.	Grandin, ND	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Feb 8	Sanderson Farms	Adel, GA	Fire	Grain Dust	0	0	Grain Bin	No Details	
Feb 15	Melick Aquafeed	Catawissa, PA	Fire	Fish Meal	0	0	Unknown	No Details	
Mar 5	C&H Sugar	Crockett, CA	Fire	Sugar Dust	0	0	Conveyor Belt	No Details	
Mar 11	Valley Proteins	Rose Hill, NC	Explosion	Unknown	5	0	Welding Equipment	No Details	
Mar 23	Hubbard Feeds	Atlantic, IA	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Apr 24	Natural Blend	Farmville, NC	Fire	Unknown	0	0	Dust Collector	No Details	
May 12	Michigan Sugar	Caro, MI	Explosion	Wood Dust	0	0	Pulp Pellet Bin	No Details	
May 22	Bunge North America	Decatur, AL	Fire	Grain Dust	0	0	Silo	No Details	
May 26	Smithfield Foods	Laurinburg, NC	Fire	Grain Dust	0	0	Dust Hopper	No Details	
Jun 3	J.M. Smucker	Lexington, KY	Fire	Peanut Dust	0	0	Unknown	No Details	
Jul 21	Tate & Lyle	Decatur, IL	Explosion	Grain Dust	0	0	Dryer	No Details	
Jul 24	J Rettenmaier USA LP	Galesburg, IL	Explosion	Grain Dust	2	0	Grain Dryer	No Details	
Jul 27	Iowa Drying and Processing LLP	Sibley, IA	Fire	Dried Egg Yolk	0	0	Dryer	\$2.5-\$3 Million	
Jul 30	Coors	Golden, CO	Explosion	Grain Dust	0	0	Silo	No Details	
Aug 20	Belstra Milling Company	De Motte, IN	Fire	Grain Dust	0	0	Grain Hopper	No Details	
Aug 31	Unknown	Sioux Falls, SD	Fire	Grain Dust	0	0	Unknown	No Details	
Sep 2	Animal Feed Products (Food Products)	Hodges, SC	Fire	Grain Dust	0	0	Silo	No Details	
Sep 10	Farm to Market Pork and Beef	Kalispell, MT	Fire	Grain Dust	0	0	Feed Tube	No Details	
Oct 3	Mr. Chips Inc.	Pinconning, MI	Fire	Unknown	1	0	Unknown	No Details	
Oct 6	Minn-Dak Farmers Cooperative	Wahpeton, ND	Fire	Unknown	0	0	Boiler Vacuum	No Details	
Oct 9	Hill's Pet Nutrition	Emporia, KS	Fire	Grain Dust	0	0	Food Dryer	No Details	
Oct 15	Riceland Foods	Stuttgart, AR	Explosion	Grain Dust	3	0	Storage Building	No Details	
Nov 27	MGP Ingredients Inc.	Atchison, KS	Explosion	Grain Dust	0	0	Unknown	No Details	
Dec 1	Purina Mills	Richmond, IN	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Dec 7	Olam Spices	Las Cruces, NM	Fire	Chile Dust	0	0	Conveying System	No Details	
Dec 18	Sidney Sugars Inc.	Sidney, MT	Fire	Overdried Pulp	0	0	Pulp Dryer	No Details	
Dec 28	M-G, Inc.	Weimar, TX	Explosion	Grain Dust	0	0	Grain Elevator	No Details	

**INCIDENT SUMMARY - INCIDENTS: 28 | FIRES: 20 | EXPLOSIONS: 8 | INJURIES: 11 | FATALITIES: 0**

## PULP & PAPER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 30	ARAUCO	Grayling, MI	Explosion	Paper Dust	0	0	Dryer	No Details	
Feb 19	ND Paper	Old Town, ME	Fire	Wood Dust	0	0	Chip Bin	No Details	
Mar 30	Procter & Gamble	Oxnard, CA	Fire	Paper Dust	0	0	Unknown	No Details	
Apr 16	Cascades	Clarks Summit, PA	Fire	Paper Dust	0	0	Unknown	No Details	
Apr 17	Domtar	Rothschild, WI	Fire	Wood Dust	0	0	Debarking Equipment	No Details	
Jun 12	WestRock	Mooresville, NC	Fire	Paper Dust	0	0	Cardboard Processing Machine	\$2 Million	

INCIDENT SUMMARY - INCIDENTS: 7 | FIRES: 6 | EXPLOSIONS: 1 | INJURIES: 0 | FATALITIES: 0

## POWER GENERATION & COAL HANDLING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jul 16	Wyodak Power Plant	Wyodak, WY	Fire	Coal Dust	0	0	Coal Silo	No Details	
Aug 25	Xcel Energy French Island plant	La Crosse, WI	Fire	Unknown	0	0	Dust Collector	No Details	

INCIDENT SUMMARY - INCIDENTS: 2 | FIRES: 2 | EXPLOSIONS: 0 | INJURIES: 0 | FATALITIES: 0

## SCHOOLS & EDUCATION FACILITIES

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Mar 5	Montgomery Area High School	Montgomery, PA	Fire	Wood Dust	0	0	Dust Collector	No Details	

INCIDENT SUMMARY - INCIDENTS: 1 | FIRES: 1 | EXPLOSIONS: 0 | INJURIES: 0 | FATALITIES: 0

## ETHANOL PRODUCTION

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Oct 29	Poet Biorefining	Ashton, IA	Fire	Grain Dust	0	0	Grain Dryer	No Details	

INCIDENT SUMMARY - INCIDENTS: 1 | FIRES: 1 | EXPLOSIONS: 0 | INJURIES: 0 | FATALITIES: 0

## OTHER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 28	TrinityRail	Jonesboro, AR	Fire	Unknown	0	0	Dust Collector	No Details	
Apr 14	American Zinc Recycling	Palmerton, PA	Fire	Metal Dust	0	0	Conveyor Belt	No Details	
May 6	Testrite Visual	Hackensack, NJ	Fire	Unknown	0	0	Dust Collector	No Details	
May 8	A Bead Source	Portland, OR	Fire	Bark Dust	0	0	Unknown	No Details	
May 18	General Iron Industries Inc.	Chicago, IL	Explosion	Metal Dust	0	0	Regenerative Thermal Oxidizer	No Details	
May 31	Patrick Industries	Elkhart, IN	Fire	Wood Dust	0	0	Heating Unit	No Details	

## OTHER CONTINUED

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jun 17	Fiberon	New London, NC	Explosion	Unknown	0	0	Dust Collector	No Details	
Aug 9	Evergreen Plastics	Clyde, OH	Fire	Unknown	0	0	Dust Collector	No Details	
Aug 18	Greenwood Mills Harris Plant	Greenwood Mills, SC	Fire	Cotton Dust	0	0	Unknown	No Details	
Aug 20	Unknown	Jamestown, NY	Fire	Unknown	0	0	Dust Collector	No Details	
Sep 24	ABC Coke	Tarrant, AL	Fire	Coke Dust	3	0	Unknown	No Details	
Oct 13	Pactiv Inc.	Tempe, TX	Fire	Unknown	0	0	Dust Collector	No Details	
Dec 4	Optima Chemical	Belle, WV	Explosion	Bleach Powder	3	1	Dryer	No Details	

INCIDENT SUMMARY - INCIDENTS: 13 | FIRES: 10 | EXPLOSIONS: 3 | INJURIES: 6 | FATALITIES: 1

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## WOOD & WOOD PRODUCTS

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Feb 27	Calgary Pallet Inc.	Calgary, AB	Fire	Wood Dust	0	0	Dust Collector	No Details	
Apr 15	Cap-Pele Sawmill Ltd.	Cap-Pele, NB	Fire	Wood Dust	0	0	Unknown	\$2 Million	
May 11	Wood Pellet Production (Wood & Wood Products)	Coldstream, BC	Explosion	Wood Dust	0	0	Dryer	No Details	
May 25	W.F. Tompkins and Sons	Bath, NB	Fire	Wood Dust	0	0	Unknown	No Details	
Jun 26	Greenwood Forest Prod.	Penticton, BC	Fire	Wood Dust	0	0	Hopper	No Details	
Jul 27	Pacific Bioenergy Corp.	Prince George, BC	Explosion	Wood Dust	0	0	Conveyor System	\$50,000	
Sep 30	Pinnacle Renewable Energy	Coldstream, BC	Fire	Wood Dust	0	0	Dryer	No Details	
Nov 16	West Fraser Mill	Williams Lake, BC	Fire	Wood Dust	0	0	Wood Chip Bin	No Details	
Nov 19	Great Northern Timber	Upper Musquodoboit, NS	Fire	Wood Dust	0	0	Smokestack	No Details	

**INCIDENT SUMMARY - INCIDENTS: 9 | FIRES: 7 | EXPLOSIONS: 2 | INJURIES: 0 | FATALITIES: 0**

## AUTOMOTIVE & METAL WORKING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jun 12	Gerdau Steel	Whitby, ON	Fire	Metal Dust	0	0	Berm	No Details	

**INCIDENT SUMMARY - INCIDENTS: 1 | FIRES: 1 | EXPLOSIONS: 0 | INJURIES: 0 | FATALITIES: 0**

## AGRICULTURE

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jan 23	Viterra	Vancouver, BC	Fire	Grain Dust	0	0	Grain Elevator	No Details	
May 28	Sebringville Feed Mill	Sebringville, ON	Fire	Grain Dust	0	0	Unknown	No Details	
Jun 14	Richardson International	Thunder Bay, ON	Explosion	Grain Dust	0	0	Dust Fil. System	No Details	
Aug 9	Superior Elevator ULC	Thunder Bay, ON	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Oct 8	Unknown	Marengo, SK	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Dec 2	Federated Coop. Plant	Calgary, AB	Explosion	Grain Dust	1	0	Unknown	No Details	
Dec 4	Stewart Farm	Douglas, ON	Fire	Grain Dust	0	0	Grain Silo	No Details	

**INCIDENT SUMMARY - INCIDENTS: 7 | FIRES: 5 | EXPLOSIONS: 2 | INJURIES: 1 | FATALITIES: 0**

## ETHANOL PRODUCTION

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Dec 30	Husky Lloyminster Ethanol Plant	Lloyminster, SK	Explosion	Grain Dust	0	0	Grain Dryer	No Details	

**INCIDENT SUMMARY - INCIDENTS: 1 | FIRES: 0 | EXPLOSIONS: 1 | INJURIES: 0 | FATALITIES: 0**

## OTHER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Aug 22	International Paper	Grande Prairie, AB	Fire	Wood Dust	0	0	Unknown	No Details	
Nov 18	Woodward Wastewater Treatment Plant	Hamilton, ON	Explosion	Dried Sludge	0	0	Hopper	\$75,000	
Dec 30	Roechling Engineering Plastics	Orangeville, ON	Explosion	Plastic Dust	1	0	Extruder	\$750,000	

**INCIDENT SUMMARY - INCIDENTS: 2 | FIRES: 0 | EXPLOSIONS: 2 | INJURIES: 1 | FATALITIES: 0**

## WOOD & WOOD PRODUCTS

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jan 2	Unknown	Schleedorf, Austria	Explosion	Wood Dust	0	0	Silo	No Details	
Jan 12	Unknown	Ans, Denmark	Fire	Wood Dust	0	0	Silo	No Details	
Jan 12	Kronospan	Chirk, UK	Fire	Wood Dust	0	0	Unknown	No Details	
Feb 1	Edge Renewables Ltd	Much Wenlock, UK	Fire	Wood Dust	0	0	Boiler	No Details	
Feb 12	Unknown	Jammu, India	Fire	Wood Dust	6	3	Unknown	No Details	
Apr 2	Wacker	Ennest, Germany	Explosion	Wood Dust	0	0	Wood Chip Bin	No Details	
Apr 19	Unknown	Freyburg, Germany	Explosion	Wood Dust	2	0	Silo	No Details	
May 6	Unknown	Rheinau, Germany	Explosion	Wood Dust	0	0	Wood Chipper	No Details	
May 13	Vastern Timber	Studley, UK	Fire	Wood Dust	0	0	Dust Collector	No Details	
May 18	Unknown	Carterton, New Zealand	Fire	Wood Dust	0	0	Silo	No Details	
May 20	Kiwi Lumber	Waingawa, New Zealand	Fire	Wood Dust	0	0	Silo	No Details	
Jun 10	Unknown	Herbrechtingen, Germany	Explosion	Sawdust	0	0	Conveyor Belt	No Details	
Jun 29	Svilosa AD	Svishtov, Bulgaria	Explosion	Wood Dust	0	0	Sodium Hydroxide Tank	No Details	
Jul 16	Unknown	Freiburg, Germany	Explosion	Wood Dust	3	0	Silo	No Details	
Jul 21	Enele	São Lourenço do Oeste, Brazil	Fire	Wood Dust	0	0	Unknown	No Details	
Sep 17	Unknown	Stützensgrün, Germany	Explosion	Wood Dust	2	0	Unknown	No Details	
Oct 29	Kronospan	Strzelce Opolskie, Poland	Explosion	Wood Dust	0	0	Unknown	No Details	

**INCIDENT SUMMARY - INCIDENTS: 17 | FIRES: 8 | EXPLOSIONS: 9 | INJURIES: 13 | FATALITIES: 3**

## AGRICULTURE

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jan 1	Unknown	Wellington, New Zealand	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Mar 9	Unknown	Devonport, Australia	Fire	Grain Dust	0	0	Silo	No Details	
Mar 11	ADM do Brasil	Uberlândia, Brazil	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Mar 28	Royal Portbury Dock	Bristol, UK	Fire	Grain Dust	0	0	Loading Equipment	No Details	
Apr 11	Terminal 6	Puerto San Martín, Argentina	Fire	Grain Dust	0	0	Sleeve Filter	No Details	
May 9	Unknown	Yeovil, UK	Fire	Grain Dust	0	0	Grain Hopper	No Details	
May 23	Grain Market	Ballabgarh, India	Fire	Grain Dust	0	0	Wheat Bags	No Details	
Jun 13	Unknown	Ratanak Mondol, Cambodia	Explosion	Chemical Powder	0	1	Tank	No Details	
Jul 3	Unknown	Tilbury, UK	Explosion	Grain Dust	1	0	Grain Silos	No Details	
Jul 14	Unknown	Østre Toten, Norway	Explosion	Grain Dust	4	0	Grain Silo	No Details	
Jul 22	Paranaguá Port	Paranaguá, Brazil	Fire	Grain Dust	0	0	Conveyor Belts	No Details	
Jul 29	Foyle Port	Lough Foyle, UK	Fire	Grain Dust	0	0	Shed	No Details	

## AGRICULTURE CONTINUED

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Aug 6	Unknown	Shrewton, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Aug 18	Unknown	West Stowell, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Oct 2	Port Harcourt Flour Mills	Port Harcourt, Nigeria	Explosion	Grain Dust	0	0	Unknown	No Details	
Nov 13	Unknown	Parkes, Australia	Fire	Grain Dust	0	0	Grain Hopper	No Details	
Nov 29	Tartus Port	Tartus, Syria	Fire	Grain Dust	5	0	Grain Silo	No Details	
Dec 16	Unknown	Fleckney, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	

INCIDENT SUMMARY - INCIDENTS: 18 | FIRES: 14 | EXPLOSIONS: 4 | INJURIES: 10 | FATALITIES: 1

## FOOD PROCESSING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jan 23	Muntons PLC	Stowmarket, UK	Fire	Malt Dust	0	0	Dryer	No Details	
Mar 15	Hemavati Cooperative Sugar Factory	Channarayapatna, India	Explosion	Sugar Dust	0	0	Dust Collector	No Details	
Apr 8	Denkavit	Voorthuizen, Netherlands	Explosion	Grain Dust	0	0	Silo	No Details	
Jun 19	ADM UK	Erith, UK	Explosion	Grain Dust	3	0	Silo	No Details	
Jul 1	Thomas Fawcett and Sons Ltd	Castleford, UK	Fire	Barley Dust	0	0	Silo	No Details	
Jul 4	Jagatguru Mahadev Rice Meal Tilathi	Tartus Governorate, India	Fire	Sawdust	0	0	Circuitry	\$100,000+	
Aug 11	Unknown	Dettmannsdorf, Germany	Explosion	Grain Dust	0	0	Grain Dryer	100,000s of euros	
Aug 24	Crisp Malt	Mistley, UK	Fire	Malt Dust	0	0	Storage Bin	No Details	
Oct 20	Bunge South America	Puerto General San Martín, Argentina	Explosion	Soybean Dust	0	0	Drying Unit	No Details	
Dec 17	Liprovit B.V.	Kampen, Netherlands	Explosion	Powdered Milk	2	0	Unknown	No Details	
Dec 28	Shanxi Huaqing Company	Datong City, China	Explosion	Grain Dust	4	1	Unknown	No Details	



INCIDENT SUMMARY - INCIDENTS: 11 | FIRES: 4 | EXPLOSIONS: 7 | INJURIES: 9 | FATALITIES: 1

## POWER GENERATION & COAL HANDLING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
May 24	Yermarus Thermal Power Station	Yermarus, India	Fire	Coal Dust	0	0	Conveyor Belt	No Details	
Jun 7	Chhattisgarh State Power Generation Company	Korba, India	Fire	Coal Dust	0	0	Conveyor Belt	No Details	
Jun 20	Deepika Mine	Korba, India	Fire	Coal Dust	0	0	Conveyor Belt	Millions of Rupees	












INCIDENT SUMMARY - INCIDENTS: 3 | FIRES: 3 | EXPLOSIONS: 0 | INJURIES: 0 | FATALITIES: 0

## SCHOOLS AND EDUCATIONAL FACILITIES

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Feb 28	Clayesmore School	Iwerne Minster, UK	Fire	Wood Dust	0	0	Silo	No Details	
Aug 30	Technical University (TU) Darmstadt	Darmstadt, Germany	Explosion	Metal Dust	1	0	Unknown	No Details	

**INCIDENT SUMMARY - INCIDENTS: 2 | FIRES: 1 | EXPLOSIONS: 1 | INJURIES: 1 | FATALITIES: 0**

## OTHER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Feb 17	Goyal Enterprises	Chandigarh, India	Fire	Wood Dust	1	0	Welding Equipment	No Details	
Apr 6	Unknown	Bissendorf, Germany	Explosion	Metal Dust	1	0	Unknown	No Details	
Apr 13	Galaxy Surfactants	Mumbai, India	Explosion	Powdered Chemicals	3	2	Feed Tank	No Details	
May 19	LG Chem Ltd.	Seosan, South Korea	Explosion	Aluminum Alkyl	2	1	Unknown	No Details	
Jun 10	Foskor	Richards Bay, South Africa	Fire	Sulphur Dust	0	0	Conveyor System	Millions of Rands	
Jun 28	Unknown	Itumbiara, Brazil	Fire	Cotton Dust	0	0	Storage Shed	No Details	
Aug 5	Unknown	Velbert, Germany	Explosion	Aluminum Alkyl	2	0	Unknown	No Details	
Aug 24	Gigler GmbH	Schrobenhausen, Germany	Fire	Wood Dust	0	0	Dust Collector	No Details	
Oct 5	Ravensdown	Ravensbourne, New Zealand	Explosion	Sulphur Dust	5	0	Hopper	No Details	
Dec 3	Wessex Water Services Ltd.	Avonmouth, UK	Explosion	Dried Sludge	4	1	Silo	No Details	
Dec 13	Ravensdown	Ravensbourne, New Zealand	Fire	Sulphur Dust	0	0	Unknown	No Details	

**INCIDENT SUMMARY - INCIDENTS: 11 | FIRES: 5 | EXPLOSIONS: 6 | INJURIES: 18 | FATALITIES: 4**

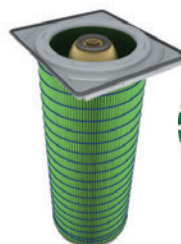


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- Flaps held open precisely until ignition or flow reversal
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- Additional dust injectors on the protected zone pipeline

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Suitable for nearly every application, the DFI is the ideal standard valve. It can be used for high explosion pressures up to 1.5 barg and for a wide variety of dusts including ST1, ST2, light metal and low MIE dusts.

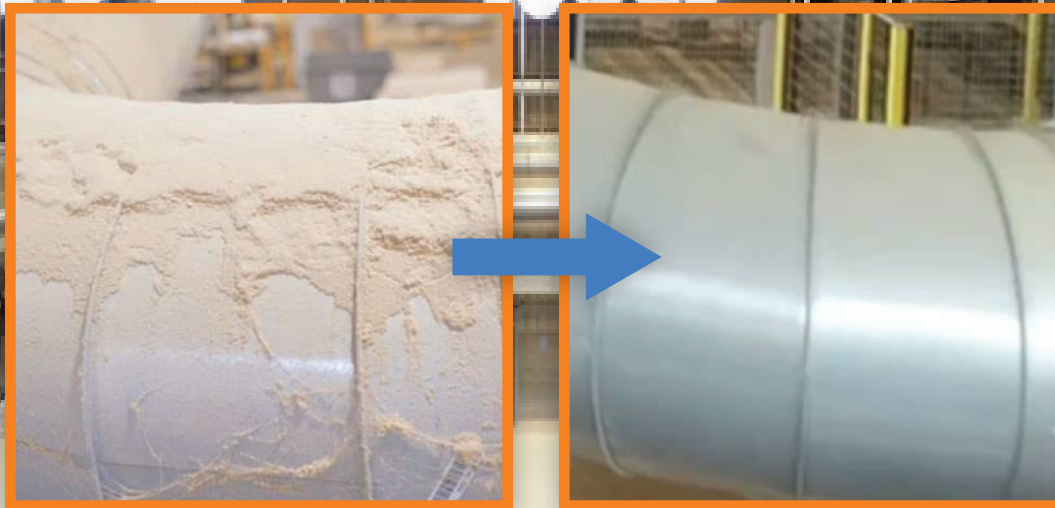
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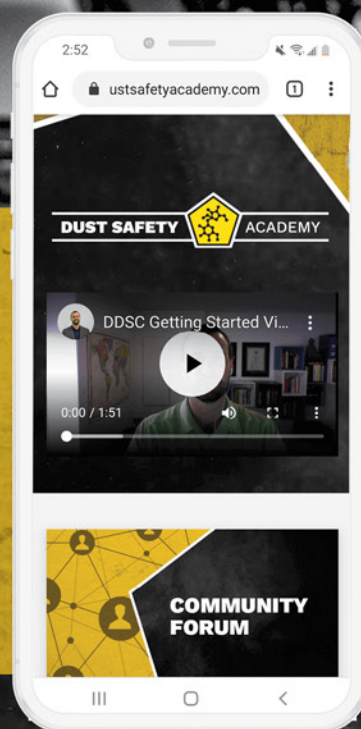
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