

2021

COMBUSTIBLE DUST INCIDENT REPORT

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OVER 150 INJURED AND KILLED IN COAL MINE VENTILATION FIRE
Gramoteino, Russia
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100 YEARS OF DUST EXPLOSION LOSS HISTORY IN NORTH AMERICA
Featured Podcast Episode
Pg. 21

2021 COMBUSTIBLE DUST INCIDENT DATA
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DUST SAFETY SCIENCE

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MEET THE PROFESSIONALS

DUST SAFETY MEMBER COMPANIES AND PARTNERS

MEMBER COMPANIES



PARTNERS



LETTER FROM THE AUTHOR

DR. CHRIS CLONEY

Managing Director, DustEx Research Ltd.



Thank you for your support and ongoing efforts in combustible dust!

At least one year with zero fatalities from combustible dust explosions by 2038 - that was (and still is) the goal when we formed DustEx Research Ltd. and [DustSafetyScience.com](https://dustsafety.com) in 2018.

Well four years in and how are we doing today?

No, we have not seen a year with zero fatalities yet... but that is not really the point. In the famous words of Zig Ziglar (see right) the point of the goal is to allow us to align our compass, to get on the road, and get to work making the change we want to see in the world.

In four years, we built the measuring stick - the [Combustible Dust Incident Database](#) and logged 960 fires, 357 explosions, 720 injuries and 126 fatalities from more than 40 countries (this incident report comes from that effort).

We've fostered awareness and global communication with the [Dust Safety Science Podcast](#) which has more than 180 episodes, over 100 hours of educational material and 35,000+ downloads to date.

We've increased knowledge, education and understanding having run two global conferences and well over 100 webinars in the [Dust Safety Academy](#) since launching two years ago.

And we've driven connection and change through the [Dust Safety Professionals](#) platform which at the time of writing has 52 member companies, over 125 offices and almost 200 subject matter experts on combustible dust helping people improve their safety systems all over the world.

And none of that would have been possible without you...

From the first "Meet the Community" page with six logos on myDustExplosionResearch.com, to the dozens of member companies, to the hundreds of attendees of the conferences, and to the thousands of emails, thank yous, questions, comments and insights we have received on our work over the last few years... we appreciate it and we appreciate you!

Stay safe out there,

Chris

P.S. Have feedback on the incident reporting? Email me at chris@dustsafety.com.

"Success is not a destination, it is a journey"

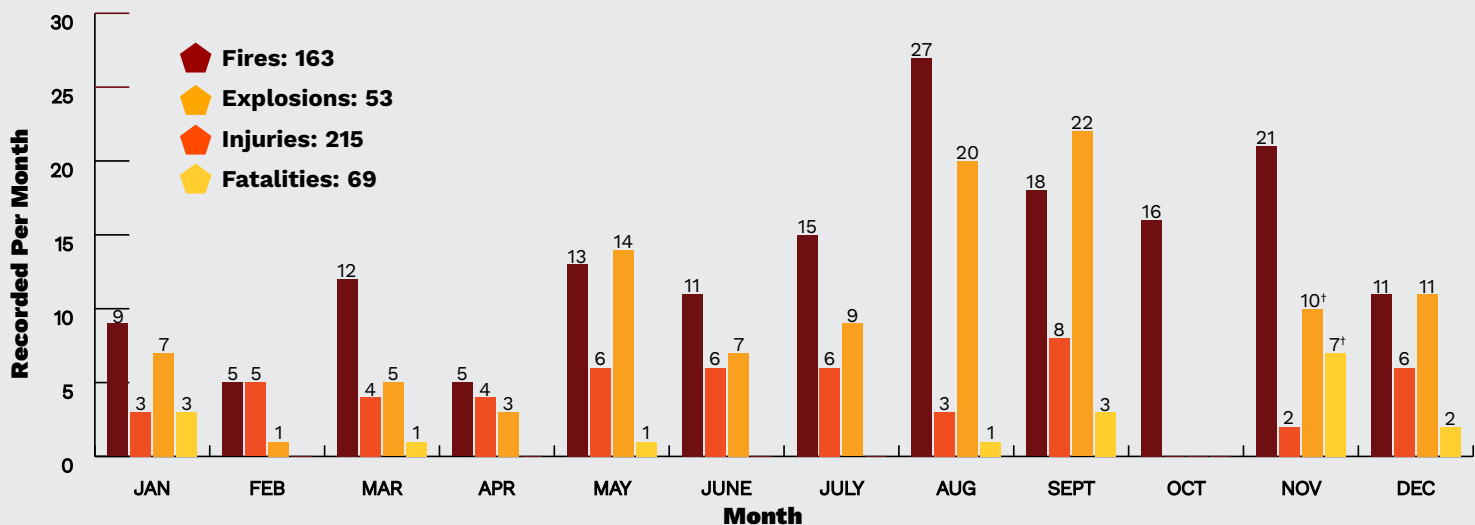
- Zig Ziglar

INCIDENT DATA OVERVIEW

	UNITED STATES					CANADA					INTERNATIONAL				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Fires	117	158	175	116	98	15	17	22	14	8	37	38	53	35	57
Explosions	28	37	37	26	20	4	4	1	7	3	36	27	37	27	30
Injuries	52	40	42	35	26	9	1	4	2	9	102	73	72	51	180*
Fatalities	6	2	1	1	2	0	0	0	0	3	7	21	7	9	64*

*Seven injuries and three fatalities from an explosion involving potato starch in Tuas, Singapore on February 25, 2021 were removed from the incident data given in the last report. Subsequent investigation determined that an oil-mist deflagration caused the primary explosion which impacted the workers and was followed by less severe potato starch flash-fires.

2021 RECORDED INCIDENTS



⁺A coal mine explosion and subsequent ventilation system fire which resulted in at least 51 fatalities and 106 injuries in Gramotenino, Russia on November 25, 2021 was removed from the recorded incidents figure above for clarity of the remaining data. This incident is, however, included in the total injuries and fatalities shown in the figure and analyzed in this report unless stated otherwise.

LOSS HISTORY - UNITED STATES

Loss history from dust explosions in the United States over the last six years is given in the following table. This data has been collected in the incident database and reported in the 2016 to 2021 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
2021	20	17	1
6 year average	29.8	27.0	2.3

This data gives an average of 30 dust explosions per year, 27 injuries and a range from one to six fatalities over the last five years. Note that dust fires are excluded in this analysis.

2021 GLOBAL LOSS OVERVIEW

In 2021, one mine explosion and subsequent dust fire in Gramoteino, Russia impacted the data more than any other incident, accounting for over 49% of the year's injuries and 73% of the fatalities:

[51 Killed in Coal Mine Explosion](#) (Gramoteino, Russia)

Of the other injuries, 83% occurred due to explosions and 17% occurred due to fires. For the other fatalities, all but one were due to dust explosions. Some of the more severe incidents include:

[One Killed in Wood Dust Explosion](#) (Klaipeda, Lithuania)

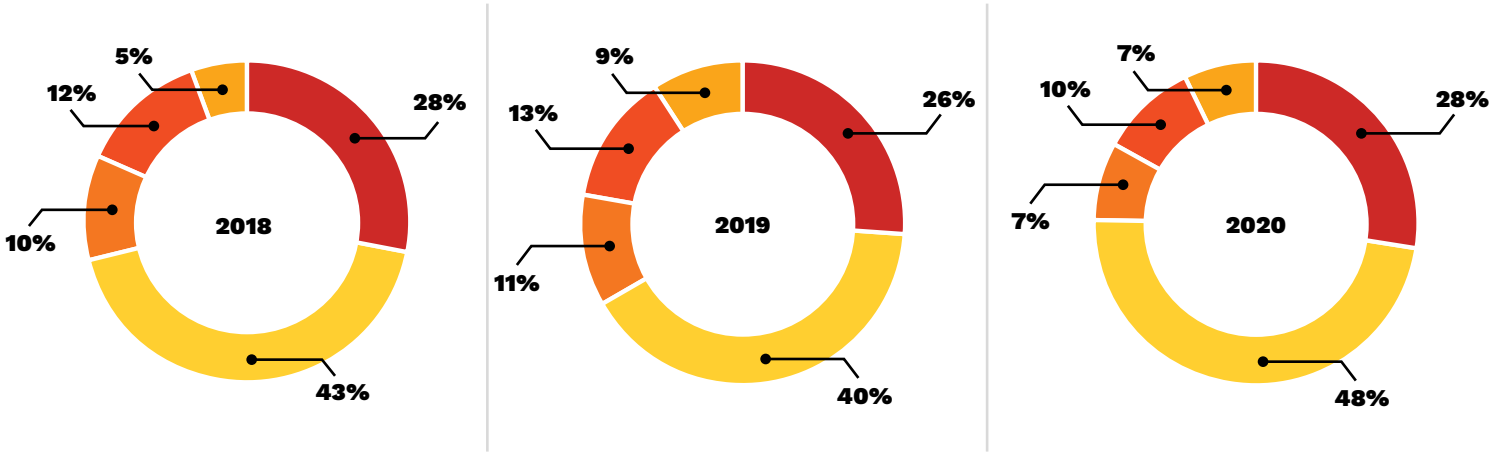
[Three Killed in Sawmill Explosion](#) (Beauceville, Quebec)

[Six Killed in Coal Mine Explosion](#) (Saran, Kazakhstan)

[Plant Fire Injures Three, \\$1M in Damages](#) (Memphis, TN)

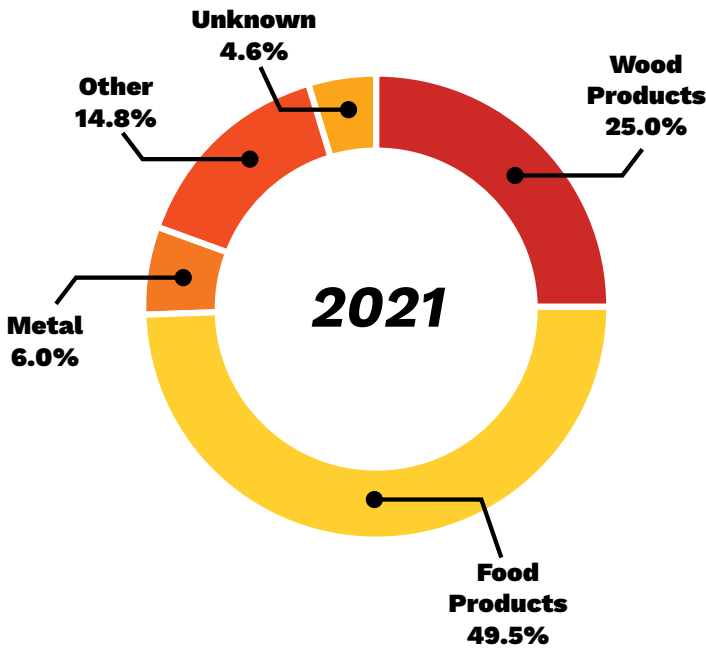
MATERIALS INVOLVED

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



DISCUSSION POINTS

From the global incident data, food and wood products made up nearly 75% of the fires and explosions recorded, but only 23% of the injuries and 12% of the fatalities. Coal was the most deadly material, accounting for over 53% of the injuries and 87% of this year's fatalities. This is largely due to the catastrophic mine explosion and subsequent ventilation fire in Russia. A breakdown of the fires, explosions, injuries and fatalities for each material is given as follows:



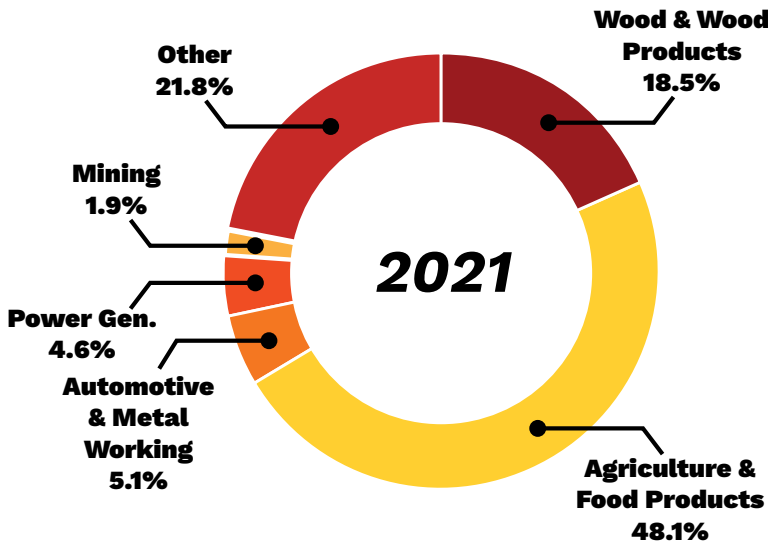
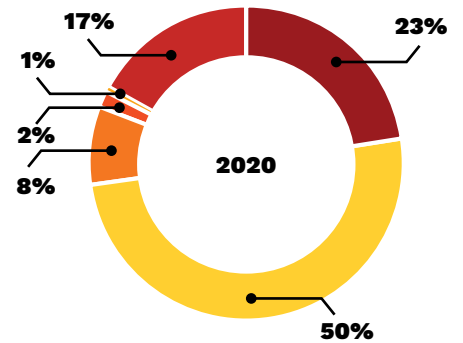
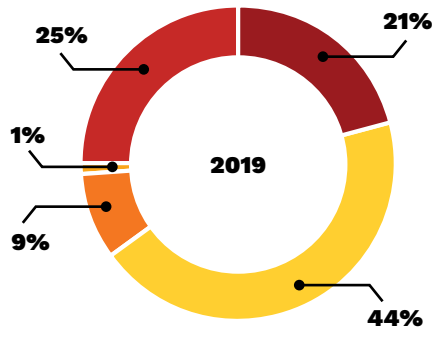
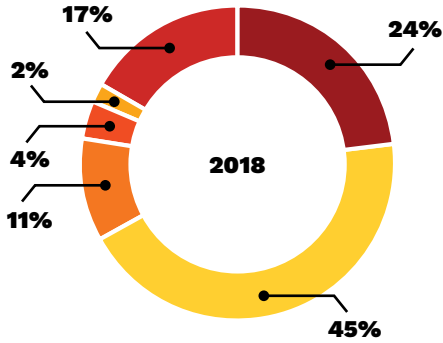
	FIRES	EXP.	INJ.	FAT.
WOOD	35	14	32	6
FOOD	91	16	18	2
METAL	10	3	16	1
COAL	9	4	115	60
PAPER	5	0	0	0
PLASTIC	0	2	1	0
CARBON	1	1	0	0
TEXTILE	0	1	9	0
OTHER	7	7	7	0
UNKNOWN	5	5	17	0
TOTAL	163	53	215	69

Twelve of the metal dust injuries, and the lone fatality, were results of two separate aluminum dust explosions. The other four injuries involved an explosion at a zinc powder facility. The nine injuries from textiles were sustained in an explosion at a packaging production plant. Under "Other," two injuries came from explosions involving rubber dust. Four workers were also injured in an unspecified chemical dust explosion at a pharmaceutical plant.

2021 DETAILED ANALYSIS

◆ Wood	22.7%	◆ Plastic	0.9%
◆ Food	49.5%	◆ Carbon	0.9%
◆ Metal	6.0%	◆ Textile	0.5%
◆ Coal	6.0%	◆ Other	6.5%
◆ Paper	2.3%	◆ Unknown	4.6%

INDUSTRIES INVOLVED



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 19% to 28% of the incidents, while agricultural activity and food production has ranged from 33% to 50%.

As shown in the detailed incident breakdown, the “other” category includes pulp & paper, ethanol, high schools, and educational facilities. Industries not broken out in the detailed breakdown include rubber products, lawn products, graphite and carbon products, food packaging, pharmaceutical, residential, plastics and waste treatment.

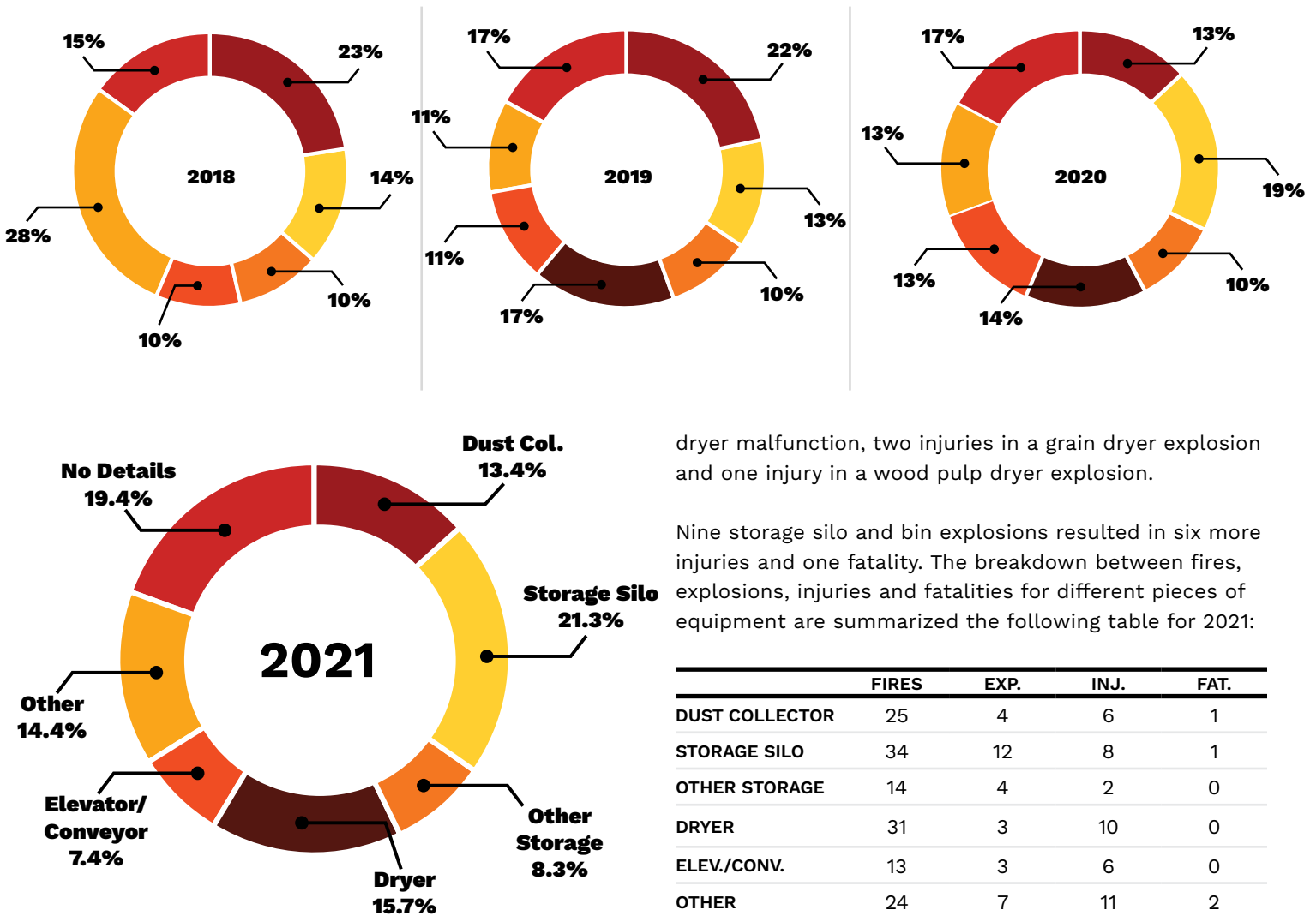
Combined, the overall “other” category of industries makes up 19% of the injuries reported in 2021. Wood and wood products, agriculture and food processing, and automotive and metalworking make up 14%, 8% and 6% of the injuries, respectively. Mining accounted for 50% of injuries and 83% of fatalities this year, mostly due to the tragic mine explosion in Russia. Overall, fatalities were recorded in wood and wood products, metal working, agricultural, food processing, power generation, and mining operations.

2021 DETAILED ANALYSIS

◆ Wood & Wood Pro.	18.5%	◆ Power Generation	4.6%
◆ Agriculture	36.6%	◆ Ethanol	2.3%
◆ Food Processing	11.6%	◆ Schools and Edu.	0.9%
◆ Automotive	1.9%	◆ Coal Handling	1.4%
◆ Metal Working	3.2%	◆ Pulp & Paper	3.2%
◆ Mining	1.9%	◆ Other	13.9%

EQUIPMENT & CAUSES

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



dryer malfunction, two injuries in a grain dryer explosion and one injury in a wood pulp dryer explosion.

Nine storage silo and bin explosions resulted in six more injuries and one fatality. The breakdown between fires, explosions, injuries and fatalities for different pieces of equipment are summarized the following table for 2021:

	FIRES	EXP.	INJ.	FAT.
DUST COLLECTOR	25	4	6	1
STORAGE SILO	34	12	8	1
OTHER STORAGE	14	4	2	0
DRYER	31	3	10	0
ELEV./CONV.	13	3	6	0
OTHER	24	7	11	2
NO DETAILS	22	20	172	65
TOTAL	163	53	215	69

DISCUSSION POINTS

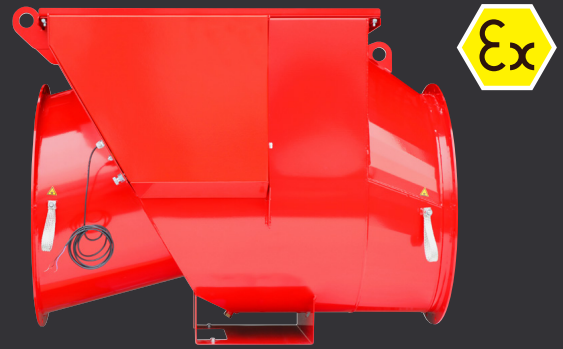
In 2021, storage silos demonstrated the highest percentage of combustible dust incidents with 34 fires and 12 explosions reported. This is a higher percentage than the 2017 and 2018 reports which found that dust collection systems had the highest percentage of incidents occur. In 2021, only 13% of the fires and explosions occurred in dust collection systems.

Of the incidents with known equipment, dryers had the largest number of injuries in 2021 with four injuries in a pharmaceutical dryer explosion, three injuries in a rice

Of the incidents where equipment is known, equipment labeled “Other” made up 17% of the incidents, 26% of the injuries and 33% of the fatalities. These incidents include a gas dryer explosion that injured six, and a boiler explosion in a sawdust facility that injured two and killed one. Incidents where no details were provided for the equipment made up 20% of the total reported. However, these incidents made up 80% of the reported injuries and 96% of the reported fatalities.

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2021 OSHA CITATIONS

ISSUE DATE	INDUSTRIAL ACTIVITY	STATE	VIOLATIONS	INT. PEN.	CUR. PEN.	INSPECTION	STATUS	CITATION LINK
Dec 3	Rubber Product Manufacturing	WI	2	\$19,114	\$12,365	1535033.015	Open	More Info
Dec 2	Overhead System Manufacturing	NH	1	\$12,288	\$9,216	1537468.015	Open	More Info
Nov 4	Plastic Product Manufacturing	PA	1	\$11,605	\$8,124	1549563.015	Open	More Info
Oct 26	Concrete Foundation and Structure	TX	2	\$21,066	\$12,288	1553496.015	Open	More Info
Sep 30	Wood Containers and Pallets	OH	4	\$16,384	\$8,000	1523851.015	Open	More Info
Sep 9	Chocolate & Confectionery	WI	3	\$38,984	\$20,414	1519144.015	Open	More Info
Sep 7	Sheet Metal Work Manufacturing	TX	2	\$16,384	\$9,830	1519967.015	Closed	More Info
Aug 30	Nonferrous Metal Refining	MO	1	\$9,557	\$6,690	1528438.015	Closed	More Info
Jun 11	Flavoring Syrup and Concentrate	WI	1	\$9,753	\$6,827	1506514.015	Closed	More Info
May 25	Kitchen Cabinet and Countertop	GA	8	\$54,614	\$38,230	1504673.015	Open	More Info
May 21	Carbon and Graphite Products	PA	2	\$9,557	\$4,900	1512202.015	Open	More Info
May 13	Wood Windows and Doors	NJ	12	\$26,332	\$14,482	1502444.015	Open	More Info
May 10	Industrial Manufacturing	IL	7	\$55,978	\$55,978	1501977.015	Open	More Info
Apr 6	Spring Manufacturing	TX	6	\$61,580	\$30,000	1513252.015	Closed	More Info
Feb 25	Powder Metallurgy	PA	3	\$4,681	\$2,500	1499344.015	Closed	More Info
Jan 25	Metal Pipe Manufacturing	OH	3	\$35,108	\$18,783	1486453.015	Open	More Info
Jan 5	Rice Milling	IL	1	\$3,856	\$3,856	1486891.015	Open	More Info

Inspections Resulting In Citations: 17

Total Citations: 59

Total Initial Penalties: \$406,841

Total Current Penalties: \$262,483

Initial Penalty/Citation: \$6,896

Initial Penalty/Inspection: \$23,932

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

PROTECTING YOUR PROCESS AGAINST EXPLOSIONS



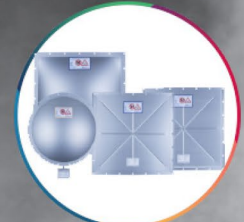
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RUBBER DUST EXPLOSION AT FACILITY IN JONESBOROUGH, TENNESSEE

JANUARY 6, 2021

One Injury

BACKGROUND

The company involved produces a wide range of synthetic compounds for the transportation, tire, industrial and rolls market.

INCIDENT DESCRIPTION

On January 7, 2021, a local news agency reported an explosion and fire at a rubber manufacturing plant in Jonesborough, Tennessee.

Firefighters arrived shortly after Washington County 911 officials received a fire alarm call at 1:52 a.m. They found flames coming from the roof and decided to mount an external attack rather than send crews into the building.

The cause of the explosion was unknown but believed to have started during manufacturing. The fire was expected to burn for days. Officials warned nearby farmers to keep their livestock away from a nearby creek due to toxins from the runoff water.

OUTCOME

There were 22 employees working when the explosion occurred. Although they all made it out, one employee suffered first, second and third-degree burns all over his body and was airlifted to a burn centre. Insurance compensation for loss of the facility totaled \$74,000,000.

Incident Database: [One Worker Injured in Explosion at Tennessee Rubber Manufacturer](#)

POTATO STARCH EXPLOSION AT FIRE PROTECTION SYSTEMS FACILITY IN SINGAPORE

FEBRUARY 25, 2021

Three Fatalities and Seven Injuries

BACKGROUND

The company involved is a registered L3 contractor with BCA Singapore in Fire Protection Works and L1 contractor with BCA Singapore for Electrical Works. It was founded in 2010 and offers services that include supplying, designing, installing and maintaining all types of fire protection and electrical systems.

INCIDENT DESCRIPTION

On February 25, 2021, a dust explosion and fire were reported at an industrial building in Tuas, Singapore. Singapore Civil Defence Force firefighters arrived at 11:25 a.m. and found the building smokelogged. After entering the building to locate the fire, they extinguished it with two water jets.

Employees were working on an industrial mixer when the explosion occurred. A representative of the Manpower Ministry's Occupational Safety and Health Division confirmed that the explosion may have involved potato starch powder.

INQUIRY COMMITTEE INVESTIGATION

After the incident, the Ministry of Manpower appointed an Inquiry Committee (IC) to examine the factors that led to the fire and explosion. This committee was also tasked with making recommendations including policy, regulatory or Workplace Safety and Health (WSH) Act measures to prevent the recurrence of similar incidents.

Through investigating loss history at the facility, physical evidence and witness statements, the committee concluded that an initial rupture of the oil jacket around the mixer in question released

an oil mist which ignited causing a primary catastrophic explosion at the site. Secondary flash fires also occurred which were likely due to combustion of potato starch powders which were allowed to accumulate at the worksite.

The IC concluded that the initial oil mist explosion caused the most significant damage and injuries during the incident, but also recommended that regulators, occupiers, employers, workers and property owners involved in facilities that use combustible powders are made fully aware of and can properly manage fire, flash-fire and explosion hazards associated with these materials.

The IC also concluded that criminal offenses had likely occurred with respect to the company and its owners during the leadup to the fatal incident.

OUTCOME

During the explosion Ten workers suffered burns. Three died while another five remained in critical condition. Two were discharged after being treated. Videos showed several workers with their clothing burned off and visible burn injuries.

On March 3, the Minister of State for Manpower announced that the government had begun inspections of almost 500 companies for potential combustible dust hazards in the wake of the Tuas explosion.

These investigations coincided with a safety time-out called by the Workplace Safety and Health Council. This measure was intended to give employers an opportunity to assess their business processes and ensure that their machinery was well-maintained and correctly used.

On March 19, three companies were issued stop-work orders after they were found to have inadequate control measures, despite “significant risk” of combustible dust explosions. The following month, the Ministry of Manpower announced that between May and June, it would carry out 400 worksite safety inspections targeting high-risk sectors including construction and manufacturing. This was due to the fact that over 3,200 workplace safety and health contraventions were found during inspections between January and April, almost double the 1,800 contraventions recorded the same period last year.

On May 19, Enterprise Singapore officially launched SS 667:2020 – Code of Practice for Handling, Storage and Processing of Combustible Dust. Over a week later, the National University of Singapore Alumni Safety, Health and Environment (SHE) Society hosted a virtual workshop that shared the critical aspects of combustible dust, including the nature of combustible dust, process safety concerns, risk management approaches, and relevant local and international standards.

Incident Database: [Explosion at Singapore Fire System Manufacturer Kills Three Workers](#)

DUST EXPLOSION AT SEED CLEANING FACILITY IN SILVERTON, OREGON

MARCH 23, 2021

One Fatality, One Injury

BACKGROUND

The company involved is a seed cleaning and crop preparation business in Silverton, Oregon. It was founded in 2009 and employs approximately five people.

INCIDENT DESCRIPTION

On March 23, 2021, a local news agency reported a dust explosion at a seed cleaning and crop preparation services company in Silverton, Oregon.

During their investigation, the local fire department determined that the deceased was on the 3rd floor of the structure when the explosion occurred removing a tarp that covered a seed waste and chaff “bunker”. The bunker funneled waste seed and chaff to a conveyor that took it outside of the structure. The seed cleaner was not in operation and they were in the process of dismantling the bunker for new equipment to be installed. Power to the seed clearing and conveyor system was locked and tagged out when the explosion occurred.

Video surveillance showed dust coming from the doorway of the lower area of the bunker prior to the explosion. The video showed four rapid flame bursts followed by a “rapid expansion in volume” associated with an extremely vigorous deflagration/explosion 58 seconds after the initial flame bursts (Silverton Fire Department Report #21-0000477).

OUTCOME

One employee was killed and another injured during the explosion and resulting fires. No other information about property damage was available., but losses are estimated at \$1,400,000.

Incident Database: [Dust Explosion at Crop Preparation Plant Kills One and Injures Another](#)

FLOUR DUST EXPLOSION AT BAKING COMPANY IN SAVANNAH, GEORGIA

SEPTEMBER 14, 2021

Two Injuries

BACKGROUND

The company involved is a baked goods producer headquartered in Thomasville, Georgia. Founded in 1919, it is one of the largest producers of packaged bakery foods in the United States with 46 bakeries throughout the United States.

INCIDENT DESCRIPTION

On September 14, 2021, a local news agency reported an explosion at a baked goods producer in Savannah, Georgia. The Savannah Fire Department reported that a dust explosion occurred in a flour mixing room at the plant. Damage was done to one wall of the room and the building's fire suppression system extinguished the resulting fire.

The fire investigator's report indicates that the explosion occurred in the sifting room which was fitted with a plastic curtain to contain potential dust from the mechanical equipment involved. The report specifies that electrical controls for the room were encased in "protective boxes and what appeared to be explosion proof housings" (Savannah Fire Department #21-0008292).

The investigator noted several electrical components within the room which showed damage or exposure that could have been an ignition source. The investigator also noted that afterwards, maintenance advised him/her that they found a wire which may have been damaged by a falling bag and showed electrical arcing, however the investigator was unable to independently confirm these findings.

OUTCOME

Two employees reported minor injuries from the explosion.

Incident Database: [Two Employees Injured in Dust Explosion at Georgia Baking Company](#)

COAL MINE EXPLOSION/FIRE KILLS AND INJURES MORE THAN 150 IN GRAMOTEINO, RUSSIA

NOVEMBER 25, 2021

At least 51 Fatalities and 106 Injuries

BACKGROUND

The coal mine is a part of a holding company involved in coal mining, railway transportation, chemicals, machine building and radio stations. The parent company is among Russia's largest producers of coal for power generation.

INCIDENT DESCRIPTION

On November 25, 2021 an international news agency reported a fire and explosion at a coal mine in Gramoteino, Russia. After the explosion, coal dust caught fire in a ventilation shaft filling the underground workplace with smoke. After initial rescue attempts, Russian emergency services were forced to temporarily suspend operations due to risk of an explosion. Methane and CO2 levels were dangerously high.

A state television report said prosecutors believed there had been a methane explosion. Other news sources suggest that the mine may have experienced a fire in the days leading up to the catastrophic incident as well.

OUTCOME

According to other news agencies, 46 miners and five rescuers were killed. It was believed that the miners had suffocated when a ventilation shaft became filled with gas. Dozens of workers were treated in hospital. Four of them were reported to be in critical condition and the total number of people with non-fatal injuries came to 106.

Continued on next page...

On November 26, three people, including the director of the mine and his deputy, had been arrested on suspicion of violating industrial safety rules. It was also reported that the court ordered two safety inspectors, who had issued a certificate for the mine that month but had not actually checked the facility, to remain in custody until late January.

Incident Database: [51 People Killed and Over 100 Injured in Russian Coal Mine Explosion](#)



Combustible Dust Consultants

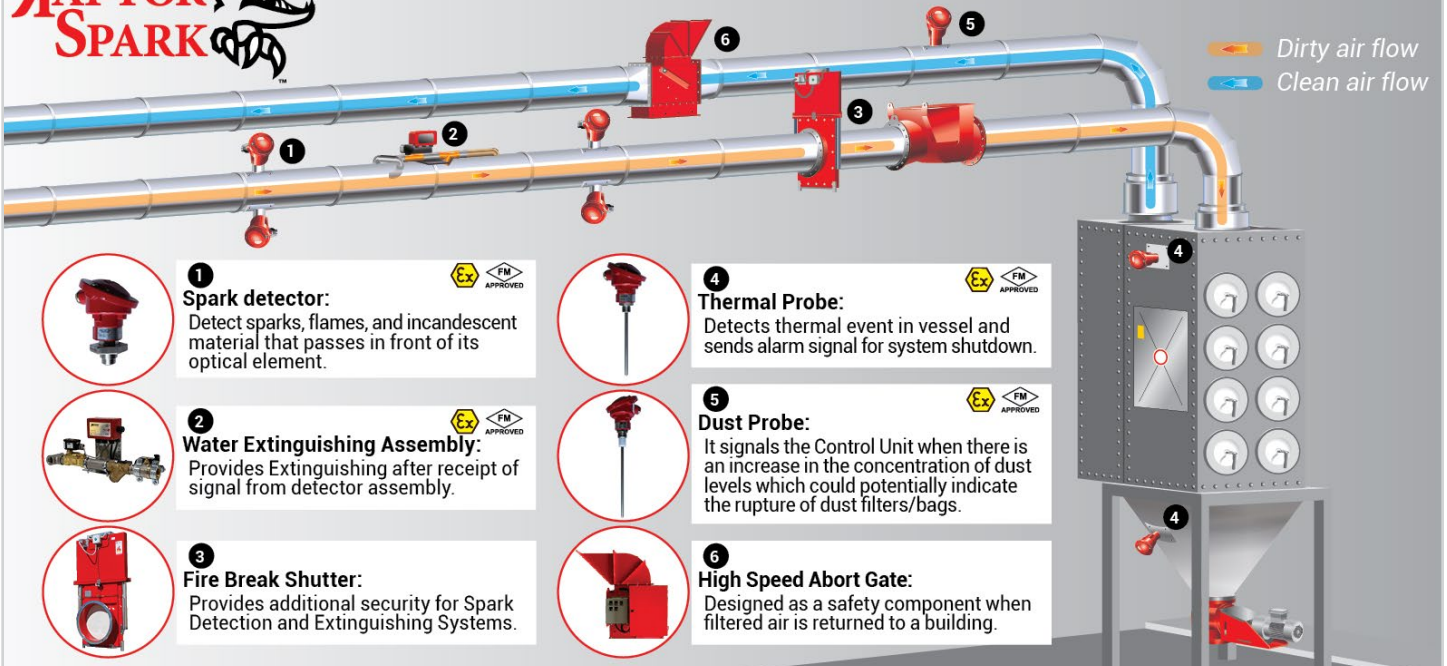


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DSS131:

HISTORY OF THE WOOD PELLET ASSOCIATION OF CANADA WITH GORDON MURRAY



HAVE YOU LISTENED TO THE DUST SAFETY SCIENCE PODCAST YET?

Below is a copy of the show notes from a past episode to give you an idea of what is typically covered. We regularly feature interviews with combustible dust experts around the world, how the most recent research is integrated into industry application and the latest developments in best practice, engineering guidance and regulation.

Check out the most recent episodes by visiting the [podcast homepage!](#)

INTRODUCTION

In today's episode of the [Dust Safety Science podcast](#), Gordon Murray, Executive Director of the [Wood Pellet Association of Canada](#) (WPAC), talks about the organization's history, which includes several accomplishments in the field of dust fire and explosion safety.

This episode is one of several with WPAC, BC Forest Safety Council, Dalhousie University and the Manufacturing Advisory Group in BC talking about projects completed over the past couple of years to improve combustible dust safety in wood manufacturing facilities in British Columbia and the rest of Canada.

You can find a full list of these episodes for reference on [Page 19](#).

A LITTLE BIT ABOUT GORDON'S BACKGROUND AND FORMATION OF THE WPAC SAFETY COMMITTEE

Gordon joined the WPAC in 2008 as a consultant and became the Executive Director the following year. He recalls that his first five years in the role was spent on advocacy issues.

"Many people will remember [that in] 2012 in British Columbia, there were two very large sawmill explosions: Lakeland and Burns Lake, [which had] fatalities and lots of people injured," he says.

The pellet plants tried to deal with the combustible dust question themselves, without much success. Then, in 2014, WorkSafeBC began putting pressure on sawmills and pellet plants to improve their dust safety practices. They responded by forming a safety committee to address the issue.



WPAC Logo - <https://www.pellet.org/>

DUST CONDITIONS IN BRITISH COLUMBIA SAWMILLS AND PELLET PLANTS WERE NOT GOOD IN 2014.

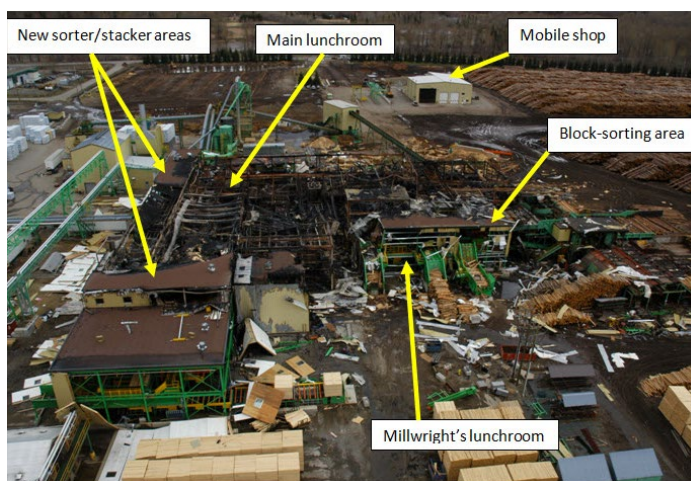
“You’d be horrified if you would think about the mills or our plants at that time,” Gordon admits. You’d go in and there would be mountains of dust everywhere, piled up on beams, on top of equipment, lights that were not properly rated. And there’d be fires starting everywhere. It was really unbelievable.”

This committee was supposed to be a short-term endeavor to address an immediate concern and share its findings with all affected companies. However, it soon expanded to include members across Canada.

“We started working on a combustible dust audit and an inspection and identifying consultants that could come into our plants and help us to understand it,” he says.

The committee’s hard work soon paid off. Companies went from a 90% failure rate on WorkSafeBC inspections to a 100% compliance rate. Everyone’s willingness to work together and improve their relationship with provincial regulators yielded life-saving results.

“We started tackling other issues in our plants, too,” Gordon remembers. “Like how do you deal with the confined space, and lockouts, and guarding, training and supervision, and contract orientation, all other kinds of aspects of safety? So we said, ‘Let’s turn this combustible dust committee into a safety committee and commit to the culture.’”



“Aftermath of the Lakeland sawmill explosion (Source: [WorkSafe BC Investigation Report](#)).

WIDESPREAD SAFETY ISSUES IN PLANTS RESULTED IN A COMMITTEE DEDICATED TO THEIR RESOLUTION.

Today, the Wood Pellet Association of Canada has 62 members from pellet companies all across the country. Participation is strong and everyone has been involved in the organization’s annual work plans.

“A work plan is a fancy way of just describing a to-do list,” Gordon says. “We break down these different things, whether it’s combustible dust, holding a workshop, completing an audit checklist or having five companies do audits done by such and such a date, or whatever.

We have a similar to-do list for confined space, for working at heights, for guarding. We share examples of good and bad, and then go back through all our plants and clean up all the guarding around the equipment and just really simple stuff like that.”

To keep the momentum going, WPAC holds regular meetings, shares its progress with WorkSafeBC, and maintains a safety culture through constant reinforcement. It is also a member of the [BC Forest Safety Council](#).

“Now we’re working on more complicated kinds of things like critical control implementation as part of implementing process safety,” Gordon explains. “We’re working on the safety of belt dryers. We’re looking at equipment isolation in order to prevent propagation of events up and down the process line in pellet plants. We’re looking at operator training and optimizing the use of alarms, at centralizing nitrogen supply, different training and supervision.”

Other initiatives include:

- A workshop on silo fire safety that involved all the fire brigades from around the province
- A combustible gas video explaining the hazards associated with buildup at the facilities
- A six-webinar series on wood pellet manufacturing which results in a training certificate for the participants

- Several Resources for addressing combustible dust and raw material storage, most of which are posted on the wood pellet section of the [BC Forest Safety Council website](#).

“We now have members from Europe as well,” Gordon says. “We’ve got regular attendance from companies like Drax Power and GDF Suez and others. We also now have a collaboration with the [European Pellet Council](#), which is the gathering of all the national pellet associations for the EU. So we’re starting to have some international impact.”

CONCLUSION

“[There isn’t] any secret to it other than deciding as an organization that safety is important to us, and that we need to be prepared to put money and effort and time into it,” Gordon says. “You can’t run your business without your people. So you’ve got to keep your people safe, make sure they go home at night to their families.” If you want to learn more about the Wood Pellet Association of Canada and their work or connect with Gordon, you can visit their website at <https://www.pellet.org/>.

LOOKING TO LEARN MORE ABOUT COMBUSTIBLE DUST SAFETY PROJECTS IN CANADA?

DSS133: Implementing Inherently Safer Design using Bowtie Analysis for Combustible Dust Hazards with Dr. Paul Amyotte

DSS132: Identifying & Implementing Critical Controls in Wood Pellet Facilities with Cherie Whelan

DSS098: History of the Manufacturing Advisory Group in British Columbia with David Murray

DSS097: Lessons learned from two British Columbia sawmill explosions in 2012 with David Murray

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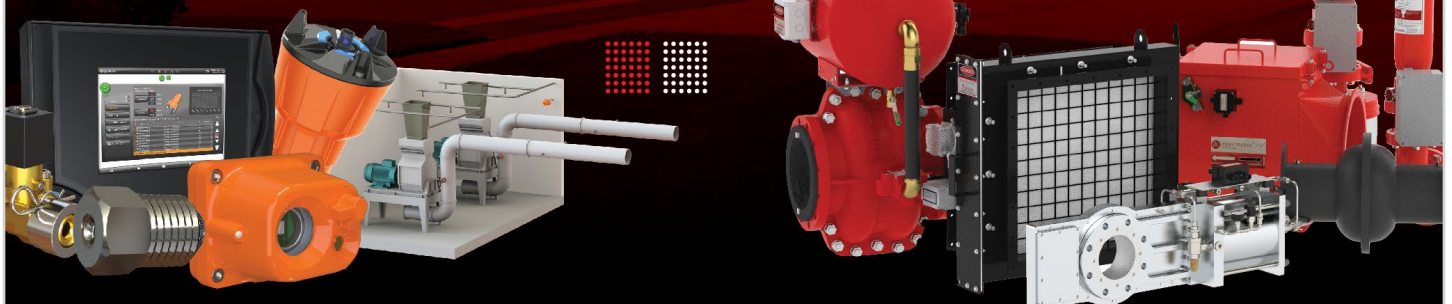


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DSS152:

DUST EXPLOSION LOSS HISTORY IN NORTH AMERICA



INTRODUCTION

In [this episode of the Dust Safety Science Podcast](#), we're talking about dust explosion loss history in North America.

In the last episode ([DSS151](#)), we explored some of the earliest resources and regulations from North America to illustrate several interesting points about combustible dust. Today, we're moving into loss history, with an emphasis on North America.

WHY IS UNDERSTANDING LOSS HISTORY IMPORTANT?

Why is it important to understand loss history? The most important thing is to not forget what we already know.

If you're not learning from the past, you tend to repeat it. For example, we had a sugar and cocoa standard in 1924, but fires and explosions are still occurring in these facilities today. That's one of the biggest reasons why understanding and keeping track of loss history is really important.

So what loss history information is actually available in North America? There are six sources we reviewed in this episode:

- In 1957, the National Fire Protection Association released a report of important dust explosions in the United States and Canada since 1860.

- In 2006, the US Chemical Safety Board published its investigation report, the "Combustible Dust Hazard Study", which covered explosions in general industry from 1980 to 2006.
- In 2018, the CSB released an update covering 2006 to 2017.
- The U.S. Bureau of Mines has its own database covering mining accidents that weren't captured by the NFPA report or the CSB reports.
- The U.S. Department of Agriculture (USDA), National Grain and Feed Association (NFGA), and several other groups involved with the grain industry do a great job of tracking incidents through detailed reports.
- The [Dust Safety Science combustible dust incident database](#).

WHAT ARE SOME OF THE CHALLENGES IN TRACKING LOSS HISTORY?

Challenge number one is that the information is available through dozens of different documents and databases. NFPA and the Chemical Safety Board have attempted to consolidate some of the information, but everything else, especially in other parts of the world, is in a bunch of different databases. Putting it all together can be a big challenge.

Continued on next page...

The second challenge is that there are overlaps and gaps in reporting. The Chemical Safety Board may report an incident as being part of general industry while another organization may identify it as a grain handling industry incident. Occasionally, an industry may not be covered at all. Think about waste treatment and other industries that may not be captured in these areas.

The third challenge is that there's an inconsistent approach to reporting across the board. In some cases, they only report incidents that involve injuries and fatalities. In other cases, there is a much lower bar to reporting.

The fourth challenge is that consolidated reports usually aren't available until years after the incidents occurred. As a result of recency bias, you attach a lot more importance to what happened last week than to what happened last year, which is much more important than what happened 10 years ago.

The combustible dust incident database is our solution to some of these problems.

We're tracking incidents soon after they happen and validating them the best we can, which yields a lot of useful insights while keeping the issue of combustible dust safety front and center.

HOW MANY DUST EXPLOSIONS OCCURRED IN THE FIRST HALF OF THE 20TH CENTURY?

The NFPA report on important dust explosions in the U.S. and Canada stated that since 1900, the organization received reports of 1,085 dust explosions. In these explosions, 640 were killed, 1,712 were injured, and property damage totalled \$97,811,678. These totals covered a wide range of industries.

In summary NFPA found that between 1900 and 1957, there were 20 reported explosions, 31 injuries and 12 fatalities per year reported across all industries except coal mining.

HOW MANY DUST EXPLOSIONS OCCUR IN US AGRICULTURAL INDUSTRIES TODAY?

Agricultural incidents are covered in three main resources:

- The USDA Task Force Report entitled "Grain Dust Explosions, An Unsolved Problem" published in the late 1970s.
- The reporting done at Kansas State University by Professor Robert Schoeff from 1977 to 2005.
- The reporting released by Dr. Kingsley Ambrose from 2006 to the current date (first at Kansas State University and then at Purdue University).

According to the USDA Task Force report, which covered 1958 to 1976, there was an average of eight grain elevator explosions per year, resulting in 15 injuries and six fatalities. In 1977 and 1978, there was a tremendous uptick in serious grain elevator explosions. In a one-month period, from December 1977 to January 1978, five explosions took the lives of 62 people and injured 53 others.

Between 1975 and 1988, there was an average of 20 grain dust explosions, 35 injuries and 11 fatalities per year in these agricultural industries. This increase led to the development of what is now the OSHA Grain Handling Standard in the late 1980s. Since the OSHA Grain Handling Standard was put in place the frequency and severity of grain dust explosions has remained relatively constant around an average of 10 explosions per year, 10-15 injuries per year and 1-2 fatalities per year.

HOW MANY DUST EXPLOSIONS OCCUR IN OTHER US INDUSTRIES?

With the U.S. Chemical Safety Board reports, the first one covers 1980 to 2006 and the second one covers 2006 to 2017. The earlier report gives a figure of 11 explosions, 27 injuries and 4.5 fatalities per year, and the later report presents nine explosions, 25 injuries and five fatalities per year.

Continued on next page...

Combined with the Agricultural industries above, these numbers suggest an average of 20 dust explosions, 30 injuries and 6-7 fatalities per year since the OSHA Grain Handling Standard was implemented in the late 1980s.

CONCLUSION

It's interesting to note that the Dust Safety Science incident reporting, which covers 2016 to today, tallies closely with the historical data. We're seeing 30 explosions, 30 to 35 injuries and two or three fatalities per year, and with the worst year being six fatalities in total.

Although things may not be getting worse over time, they don't appear to be improving greatly either, and that needs to change.

Also keep in mind that dust explosions are largely under reported and misreported in industry and that the actual number of explosions is likely 5-10 times higher than captured by the sources above including the incident database which focuses mostly on incidents that have made local news sources.

Source: [DSS152: Dust explosion loss history in North America](#)

LOOKING TO LEARN MORE ABOUT GLOBAL COMBUSTIBLE DUST LOSS HISTORY?

DSS154: Dust explosion loss history in Asia

DSS153: Dust explosion loss history in Europe and the United Kingdom

DSS152: Dust explosion loss history in North America

DSS151: Early textbooks and regulations on combustible dust in North America



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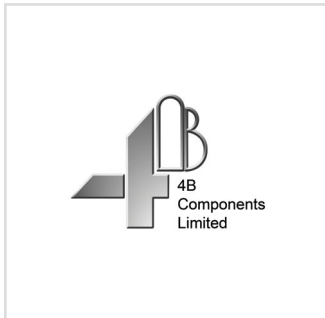
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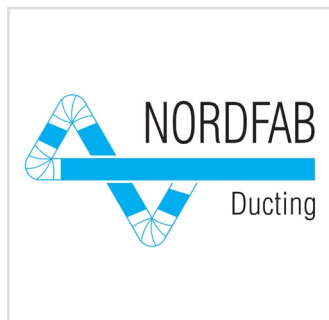


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Phone: (800) 736-6288
Email: eric@ruwac.com



Ruwac USA is American-owned and operated. Made in America with American-made parts, we specialize in industrial vacuums and only industrial vacuums. As such, rest assured that quality, design and performance are our utmost priorities. We stand behind every Ruwac vacuum system.



Sigma-HSE

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

Phone: +44 (0)1962840570
Email: 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



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.



SonicAire

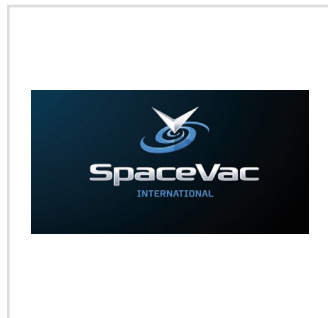
3831 Kimwell Drive
Winston-Salem NC 27103
United States

Phone: (336) 712-2437
Email: moreinfo@sonicaire.com



SonicAire is a global leader in dust buildup prevention with patented BarrierAire™ technology which eliminates overhead dust accumulation, maximizes plant safety by complying with safety and health regulations, and cuts manual overhead cleaning costs.

DSP MEMBER COMPANIES



SpaceVac International

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

Phone: +0 1604 968 668
Email: 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.



STIF

ZA de la Lande
49171 Saint-Georges-sur-Loire

Phone: 02 41 72 16 82
Fax : 02 41 39 32 122
Email: sales@stifnet.com



STIF is the first French manufacturer of components for the handling of the bulk products. It has built itself a robust international reputation by exporting to more than 60 countries.



Stonehouse Process Safety

11D Princess Rd,
Lawrenceville, NJ 08648

Phone: (609) 455-0001
Email: info@stonehousesafety.com



Stonehouse Process Safety protects people, plant, the community – and your business. Our experts identify hazards, evaluate risks, propose practical solutions, and support and verify the implementation of safety measures. We deliver tailored, quality-assured laboratory test data – cost-effectively.



XP Products

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

Phone: (630) 464-3800
Email: 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.



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CASE STUDIES

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PVC sheets and composites company reduces housekeeping costs and creates a safer workplace with SonicAir fans









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WOOD & WOOD PRODUCTS

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Mar 2	Azek Building Products	Wilmington, OH	Explosion	Wood Dust	1	0	Dryer	No Details	
Mar 14	Maine Woods Pellet Company	Athens, ME	Fire	Wood Dust	0	0	Dryer	No Details	
Mar 18	Tilo Industries	Buffalo Township, PA	Fire	Wood Dust	0	0	Silo	No Details	
May 2	Logistec USA Inc.	Brunswick, GA	Explosion	Wood Dust	0	0	Unknown	No Details	
May 15	West Fraser	Riegelwood, NC	Fire	Wood Dust	0	0	Pipe	No Details	
May 27	Modern Cabinet Company	Poughkeepsie, NY	Fire	Wood Dust	0	0	Dust Collector	\$250,000	
May 29	Trinity River Lumber Company	Weaverville, CA	Fire	Wood Dust	0	0	Unknown	No Details	
Jun 5	Unknown	North Plains, OR	Fire	Wood Dust	0	0	Sawdust Hopper	No Details	
Jun 16	Unknown	Auberry, CA	Fire	Wood Dust	0	0	Unknown	No Details	
Jul 14	Augusta Lumber Mill	Rockbridge County, VA	Fire	Wood Dust	0	0	Unknown	No Details	
Jul 16	Unknown	Guernsey, WY	Fire	Wood Dust	0	0	Unknown	No Details	
Aug 5	Superior Cedar Products Inc.	South Carney, MI	Fire	Wood Dust	0	1	Grinder	No Details	
Sep 2	Hazlehurst Wood Pellet Company	Hazlehurst, GA	Explosion	Wood Dust	4	0	Unknown	No Details	
Sep 21	Southern Finishing Company	Martinsville, VA	Fire	Wood Dust	0	0	Sawdust Hopper	No Details	
Dec 10	Unknown	East Providence, RI	Explosion	Wood Dust	0	0	Sawdust Hopper	No Details	
Dec 13	HomerWood Hardwood Flooring	Titusville, PA	Fire	Wood Dust	0	0	Dust Collector	No Details	
Dec 14	Kingfield Wood Products	Kingfield, ME	Fire	Wood Dust	0	0	Sawdust Bin	No Details	

INCIDENT SUMMARY - INCIDENTS: 17 | FIRES: 13 | EXPLOSIONS: 4 | INJURIES: 5 | FATALITIES: 1

AUTOMOTIVE & METAL WORKING















DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 28	P Kay Metals	Lewiston, ID	Fire	Metal Dust	0	0	Dust Collector	\$5,000	
Jan 29	Metalcraft of Mayville	Beaver Dam, WI	Fire	Metal Dust	0	0	Dust Collector	No Details	
Feb 19	Webb-Stiles Company	Valley City, OH	Fire	Metal Dust	0	0	Vacuum	No Details	
Mar 27	Bridgestone Firestone	LaVergne, TN	Explosion	Sulfur	1	0	Unknown	No Details	
Jul 17	Bridgestone	Graniteville, SC	Fire	Rubber Dust	0	0	Unknown	No Details	
Oct 10	Silgan Containers Corporation	Evansville, IN	Fire	Metal Dust	0	0	Dust Collector	No Details	
Nov 1	Metalworks Inc.	Lincoln, NE	Fire	Metal Dust	0	0	Dust Collector	No Details	
Dec 1	Unknown	Chattanooga, TN	Fire	Metal Dust	0	0	Dust Collector	No Details	

INCIDENT SUMMARY - INCIDENTS: 8 | FIRES: 7 | EXPLOSIONS: 1 | INJURIES: 1 | FATALITIES: 0

AGRICULTURE

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	
Jan 12	Unknown	Owensboro, KY	Fire	Grain Dust	0	0	Unknown	No Details	
Feb 19	ADM Farmview	Fremont, NE	Fire	Grain Dust	0	0	Grain Bin	No Details	
Mar 4	Reisdorf Brothers, Inc.	North Java, NY	Fire	Grain Dust	0	0	Grain Machine	\$2,000,000	
Mar 23	Riches Seeds	Silverton, OR	Explosion	Grain Dust	1	1	Unknown	\$1,400,000	
Mar 25	Nunn-Better Milling Company	Evansville, IN	Fire	Grain Dust	0	0	Grain Bin	No Details	
Mar 26	Poulin Grain	Swanton, VT	Fire	Grain Dust	0	0	Grain Silo	No Details	
May 3	Dakota Mill and Grain	Fort Pierre, SD	Fire	Grain Dust	0	0	Grain Bin	No Details	
May 5	Perdue Farms	Salisbury, MD	Fire	Grain Dust	0	0	Soybean Dryer	No Details	
May 11	North Star Feeds	Atchison, KS	Fire	Grain Dust	0	0	Grain Bin	No Details	
May 12	Unknown	Bedford, VA	Fire	Grain Dust	0	0	Grain Silo	No Details	
May 14	Landus Cooperative	Jefferson, IA	Explosion	Grain Dust	0	0	Grain Silo	No Details	
May 18	JR Simplot Company	Mountain Home, ID	Explosion	Grain Dust	1	0	Unknown	No Details	
May 22	Boyd Station LLC	Danville, PA	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Jun 1	Christensen Farms	Sleepy Eye, MN	Explosion	Grain Dust	0	0	Grain Silo	No Details	
Jun 1	Farmer's Co-op of Hanska	New Ulm, MN	Explosion	Grain Dust	1	0	Grain Bin	No Details	
Jun 29	Alto Pekin LLC	Pekin, IL	Fire	Grain Dust	0	0	Corn Dryer	No Details	
Jul 10	Unknown	Curtiss, WI	Fire	Grain Dust	0	0	Unknown	No Details	
Jul 12	MGI Grain Elevator	East Grand Forks, MN	Fire	Grain Dust	0	0	Grain Elevator	\$20,000	
Jul 14	Purina Mills	Caledonia, NY	Fire	Grain Dust	0	0	Unknown	No Details	
Jul 25	Wheaton Dumont Co-Op Elevator	Clinton, MN	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Jul 28	Unknown	Memphis, TN	Fire	Grain Dust	0	0	Rail Car	\$3000	
Jul 29	ADM	Columbus, NE	Fire	Coal Dust	0	0	Storage Dome	No Details	
Aug 3	Unknown	Minneapolis, MN	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Aug 6	Reitz Dairy Farm	Shamokin Township, PA	Fire	Silage	0	0	Silo	No Details	
Aug 17	Unknown	Sumas, WA	Fire	Grain Dust	0	0	Silo Bunker	\$700,000	
Aug 23	Unknown	Great Falls, MT	Fire	Grain Dust	0	0	Grain Bin	No Details	
Aug 30	Ripley Farms	Summerhill, NY	Fire	Grain Dust	0	0	Bale Grinder	No Details	
Sep 15	Trouw Nutrition	Strykersville, NY	Fire	Grain Dust	0	0	Grain Bin	\$60,000	
Sep 22	Unknown	White, SD	Fire	Grain Dust	0	0	Grain Dryer	\$53,000	
Sep 29	Larry Wickman Farm	Masonville, IA	Explosion	Grain Dust	0	0	Grain Dryer	No Details	
Oct 1	Unknown	Easton, WI	Fire	Grain Dust	0	0	Grain Silo	No Details	
Oct 5	Port of Vancouver	Vancouver, WA	Fire	Grain Dust	0	0	Grain Silo	No Details	

AGRICULTURE CONTINUED

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Oct 8	AG Partners	Albert City, IA	Fire	Grain Dust	0	0	Conveyor Belt	No Details	
Oct 9	Unknown	Mount Angel, OR	Fire	Grain Dust	0	0	Grain Elevator	No Details	
Oct 14	NEW Cooperative Inc.	Lidderdale, IA	Fire	Grain Dust	0	0	Feed Tower	No Details	
Oct 18	Dakota Specialty Milling	Fargo, ND	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Oct 20	ReConserve Inc.	Flowery Branch, GA	Fire	Grain Dust	0	0	Grain Silo	No Details	
Oct 25	Unknown	Belvidere, IL	Fire	Grain Dust	0	0	Grain Bin	No Details	
Nov 2	Country Visions Co-op	Kiel, WI	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Nov 12	Unknown	Barry Township, PA	Fire	Grain Dust	0	0	Grain Silo	No Details	
Nov 13	Sheppard Grain Inc.	Phelps, NY	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Nov 15	ADM	Red Wing, MN	Fire	Grain Dust	1	0	Grain Bin	\$60,000	
Nov 17	DuMond Farms	Union Springs, NY	Fire	Grain Dust	0	0	Grain Bin	No Details	
Dec 8	Cedar Creek Farms Inc.	Cato, NY	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Dec 11	Unknown	Bath, NY	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Dec 13	Gateway FS	Nashville, IL	Fire	Grain Dust	0	0	Grain Elevator	No Details	






INCIDENT SUMMARY - INCIDENTS: 46 | FIRES: 40 | EXPLOSIONS: 6 | INJURIES: 4 | FATALITIES: 1

FOOD PROCESSING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 22	Washington Potato Plant	Warden, WA	Fire	Potato Dust	0	0	Dehydrator	No Details	
Mar 15	Minn-Dak Farmers Cooperative	Wahpeton, ND	Explosion	Powdered Sugar	2	0	Unknown	No Details	
Mar 18	Perfection Pet Foods	Visalia, CA	Fire	Ground Pet Food	0	0	Dog Food Prod. Equip.	\$200,000	
Apr 20	Domino Sugar	Baltimore, MD	Fire	Sugar Dust	0	0	Silo	No Details	
May 23	Riceland Foods	Stuttgart, AR	Fire	Grain Dust	0	0	Grain Bin	No Details	
Jun 10	Alfagreen Supreme	Toledo, OH	Fire	Dehydrated Alfalfa	0	0	Unknown	No Details	
Jul 25	Kellogg's	Memphis, TN	Fire	Dried Rice	3	0	Rice Dryer	\$1,000,000	
Aug 17	J.M. Smucker	Lexington, KY	Fire	Peanut Dust	0	0	Sawdust Hopper	No Details	
Sep 11	Kellogg's	Battle Creek, MI	Fire	Grain Dust	0	0	Ductwork	No Details	
Sep 14	Derst Baking Company	Savannah, GA	Explosion	Flour Dust	2	0	Unknown	\$25,000	
Nov 8	Alfagreen Supreme	Odessa, NE	Fire	Dehydrated Alfalfa	0	0	Storage Silo	No Details	
Nov 26	Fieldale Farms Corporation	Baldwin, GA	Fire	Grain Dust	0	0	Grain Silo	No Details	
Dec 11	Kellogg's	Lancaster, PA	Fire	Grain Dust	0	0	Dust Collector	No Details	










INCIDENT SUMMARY - INCIDENTS: 13 | FIRES: 11 | EXPLOSIONS: 2 | INJURIES: 7 | FATALITIES: 0

PULP & PAPER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
May 24	Packaging Corporation of America	International Falls, MN	Fire	Paper Dust	0	0	Paper Machine	No Details	
Jun 17	Georgia-Pacific LLC	Brookhaven, MS	Fire	Paper Dust	0	0	Debarker	No Details	
Jun 27	Georgia-Pacific	Green Bay, WI	Fire	Paper Dust	0	0	Con. System	\$50,000	
Aug 31	Georgia-Pacific	Palatka, FL	Fire	Sawdust	1	0	Paper Machine	No Details	
Oct 15	ND Paper Mill	Old Town, ME	Fire	Wood Dust	0	0	Unknown	No Details	



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

POWER GENERATION & COAL HANDLING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Feb 22	Aurora Energy	Fairbanks, AK	Fire	Coal Dust	0	0	Unknown	No Details	
Apr 20	Edgewater Power Plant	Sheboygan, WI	Fire	Coal Dust	0	0	Dust Collector	No Details	
Apr 22	ADA Carbon Solutions	Coushatta, LA	Explosion	Coal Dust	2	0	Coal Handling System	No Details	
Jul 26	Elk Coal Mine	Ravensdale, WA	Fire	Coal Dust	0	0	Unknown	No Details	
Jul 29	Green Plains	Mount Vernon, IN	Explosion	Grain Dust	0	0	Grain Bin	No Details	
Aug 26	OG&E River Valley Power Plant	Panama, OK	Fire	Coal Dust	2	0	Coal Silo	No Details	
Sep 3	Alliant Energy	Ottumwa, IA	Fire	Coal Dust	0	0	Coal Silo	No Details	
Sep 23	Convergen Energy	Green Bay, WI	Fire	Unknown	0	0	Dust Collector	\$40,000	
Dec 30	CSX Transportation	Baltimore, MD	Explosion	Coal Dust	0	0	Dust Collector	No Details	






INCIDENT SUMMARY - INCIDENTS: 9 | FIRES: 6 | EXPLOSIONS: 3 | INJURIES: 4 | FATALITIES: 0

SCHOOLS & EDUCATIONAL FACILITIES

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 25	Basehor-Linwood High School	Basehor, KS	Fire	Wood Dust	0	0	Dust Collector	No Details	
Dec 10	Millbrook High School	Winchester, VA	Fire	Wood Dust	0	0	Dust Collector	\$250,000	














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

ETHANOL PRODUCTION

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 7	POET Biorefining	Ashton, IA	Fire	Grain Dust	0	0	Hammer Mill	\$10,000	
May 7	CHS Ethanol	Rochelle, IL	Fire	Grain Dust	0	0	Dust Col.	No Details	
May 24	South Bend Ethanol	South Bend, IN	Fire	Grain Dust	2	0	Grain Dryer	No Details	
Sep 2	Marquis Energy	Hennepin, IL	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Sep 10	E Energy Adams, LLC	Adams, NE	Fire	Grain Dust	0	0	Corn Dryer	No Details	







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

OTHER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT.	EQUIPMENT	DAMAGES	LINK
Jan 6	HEXPOL Rubber Compounding	Jonesborough, TN	Explosion	Rubber Dust	1	0	Unknown	No Details	
Jan 13	Profile Products LLC	Conover, NC	Fire	Unknown	0	0	Bagger and Auger Systems	No Details	
Jan 27	NAC Carbon Products	Punxsutawney, PA	Explosion	Carbon Dust	0	0	Unknown	No Details	
Apr 5	Avedis Zildjian Co.	Norwell, MA	Fire	Unknown	0	0	Dust Collector	No Details	
May 12	Pactiv Inc.	Temple, TX	Fire	Unknown	0	0	Storage Silo	No Details	
Jun 8	Humane Manufacturing	Janesville, WI	Explosion	Rubber Dust	1	0	Silo	No Details	
Jun 8	San Francisco Southeast Treatment	San Francisco, CA	Fire	Sludge Dust	0	0	Unknown	No Details	
Jul 28	Optima Chemical	Belle, WV	Explosion	Rubber Dust	0	0	Furnace	No Details	
Aug 6	SIG Sauer GmbH	Newington, NH	Fire	Metal Dust	0	0	Dust Collector	No Details	
Sep 2	Unknown	Dundalk, MD	Fire	Magnesium Dust	0	0	Unknown	No Details	
Sep 9	Kuhn Krause	Hutchinson, KS	Fire	Unknown	0	0	Dust Collector	No Details	
Sep 28	Birla Carbon	Ulysses, KS	Fire	Carbon Dust	0	0	Unknown	No Details	
Dec 20	Penway Corporation	Croydon, PA	Fire	Powdered Paint	0	0	Paint Dryer	No Details	


INCIDENT SUMMARY - INCIDENTS: 13 | FIRES: 9 | EXPLOSIONS: 4 | INJURIES: 2 | FATALITIES: 0

WOOD & WOOD PRODUCTS

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Mar 11	Forestview Kitchens	Breslau, ON	Fire	Wood Dust	0	0	Dust Collector	No Details	
Jun 3	MarDan Lumber Sales	Armstrong, BC	Fire	Wood Dust	0	0	Unknown	No Details	
Jul 13	Lewis Moulding & Wood Specialties Ltd.	Weymouth, NS	Fire	Wood Dust	0	0	Unknown	No Details	
Aug 2	Millett Lumber	Chester Basin, NS	Fire	Wood Dust	0	0	Unknown	No Details	
Aug 25	Natural Forest Products	Orillia, ON	Fire	Wood Dust	0	0	Sawdust Hopper	\$250,000	
Sep 20	Bois Ouvré de Beauceville	Beauceville, QC	Explosion	Wood Dust	5	3	Unknown	No Details	





INCIDENT SUMMARY - INCIDENTS: 6 | FIRES: 5 | EXPLOSIONS: 1 | INJURIES: 5 | FATALITIES: 3

AUTOMOTIVE & METAL WORK

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Oct 25	Kelowna Electroplating	Kelowna, BC	Fire	Metal Dust	0	0	Dust Collector	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 20	Unknown		Fire	Grain Dust	3	0	Grain Elevator	No Details	
Apr 2	Alliance Grain Terminal		Explosion	Grain Dust	1	0	Silo	No Details	
Jun 26	Hylife Ltd.		Explosion	Grain Dust	0	0	Unknown	No Details	
Jun 30	Green Prairie International		Fire	Grain Dust	0	0	Unknown	No Details	



INCIDENT SUMMARY - INCIDENTS: 4 | FIRES: 2 | EXPLOSIONS: 2 | INJURIES: 4 | FATALITIES: 0

WOOD & WOOD PRODUCTS

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Feb 6	Unknown	Prinzersdorf, Austria	Explosion	Wood Dust	0	0	Silo	No Details	
Mar 18	Pronorm	Vlotho, Germany	Fire	Wood Dust	0	0	Chip Bunker	No Details	
Mar 30	Unknown	Volkersdorf, Austria	Fire	Wood Dust	0	0	Diesel Engine	€150,000	
Apr 27	Popp	Pegnitz, Germany	Fire	Wood Dust	0	0	Sawdust Compressor	No Details	
May 3	Vakaru Medienos Grupe	Klaipeda, Lithuania	Explosion	Wood Dust	7	1	Unknown	No Details	
Jun 18	Unknown	Weihenzell, Germany	Explosion	Wood Dust	1	0	Conveyor Belt	No Details	
Aug 10	Unknown	Mondaí, Brazil	Fire	Wood Dust	0	0	Unknown	No Details	
Aug 18	Pan Pac Forest Products Ltd.	Whirinaki, New Zealand	Fire	Wood Dust	0	0	Silo	No Details	
Sep 5	Madepar Indústria e Comércio de Madeiras Ltda.	Lages, Brazil	Explosion	Wood Dust	0	0	Sawdust Silo	No Details	
Oct 14	Unknown	Crayford, UK	Fire	Wood Dust	0	0	Dust Collector	No Details	
Nov 12	IP Artefatos de Madeira Ltda.	Lages, Brazil	Fire	Sawdust	0	0	Sawdust Silo	No Details	
Nov 15	Unknown	Paços de Ferreira, Portugal	Fire	Sawdust	0	0	Silo	No Details	
Nov 16	Matté & Cia Ltda.	União do Oeste, Brazil	Fire	Sawdust	0	0	Sawdust Silo	No Details	
Nov 18	Unknown	Braço do Norte, Brazil	Fire	Sawdust	0	0	Sawdust Box	No Details	
Nov 24	Unknown	Beit Shemesh, Israel	Fire	Wood Dust	7	0	Unknown	No Details	
Dec 11	Unknown	Segamat, Malaysia	Explosion	Sawdust	2	1	Boiler	No Details	
Dec 23	Unknown	Schameder, Germany	Explosion	Wood Dust	3	0	Silo	No Details	




INCIDENT SUMMARY - INCIDENTS: 17 | FIRES: 11 | EXPLOSIONS: 6 | INJURIES: 20 | FATALITIES: 2

AUTOMOTIVE & METAL WORK



























DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Aug 27	Mextra Engenharia Extrativa de Metais	Taubaté, Brazil	Explosion	Aluminum Dust	6	0	Gas Washer	No Details	
Dec 29	AIDC	Taichung City, Taiwan	Explosion	Aluminum Dust	6	1	Dust Collector	No Details	

INCIDENT SUMMARY - INCIDENTS: 2 | FIRES: 0 | EXPLOSIONS: 2 | INJURIES: 12 | FATALITIES: 1

AGRICULTURE

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jan 9	R H Hall	Ringaskiddy, Ireland	Fire	Grain Dust	0	0	Grain Silo	No Details	
Mar 5	Unknown	Buenos Aires, Argentina	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Mar 7	AFA Maciel	Aldao, Argentina	Fire	Grain Dust	0	0	Grain Dryer	No Details	

AGRICULTURE CONTINUED

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Apr 10	Unknown	Alta Floresta, Brazil	Fire	Grain Dust	0	0	Grain Silo	No Details	
Jul 8	Unknown	Nova Mumtum, Brazil	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Jul 17	Unknown	Nortão, Brazil	Explosion	Grain Dust	0	0	Grain Silo	No Details	
Jul 27	Cooperativa Triticola de Espumoso (Cotriel)	Arrio de Tigre, Brazil	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Aug 3	Unknown	Eichstegen, Germany	Fire	Grain Dust	0	0	Grain Silo	No Details	
Aug 3	Unknown	Six Mile Bottom, UK	Fire	Grain Dust	0	0	Grain Silo	No Details	
Aug 9	Unknown	Mallanganee, Australia	Fire	Grain Dust	0	0	Grain Silo	No Details	
Aug 10	Unknown	Luz, Brazil	Fire	Grain Dust	0	0	Grain Silo	No Details	
Aug 12	Unknown	Seevur, India	Fire	Cotton	0	0	Cotton Waste Grinder	No Details	
Aug 15	Unknown	Horningsham, UK	Fire	Grain Dust	0	0	Grain Silo	No Details	
Aug 19	Unknown	Araxá, Brazil	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Aug 23	Unknown	Bridport, UK	Fire	Grain Dust	0	0	Grain Silo	No Details	
Aug 24	Unknown	Cascavel, Brazil	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Aug 30	Unknown	Chewton Mendip, UK	Fire	Grain Dust	0	0	Grain Silo	No Details	
Sep 7	Delacon	Engerwitzdorf, Austria	Explosion	Unknown	1	0	Silo	No Details	
Sep 9	Unknown	Lucas de Rio Verde, Brazil	Fire	Grain Dust	0	0	Grain Silo	No Details	
Sep 9	Agricultural Cooperative of Beja and Brinches	Brinches, Portugal	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Sep 15	Unknown	East Wellow, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Sep 16	Unknown	Beckhampton, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Sep 23	Cargill	Narrabri, Australia	Fire	Grain Dust	0	0	Conveyor Belt	No Details	
Sep 26	Unknown	Kozhikode, India	Fire	Cotton	0	0	Spinning Machine	No Details	
Oct 20	Unknown	Cloughton-on-Brock, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Nov 1	Molinos Agro	San Lorenzo, Argentina	Fire	Grain Dust	0	0	Dust Collector	No Details	
Nov 12	CRAVIL	Santa Terezinha, Brazil	Fire	Grain Dust	0	0	Grain Silo	No Details	
Nov 16	Unknown	Berwick St Leonard, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Dec 7	Unknown	Regensburg, Germany	Fire	Grain Dust	0	0	Grain Silo	No Details	

INCIDENT SUMMARY - INCIDENTS: 29 | FIRES: 27 | EXPLOSIONS: 2 | INJURIES: 1 | FATALITIES: 0

FOOD PROCESSING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Feb 4	Heygates Ltd.	Bugbrooke, UK	Fire	Flour Dust	0	0	Dust Collector	No Details	
Feb 18	British Sugar	Bury St. Edmunds, UK	Fire	Sugar Dust	0	0	Conveyor System	No Details	
May 28	Ceres Tolvas	Buenos Aires, Argentina	Explosion	Grain Dust	0	0	Water Wheel	No Details	
Jun 23	Unknown	Silvanópolis, Brazil	Fire	Grain Dust	0	0	Grain Dryer	No Details	
Aug 16	Camstar Herbs	Eye, UK	Fire	Dried Herbs	0	0	Herb Dryer	No Details	
Aug 31	J. Macêdo S.A.	Londrina, Brazil	Fire	Flour Dust	0	0	Unknown	No Details	
Sep 4	Unknown	Brooklet, Australia	Fire	Nut Dust	0	0	Silo	No Details	
Sep 29	Südzucker AG	Ochsenfurt, Germany	Explosion	Sugar Dust	1	0	Conveyor Belt	No Details	
Oct 12	Cereform Ltd.	Corby, UK	Fire	Flour Dust	0	0	Unknown	No Details	
Nov 6	Unknown	Nochchiyagama, Sri Lanka	Explosion	Grain Dust	0	1	Grain Silo	No Details	
Nov 12	Usina Santa Lucia	Araras, Brazil	Fire	Sugar Dust	0	0	Conveyor Belt	No Details	
Dec 19	Unknown	Barlby, UK	Fire	Grain Dust	0	0	Grain Dryer	No Details	

INCIDENT SUMMARY - INCIDENTS: 12 | FIRES: 9 | EXPLOSIONS: 3 | INJURIES: 1 | FATALITIES: 1

PULP & PAPER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Mar 29	Unknown	Saharanpur,, India	Fire	Paper Dust	0	0	Unknown	No Details	
Oct 17	Karioi Pulp Mill	Ohakune, New Zealand	Fire	Paper Pulp	0	0	Flash Dryer	No Details	


















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

POWER GENERATION & COAL HANDLING

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Jan 20	Angren Thermal Power Plant	Angren, Uzbekistan	Explosion	Coal Dust	3	3	Unknown	No Details	
Jul 22	EDF Pointe des Carrières	Fort-de-France, Martinique	Explosion	Wood Dust	1	0	Unknown	No Details	
Oct 11	Vanino Port	Vanino, Russia	Fire	Coal Dust	0	0	Conveyor Belt	No Details	
Nov 7	Abaiskaya Mine	Saran, Khazakstan	Explosion	Coal Dust	2	6	Unknown	No Details	
Nov 15	Tees Renewable Energy Plant	Teesside, UK	Fire	Wood Dust	0	0	Silo	No Details	
Nov 16	IBCM Indústria de Bio Combustível de Madeira Ltda.	Guarapuava, Brazil	Fire	Sawdust	0	0	Sawdust Silo	No Details	
Nov 25	Listvyazhnaya Mine	Gramoteino, Russia	Fire	Coal Dust	106	51	Unknown	No Details	
Dec 6	Imerys Brasil	Bacarena, Brazil	Explosion	Sodium Hydrosulfite	0	0	Unknown	No Details	

INCIDENT SUMMARY - INCIDENTS: 8 | FIRES: 4 | EXPLOSIONS: 4 | INJURIES: 112 | FATALITIES: 60

OTHER

DATE	COMPANY	LOCATION	TYPE	FUEL	INJ.	FAT	EQUIPMENT	DAMAGES	LINK
Feb 1	Unknown	Deutsch-Wagram, Austria	Explosion	Wood Dust	0	0	Unknown	No Details	
Feb 5	De Veste Condominium Complex	Terneuzen, Netherlands	Explosion	Wood Dust	0	0	Silo	No Details	
Feb 18	LyondellBasell	Kerpen, Germany	Explosion	Plastic Dust	1	0	Unknown	No Details	
Feb 25	Stars Engrg	Tuas, Singapore	Explosion	Potato Starch	0*	0*	Mixer	No Details	
Apr 5	Hansgrohe	Schiltach, Germany	Explosion	Unknown	0	0	Extraction System	€10,000	
Apr 15	Unknown	Wiesental, Germany	Explosion	Unknown	0	0	Dust Collector	€100,000	
May 11	Sakai Chemical Industry Company	Fukushima, Japan	Explosion	Zinc Powder	4	0	Unknown	No Details	
Jun 5	Unknown	Mettupalayam, India	Explosion	Chemical Dust	4	0	Dryer	No Details	
Jun 21	Unknown	Eschenz, Switzerland	Fire	Unknown	0	0	Dryer	No Details	
Jul 4	Bharat Chemicals	Palghar, India	Explosion	Unknown	5	0	Unknown	No Details	
Jul 7	Formosa Plastics	Kaohsiung City, Taiwan	Explosion	Plastic Dust	0	0	Silo	No Details	
Jul 8	Unknown	Chennimalai, India	Fire	Cotton	0	0	Spinning Machine	No Details	
Aug 12	Konica Minolta	Tatsuno, Japan	Explosion	Toner Dust	0	0	Unknown	No Details	
Aug 16	Unknown	Navenby, UK	Fire	Unknown	0	0	Dust Collector	No Details	
Aug 17	Unknown	Pölling, Germany	Explosion	Unknown	11	0	Unknown	No Details	
Sep 2	Rafitec Indústria e Comércio de Sacaria	Xaxim, Brazil	Explosion	Textile Fibres	9	0	Unknown	No Details	
Nov 26	Unknown	Papanduva, Brazil	Fire	Coal Dust	0	0	Conveyor Belt	No Details	

INCIDENT SUMMARY - INCIDENTS: 17 | FIRES: 4 | EXPLOSIONS: 13 | INJURIES: 34 | FATALITIES: 0

*Seven injuries and three fatalities from the February 25 explosion at Stars Engrg were removed from the incident data as a subsequent investigation suggested that they occurred due to a primary oil-mist explosion, not the secondary potato starch flash-fires.

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