OSHA Dust Related Incidents of 2018

Dalhousie University

Final Research Report

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Executive Summary

This report outlines OSHA citation data that was collected in relation to dust related citations in 2018. This data is provided, and key information is outlined. This includes the amount of citations issued for each industry, where woodworking and pulp had the greatest amount of citations. From here, the NFPA standards that were outlined are shown. These citations only contained 9 instances where NFPA standards were cited. The common equipment of concern was then outlined, with dust collectors being the most prevalent, being cited in 31 citations. The penalties associated with these citations were then outlined with the total amount of penalties in 2018 being $1,140,921 after settlements were made. Afterwards, the importance of citation data is shown along with some discussion around common concerns. Finally, mitigation efforts are discussed, along with some important features that OSHA citations should include.

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1 Introduction

This research report outlines the 2018 OSHA citations that were used for dust related incidents. By investigating the findings within these citations, the data is compiled into a more legible format in order to analyze key points that are described. Upon analyzing the compiled data, it is possible to determine common causes within industry. This outlines common hazards which will then be examined in order to find possible mitigation efforts. Included in this report is an investigation into the terminology and content used within OSHA citations. With this, suggestions are made into common information that OSHA citations should include in order to provide a thorough citation. This includes NFPA standards along with other information that will be discussed further within this report.

1.1 Scope

To compile and analyze OSHA data on incidents involving dust explosions and their issues in relation to process safety. This will be done by inspection of OSHA dust-related citations during 2018. Using this information, the findings will be reported and presented to examine commonalities and possible mitigation measures for future incidents.

1.2 Motivation

To determine common root causes of these incidents in order to determine why they happen and how they can be prevented in the future. This will provide useful information to those within this industry field for possibilities of loss mitigation and the creation of a safer workplace.

1.3 Objectives

The main objectives of this report are listed below:

- Compile OSHA citation information into an easily legible format to provide greater ease of investigation.
- Analyze citations by comparing their similarities in order to determine the most common causes of incidents.
- Provide a clear description and understanding of OSHA citations, how to interpret them coherently and information that should be included in a thorough OSHA citation.
- Determine possible mitigation options to prevent similar future incidents using the application of safety analysis tools such as the hierarchy of controls.

2 Background Information

In order to fully understand the purpose and benefit of this report, some background information will be discussed. This information includes a description of the explosion pentagon, dust explosions, flash fires, deflagration, detonation, OSHA citations, NFPA standards.

The explosion pentagon describes the conditions that are required for an explosion to occur. These conditions include a fuel, mixing, an oxidant, confinement and an ignition source. The explosion pentagon is shown in Figure 1 (Hughes Environment, 2015).

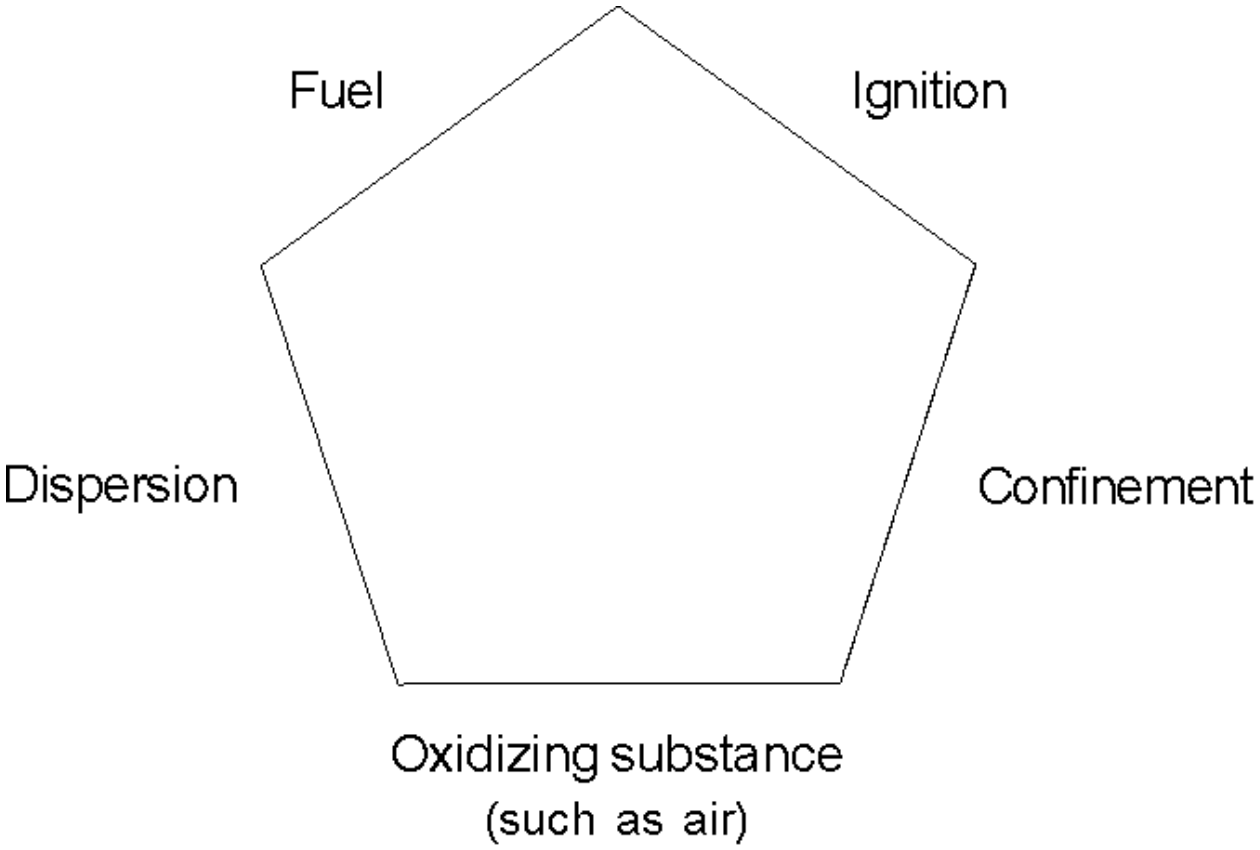


Figure 1: Explosion Pentagon Diagram

In the case of dust explosions, the fuel is the combustible dust. Mixing could be cause by a variety of different things (such as cleaning or mixing within process units) with the oxidant generally being air. Confinement could be anything leading to disruption of the energy from dissipating including the walls of the process unit, the building containing the process, ducts and even the atmosphere surrounding under the correct conditions.

A dust explosion can occur if the proper conditions are met to allow combustible dust to ignite within a confined space. These conditions follow the structure of the explosion pentagon. When fine dust (even from a material that may not be combustible under normal conditions) is mixed in a confined space with an oxidant and meets an ignition source, an explosion can occur. A similar case occurs in flash fires under these conditions but with the lack of confinement. In most cases in OSHA citations, the term deflagration is used. Deflagration in dust explosions describes when a combustible dust burns rapidly and causes a pressure wave at supersonic speeds to propagate. If this pressure wave moves faster than the explosion of the material, it is deemed a deflagration. If the explosion were to move faster than the pressure wave, however, it would be deemed a detonation (Helmenstine, 2019).

OSHA (Occupational Safety and Health Administration) citations are a way to outline concerns that were investigated in industry. This information includes details on the company in question, along with a description as to why they were cited. Using this information, it is possible to compile data on common problems.

NFPA (National Fire Prevention Act) standards are codes that are used in order to minimize the probability and effects of concerns related to fires and similar risks. They generally outline regulations in which processing should be conducted in order to reduce the risk of incidents.

3 OSHA Citation Data

This section outlines the OSHA citation data that was compiled and reformatted for legibility. This data was formatted into a spreadsheet as shown below in Table 1

Table 1: OSHA Citation Data

Issuance Date	Company	Industrial Activity	State	Inspection Type	Violations	Initial Penalty	Current Penalty	Inspection	Status
17-Jan	The Cubbison Company	Printing Services	OH	Complaint	1	$6,467	$5,174	1259793.02	Closed
17-Jan	Marshall Ingredients, Llc	Deydrated Food Processing	NY	Complaint/ Referral	9	$155,205	$155,205	1250461.02	Open
19-Jan	Caston Architectural Millwork, Inc.	Woodworking and Millwork	OK	Complaint	11	$39,579	$13,800	1256134.02	Open
19-Jan	Northeast Agricultural Sales, Inc.	Fertilizer Manufacturing	ME	Referral	9	$686,292	$47,799	1269702.02	Open
24-Jan	Scan-Pac Mfg., Inc.	Equipment Manufacturing	WI	Complaint	4	$48,227	$23,282	1255618.02	Open
30-Jan	Mpv Morganton Pressure Vessels North Carolina, Llc	Metal Tank Manufacturing	AL	Complaint	10	$101,800	$51,000	1266870.02	Open
30-Jan	Niche Polymer, Llc	Plastic and Resin	WV	Referral	2	$12,934	$9,700	1279599.02	Closed
02-Feb	All Color Powder Coating, Inc.	Paint and Coating	WI	Complaint	1	$5,497	$3,848	1259598.02	Closed
05-Feb	Dentalez Alabama, Inc.	Dental Equipment	AL	Referral	7	$39,735	$22,311	1275989.02	Closed
08-Feb	Power And Composite Technologies Llc	Plastics and Resin	NY	Referral	1	$9,147	$9,147	1274530.02	Open
23-Feb	Applegate Wisconsin, Llc.	Paper Products	WI	Referral	4	$38,248	$30,341	1272259.02	Open
18-Mar	Global Metal Powders, Llc	Metal Services	PA	Complaint	5	$12,750	$7,778	1262338.02	Open
12-Mar	Global Graphene Group, Inc.	Carbon/Graphite Products	OH	Complaint	1	$5,497	$3,848	1297749.02	Closed
20-Mar	Titanium Metals Corporation	Smelting and Refining	PA	Referral	2	$21,313	$15,975	1280334.02	Closed
23-Mar	Brolite Products, Inc.	Food Processing	IL	Referral	3	$16,815	$6,000	1267703.02	Open
03-Apr	Signode Industrial Group Llc	Plastic Packaging	IL	Referral	4	$27,716	$24,944	1275487.02	Open

12-Apr	Frieslandcampina Ingredients North America, Inc.	Food Processing	NY	Complaint	3	$21,619	$16,216	1273034.02	Open
17-Apr	German Pellets Of Texas	Wood Products	TX	Not Stated	4	$95,322	$95,322	1272047.02	Open
19-Apr	Miltec, Inc.	Adhesive Manufacturing	WI	Referral	3	$14,118	$7,000	1278584.02	Open
19-Apr	Uxbridge Cabinet Center, Inc.	Wood Products	MA	Referral	5	$25,872	$9,240	1272727.02	Open
27-Apr	Spectro Coating Corp.	Textile Coating	MA	Referral	5	$50,444	$25,225	1274754.02	Open
16-May	Oak Ridge Custom Cabinets, Inc.	Wood Products	WI	Complaint	3	$13,304	$5,174	1296278.02	Open
18-May	Rp Baking Llc	Commercial Baking	NJ	Referral	2	$18,294	$14,000	1297478.02	Closed
22-May	Precision Chrome, Inc.	Plating & Polishing	IL	Not Stated	7	$24,392	$17,174	1295568.02	Open
23-May	Mooreco, Inc.	Wood Products	TX	Inspection	6	$54,879	$27,440	1289686.02	Open
30-May	3d Idapro Solutions, Llc	Food Processing	WI	Referral	2	$20,787	$14,552	1280845.02	Closed
15-Jun	Meloon Foundries, Llc	Metal Foundry	NY	Complaint	1	$6,467	$4,527	1283599.02	Open
28-Jun	Arnet Pharmaceutical Corporation	Pharmaceutical Preparation Manufacturing	FL	Referral	2	$18,478	$11,087	1303375.02	Open
10-Jul	Shield Casework Llc	All Other Plastics Product Manufacturing	MO	Complaint	1	$11,641	$3,622	1292504.02	Closed
11-Jul	Genan Inc.	Recyclable Material Merchant Wholesalers	TX	Accident	18	$204,549	$100,000	1291035.02	Open
27-Jul	Farmers Co-Operative Gin Co.	Cotton Ginning	OK	Referral	2	$7,760	$4,650	1301249.02	Closed
13-Aug	D & G Recycling, Llc	Materials Recovery Facilities	NY	Complaint	6	$9,978	$6,000	1303557.02	Open
17-Aug	Special Metals Corporation	Nonferrous Metal Rolling, Drawing, and Extruding	NY	Complaint	5	$51,737	$35,107	1308940.02	Closed
21-Aug	Ckjk, Llc	All Other Miscellaneous Wood Product Manufacturing	PA	Complaint	7	$6,097	$3,050	1297275.02	Closed
21-Aug	J.A.C.K. Wood Products, Llc	Sawmills	PA	Complaint	12	$10,531	$5,300	1297264.02	Open

05-Sep	Ravago Americas Llc	All Other Plastics Product Manufacturing	IL	Complaint	1	$7,068	$4,948	1310941.02	Closed
17-Sep	Brady Enterprises Incorporated	Spice and Extract Manufacturing	MA	Referral	2	$18,294	$6,000	1307797.02	Closed
26-Sep	Ultra-Poly Corporation	Plastics Material and Resin Manufacturing	PA	Referral	1	$5,654	$3,500	1336727.02	Open
27-Sep	Gbw Railcar Services, L.L.C.	Railroad Rolling Stock Manufacturing	TX	Complaint	5	$122,873	$122,873	1306379.02	Open
27-Sep	Kyllonen Cabinets And Trim, Llc	Wood Kitchen Cabinet and Countertop Manufacturing	TX	Complaint	6	$15,522	$15,522	1325312.02	Open
27-Sep	Dubell Lumber Company	Home Centers	NJ	Complaint	18	$106,432	$65,988	1305884.02	Open
16-Oct	Energizer Holdings, Inc.	Polish and Other Sanitation Good Manufacturing	PA	Complaint	1	$12,934	$12,934	1333923.02	Open
17-Oct	Goex Corporation	Unlaminated Plastics Profile Shape Manufacturing	WI	Complaint	3	$24,945	$17,462	1317654.02	Open
30-Oct	Mw Industries, Inc. Dba Mohawk Spring Corporation	Spring (Light Gauge) Manufacturing	IL	Complaint	3	$50,813	$15,150	1313626.02	Open
13-Nov	Revlis Corporation	All Other Miscellaneous Chemical Product and Preparation Manufacturing	OH	Complaint	5	$23,281	$16,000	1334443.02	Open
07-Dec	Orepac Building Products (International), Inc.	All Other Miscellaneous Wood Product Manufacturing	ID	Complaint	2	$20,325	$7,391	1349897.02	Open
11-Dec	Surface Dynamics, Inc.	Surgical and Medical Instrument Manufacturing	OH	Referral	3	$27,162	$10,000	1336668.02	Open
27-Dec	Executive Coach Builders, Inc.	Automobile Manufacturing	Mo	Complaint	1	$8,315	$8,315	1329863.02	Open

This information was collected from the OSHA website by searching citation incidents in 2018 related to dust. Descriptions of the citations were also provided and are used further within this report for analysis. Overall, 48 citations were made related to dust in 2018 by OSHA. All the descriptions that were reformatted will be shown in Appendix A.

In order to show the format of the citations originally, a screenshot is shown below to describe how the current formatting may be tough to navigate shown in Figure 2.

Inspection: 1259793.015 - The Cubbison Company

Inspection Information - Office: Cleveland

Nr: 1259793.015	Report ID: 0522300	Open Date: 08/30/2017		
The Cubbison Company 380 Victoria Rd. Youngstown, OH 44514		Union Status: Union		
SIC:				
NAICS: 323122/Prepress Services				
Mailing: 380 Victoria Rd., Youngstown, OH 44514				
Inspection Type:	Complaint			
Scope:	Partial	Advanced Notice:	N	
Ownership:	Private			
Safety/Health:	Health	Close Conference:		
		Close Case:	03/26/2018	
Related Activity:	Type	ID	Safety	Health
	Complaint	1257830		Yes

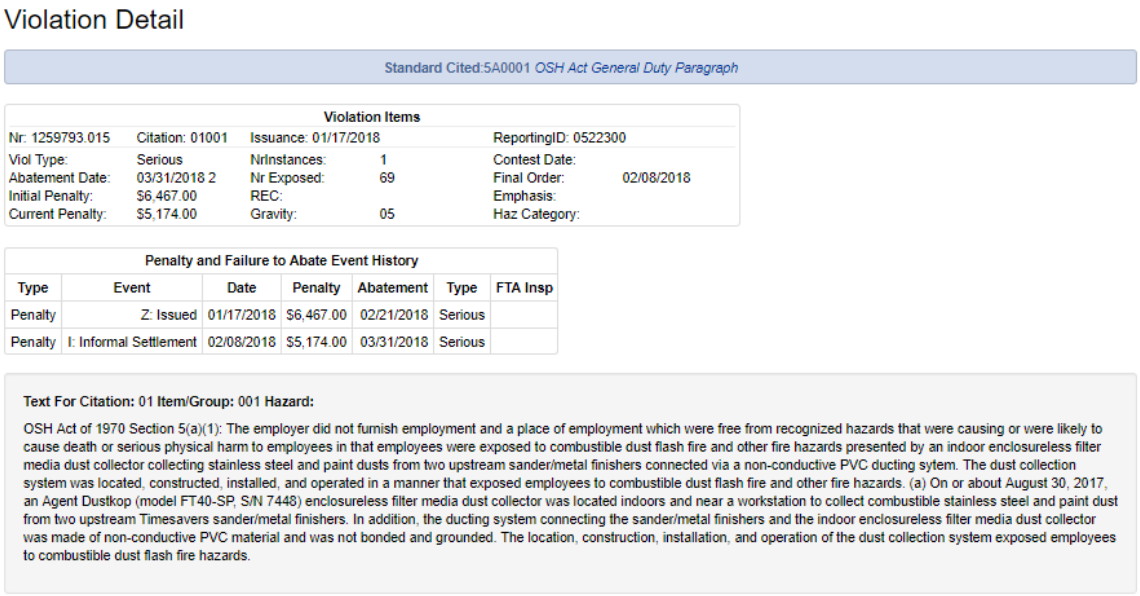
Case Status: CLOSED

Violation Summary

	Serious	Willful	Repeat	Other	Unclass	Total
Initial Violations	1			1		2
Current Violations	1			1		2
Initial Penalty	$6,467	$0	$0	$0	$0	$6,467
Current Penalty	$5,174	$0	$0	$0	$0	$5,174
FTA Amount	$0	$0	$0	$0	$0	$0

Violation Items

#	ID	Type	Standard	Issuance	Abate	Curr$	Init$	Fta$	Contest	LastEvent
1.	01001	Serious	5A0001	01/17/2018	03/31/2018	$5,174	$6,467	$0		I - Informal Settlement
2.	02001	Other	19100132 D02	01/17/2018	03/31/2018	$0	$0	$0		I - Informal Settlement



Violation Detail

Standard Cited:5A0001 *OSH Act General Duty Paragraph*

Violation Items

Nr: 1259793.015	Citation: 01001	Issuance: 01/17/2018		ReportingID: 0522300	
Viol Type:	Serious	NrInstances:	1	Contest Date:	
Abatement Date:	03/31/2018 2	Nr Exposed:	69	Final Order:	02/08/2018
Initial Penalty:	$6,467.00	REC:		Emphasis:	
Current Penalty:	$5,174.00	Gravity:	05	Haz Category:	

Penalty and Failure to Abate Event History

Type	Event	Date	Penalty	Abatement	Type	FTA Insp
Penalty	Z: Issued	01/17/2018	$6,467.00	02/21/2018	Serious	
Penalty	I: Informal Settlement	02/08/2018	$5,174.00	03/31/2018	Serious	

Text For Citation: 01 Item/Group: 001 Hazard:

OSH Act of 1970 Section 5(a)(1): The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or were likely to cause death or serious physical harm to employees in that employees were exposed to combustible dust flash fire and other fire hazards presented by an indoor enclosureless filter media dust collector collecting stainless steel and paint dusts from two upstream sander/metal finishers connected via a non-conductive PVC ducting sytem. The dust collection system was located, constructed, installed, and operated in a manner that exposed employees to combustible dust flash fire and other fire hazards. (a) On or about August 30, 2017, an Agent Dustkop (model FT40-SP, S/N 7448) enclosureless filter media dust collector was located indoors and near a workstation to collect combustible stainless steel and paint dust from two upstream Timesavers sander/metal finishers. In addition, the ducting system connecting the sander/metal finishers and the indoor enclosureless filter media dust collector was made of non-conductive PVC material and was not bonded and grounded. The location, construction, installation, and operation of the dust collection system exposed employees to combustible dust flash fire hazards.

Figure 2: OSHA Layout of Information (OSHA, n.d.) (Eckhof & Amyotte, 2009)

While this is all important information regarding the citation, it may be difficult for individuals in industry to understand due to some of the terminology and overwhelming amount of information. For that reason, the information was reformatted into a spreadsheet to outline the main details contained within the citation. The descriptions were also reformatted to produce ease of finding key points without losing all the important information within.

3.1 Referenced Industries

After compiling the data, the citations were categorized into various industries in order to outline some of the most common industries that received citations. While this data may suggest that some industries have more incidents regarding dust, it is important to keep in mind that incidents within industry can fluctuate. This is to say that even though some industries received less citations, it does not mean that problems within this industry will not occur. Because of that, it is always important to stay vigilant when reducing the probability and impact associated with these concerns. This information will be categorized by the process that is associated with each fuel.

3.1.1 Food Processing

Within food processing, there was found to be 6 citations. The fuels that were stated in these citations along with some research into the company's ingredients include dried fruit powders, powdered dairy products, powered grain materials, and cocoa powder.

3.1.2 Metalworking

Within metalworking facilities, there was found to be 10 citations. Common fuels that were stated in these citations along with some research into the company's process include stainless steel dust, titanium dust, chrome and steel polishing dust, aluminum dust, nickel and cobalt dust and carbon dust

3.1.3 Woodworking and Pulp

Within woodworking and pulp facilities, there was found to be 12 citations. Common fuels that were stated in these citations along with some research into the company's process include saw dust, cellulose and pelletized wood for furnaces.

3.1.4 Plastic Processing

Within plastic processing facilities, there was found to be 8 citations. Common fuels that were stated in these citations along with some research into the company's process include PVC dust, plastic used for surface coating, polyester dust, polypropylene dust and polystyrene dust. In generally, many different plastic dusts can lead to explosions, but these were the products listed while some companies process a variety of plastics and resins.

3.1.5 Other Notable Citations

Other than the main categories that are outlined above, there are some other fuels that should be mentioned. These are medical product processing facilities, with 2 citations, paint processing facilities with 2 citations and agricultural processing with 2, which could possibly be included in food processing depending on the material. Other industries that were cited that did not necessarily specify a fuel include automobile production, chemical processing, waste processing and textiles coating. Some of these citations could be classified within other categories if their possible fuel sources were listed.

3.2 Referenced NFPA Standards

In these citations, some quoted NFPA standards while many did not. In total, out of the 48 citations that were investigated, only 10 included any reference to NFPA standards. The NFPA standards are listed below.

3.2.1 Food Processing

For the food processing industry, 2 out of 6 of the citations referred to NFPA standards. These included sections 4.1.2, 7.11, 8.3.4.2, 8.3.9.4.4.1, 8.8.4 and 8.8.5 in NFPA 61, section 7.1.1 in NFPA 652 and NFPA 69 regarding passive isolation.

3.2.2 Metalworking

For the metalworking industry, 2 out of 10 of the citations referred to NFPA standards. These included sections 9.4.1, 9.4.10, 9.4.12, 9.4.13, 9.4.13.2, 9.4.13.11, 9.4.13.14, 9.4.3.15, 9.4.13.15.7.5 and 9.4.13.15.1 in NFPA 484.

3.2.3 Woodworking and Pulp

In woodworking and pulp processing facilities no citations included NFPA standards.

3.2.4 Plastic Processing

For the plastic processing industry, 3 out of 8 of the citations referred to NFPA standards. These included sections 7.1.4.1, 7.1.6.1, 7.12.2.5, 7.12.3, 7.13.1.2.2, 7.13.1.6 and 7.15 in NFPA 654.

3.2.5 Other Notable Citations

In other citations, 3 citations included NFPA standards. One citation included sections included 8.9.4 and 8.9.3.2 within NFPA 652, sections 7.1.4.1 and 7.1.6.1 within NFPA 654, Sections 5.2.3, 6.6.1, and 8.9 within NFPA 68, chapters 11 and 12 within NFPA 69 and standards from NFPA 33. This citation was from a paint processing facility. The other citation included section 8.2.2.5.1.4 from NFPA 664 and sections 6.4.1, 6.2.3.1 and 7.13.1.1.1 from NFPA 654.

3.3 Referenced Equipment of Concern

This section will outline the various pieces of equipment that were outlined within the citations to understand the main concern areas surrounding many systems. In total there were 75 different equipment concerns outlined within these citations.

3.3.1 Dust Collectors

For dust collectors, there were 31 instances within these citations were these pieces of equipment were mentioned. This is the highest level out of all the equipment which is understandable as a main source of concern within these processes.

3.3.2 Ducts

Ducts were one of the second most mentioned sources, with 11 citations referring to faulty duct work. Because ducts play a key role in moving materials within a dust collection system, this number is justified in its extent.

3.3.3 Workspace Conditions

Another piece of "equipment" that was specified in 11 citations was the general workspace. Usually in this instance it was referring to housekeeping and placement of various units within the plant.

3.3.4 Cyclones

The next most commonly cited piece of equipment was cyclones. These units had a total of 8 references within the citations. This unit plays a key role in separating dust from air within dust collection systems and has the potential for issues due to its mixing characteristics.

3.3.5 Venting systems

While venting within theses systems is a major problem, this section only outlines venting that was in place that was defective. While many systems lacked venting or suppression of from dust collections systems, 4 citations mention existing venting that had issues. This is not to say that venting was not an issue for other systems, just that the venting systems outlined were specifically cited as being faulty.

3.3.6 Dryers

In total, there were 2 instances that where dryers were cited as a main issue. Dryers can be an issue because of the mixing that takes place within the dryer and the pressure ratings surrounding the drying system. Along with this, the heating within the dryer can pose an issue if temperatures were to rise unexpectedly.

3.3.7 Other Equipment

Some other issues that arose totaled to 8 references in the citations. These references were very case specific and were caused by various concerns. For example, some pieces of equipment contained in the system were not properly grounded, leading to possible ignitions sources.

3.4 Citation Penalties

Because the issues cited within the data raise safety concerns within a workplace, they are often associated with fines. These fines are put in place as a penalty for the disregard of the hazards within their process and are a means of preventing companies from raising further concerns. Along with this, companies must repair the issues that are cited, or they will face further penalties.

The total initial penalties within these citations totaled to $2,337,109, with an average initial penalty per citation being $48,690. For the initial penalties, the cost associated ranged from $5,497 to $686,292. These penalties are often disputed, or agreements are made to lower the price. For the reduced, or current penalty price, the total cost is $1,140,921 with an average penalty cost of $23,769. This current penalty cost had a range of $3,050 to $155,205.

4 Discussion

This section will discuss the data found within the OSHA citations to outline its importance. On top of that, the sources of concern outlined above will be discussed regarding how these problems concerns arise.

4.1 Importance of Citation Data

The data outlined within these citations is important for many reasons. They include key information to keep in mind when performing hazard analysis on industrial systems. This

information can be used towards ensuring that processes operate in a safer fashion. This process also documents concerns in order to provide the company, and other interested people with information. This information can be used to prevent future issues from occurring through various mitigation efforts. Some mitigation efforts will be discussed further in this report.

4.2 Explosible Data Collected in Lab

To show some of the data that can be acquired in order to determine the limits of combustible dust, some lab data will be provided. This information provides companies with general limits as to when dust will cause concerns. The following data outlines the minimum explosible concentration, which is an important characteristic to look at regarding the minimum amount of dust that is needed for an explosion to occur. This shows that a very small amount o combustible dust can cause issues in industry if the right conditions are met. Table 2 shows the data the was collected for olive pomace with a particle diameter of 75 um.

Table 2: Minimum Explosible Concentration of Olive Pomace

Concentration (g/m^3)	Max Pressure (bar)	dP/dt (bar/s)
200	5.1	66
150	1.3	21
120	2.1	16
110	2.4	24
100	2.2	22
90	1.9	18
80	0.8	17
80	0.6	12

This data shows that this olive pomace has a minimum explosible concentration of 90 g/m^3. For the sample taken at 80, there is a pressure change but it is due to the energy produced by the ignitor. This test was performed in a 20 L chamber.

4.3 Common Industry Concerns

The most common industry concerns cited in the data was found to be dust collectors. The most common dust collector concerns arose around enclosureless dust collectors and filter media-type dust collectors. Enclosureless dust collectors have the possibility of creating a flash fire or an

explosion as the confinement within this system does not have walls that are solid. It was found that 8 of the 31 citations containing dust collectors were related to enclosureless dust collectors.

Another commonly cited issue was a lack of deflagration protection. This step is important in controlling and explosion, should it occur. Some of the specific measures that were cited within this OSHA citation data included a lack of proper venting, suppression or isolation. It was found that the 4 citations that specifically involved venting were related to venting that terminated indoors or venting panels that membranes had be replaced with non-approved materials. Without proper venting, suppression and isolation, an explosion is not controlled and can send explosive force towards employees and other equipment within the facility. With this lack of deflagration measures, facilities had no controlling factor surrounding the dust collection systems.

Another common industry concern that arose was a lack of proper grounding associated with the dust collection system. This lack of grounding caused facilities to run the risk of creating an ignition source by static electricity.

Other issues that were outlined include systems no being airtight, exhausting materials directly into the building, placement of units and the used of plastic hoses as ducts. The main issue with using plastic as duct work is that is cannot be grounded because plastic is an insulator. This is an issue because the flow of dust within the duct will create static electricity.

4.4 NFPA Standards Cited

Many of these citations did not contain any reference to NFPA standards which is an issue that will be discussed later in this report. The citations that did include NFPA are helpful as they provide the company that is cited with a standard in which they can fix their system to in order to create a safe working environment. For that reason, NFPA standards are an important piece of information to include within OSHA citations.

It appeared that any citation that included NFPA standards, also included some options for mitigation based on these NFPA standards. This is not to say that some of the citations did not provide mitigation efforts, but the citations with NFPA standards were more in depth.

4.5 Economic Effect of Citations

Because these citations have penalties associated with them, it is important to look at the economics effect of the citations. These citations cost companies money not only from their penalties, but also from the loss that they cause. For the loss associated with these penalties, there are a few categories.

The first is loss associated with the personnel within the plant. This is caused by injury that results in a person not being able to work or medical expense for the company. By allowing people to work in dangerous conditions, they are more likely to be affected by this instance. This costs companies money and results in loss. The second is loss to equipment. If an explosion occurs, equipment will likely be damaged, resulting in the company having to invest more money into repairs or buying new units. The third category of loss is damage to the surrounding environment. If an explosion occurs, it can affect the environment surrounding the plant through fires and the release of contaminants into the area. This can cause loss to the company because the environment will have to be cleaned of these contaminants and could affect the well being of people or other businesses in the area. The final loss that can occur is the loss of production within the process. When an incident occurs, companies must act to repair the units affected within the production and, therefore, lose the time for production within the process where they could be making money. All these factors can affect a company's profits and decrease the benefit for shareholders. For this reason, it is important to ensure that the proper safety measures are in place to mitigate the effects and probability of incidents.

5 Mitigation

This section will discuss mitigation efforts that can be put in place in order to minimize loss during processes. It will also discuss some of the important details that should be put into OSHA citations in order to provide companies with a thorough description and options to fix the issues that result.

5.1 Hierarchy of Controls

In order to find proper mitigation efforts, it is helpful to look at these citations from the perspective of the hierarchy of controls. This can produce ways for companies to protect from loss and improve

their safety rating. The outline for the information in this section was retrieved from the follow reference (Eckhof & Amyotte, 2009).

5.1.1 Inherently Safer Design

By making processes inherently safer, it is possible to mitigate some of the risk associated. An example of this is making dust collection airtight in order to remove the possibility of dust escaping. Another example would be removing the possibility of dust being produced, but this is not usually a viable option in many processes. To do this, for example, metal products could be cast in a manner that does not require grinding to be done afterwards. This is not a realistic option, therefore, designing an airtight dust collection system is a better option. As some say, the best housekeeping is housekeeping that does not have to be done.

Another way to design a process to be inherently safer, is by ensuring the proper distance between units is provided. This protects other equipment in the event of an explosion. Proper distance can also protect people by placing office buildings for the company far enough away to not be majorly affected by an explosion.

5.1.2 Minimization

An option for increasing safety within a process minimizing or eliminating the dust. This can be done by proper housekeeping within the process to minimize the amount of dust that is available, should an explosion occur. However, this is more likely to fall under the category of procedural safety.

In order to properly employ minimization to reduce dust explosion risk, is easiest to accomplish during the design phase of a process. This could be done by designing a process to minimize the escape of dust from units, or by minimizing the amount of grinding/milling that must occur to create a final product. To do this, for example, a saw mill could potentially use a saw that is somewhat thinner, leading to less material being shaved off the wood. This is beneficial to reduce the amount of combustible material in a facility and is helpful as Trevor Kletz said, “What you don’t have, can’t leak.” (Maitland, 2015).

5.1.3 Substitution

Substitution can be used in order to reduce the risk associated with various dusts. For example, within these citations, plastic piping was often used for ducting. In order to make a process safer, these plastic ducts should be replaced with a conductive material and properly group. By substituting this material, the risk of ignition is decreased by displacing static electricity.

This can also be done by substituting procedures within a system for a safer process. Sweeping dust (which can cause mixing of the dust in air) can be substituted with an explosion proof vacuum. This eliminates mixing caused by sweeping and the explosion proof vacuum provides a solution that limits ignition sources. This substitution would be more likely to fall into procedural safety, but it provides an example of substituting processes.

5.1.4 Moderation

Moderation can be accomplished in several ways regarding dust explosions. For example, the dust can be moderated through the addition of inert dusts or increasing the particle size of the dust. In some cases, this may be tough, for example, as grinding of metal will create a certain diameter based on the extent of the grinding. In this case it is very important to ensure that collection of the dust is done in the proper manner to minimize the risk associated.

5.1.5 Simplification

In order to simplify a process, a system could be designed to be more robust in order to contain any explosion that could occur. Another example, which applies to OSHA citations, is providing information regarding the properties and dangers associated with dust in a clear manner. By clearly stating the dangers and methods associated with collecting dust, it is easy for people to adjust and improve their system in order to create a safer process.

5.1.6 Passive Engineered Safety

This section, along with section 5.1.7 were the mitigation efforts that were discussed most commonly in the OSHA citations. Because can be potentially easier to add-on safety devices afterwards, they are more commonly discussed. These can be helpful, but it is also very important to look at the root cause of why the explosion occurred before tacking on safety measures. This is because you can change a vent panel without determine the cause of its burst, then must replace it

again within a short period of time. This is hard on equipment and could cause a more catastrophic failure to occur in the future. By properly finding the root of the issue, you can correct to decrease the probability of it happening again.

Passive engineered safety can be employed in order to reduce the risk associated with dust explosions. This must be done properly, however, as many cases in these citations did not properly employ them. This can be done by things such as venting but, again, must be done properly. In some cases, within these citations, venting was done but was not done to vent out of the facility. In other cases, venting terminated into the building. By properly employing venting, in order to expelled pressure outside of the facility, companies would be able to ensure that explosions would be properly dispersed.

5.1.7 Active Engineered Safety

Active engineered safety can be used to properly suppress the effects of dust explosions. For example, suppression systems can be used to extinguish a flame front that is created by dust explosions. This, along with venting, is important as many of the OSHA citations stated that proper deflagration systems were not put in place within these processes. By using a system that would detect and extinguish dust explosions, along with the use of venting, the severity of dust explosions would be decreased. This would then reduce the risk associated with these dust explosions by having them release in a controlled manner, should they occur.

In order to protect backflow within these systems due to an explosion, the use of isolation devices could be implemented.

5.1.8 Procedural Safety

When handling combustible dust, it is important for management to outline proper procedure for dealing with materials. By providing employees with proper procedures, it is possible to reduce the risk of employees making a mistake. This, however, should be considered one of the last lines of safety. This is because errors or alterations for procedure can occur. Because of that, a proper safety culture should be employed.

For example, a procedure to clean up combustible dust could be to put on PPE, using a explosion proof vacuum, suck up combustible dust while minimizing mixing of the dust in air, dispose of the

dust into the proper receptacle, document the cleaning to indicate it was completed, along with any comments on changes in conditions, file the document properly.

5.1.9 PPE

Personal protective equipment is the last line of protection in a process. This is a last resort when it comes to safety. Regarding dust, the use of PPE such as dust masks and protective eyewear should be used.

5.2 OSHA Citation Characteristics

This section will outline characteristics that each OSHA citation should contain in order to properly inform interested parties. This information should provide companies with recommendations and standards in which adjustments should meet. This information should be included, along with the information that is already provided.

5.2.1 Incident Description

A proper incident description is key in when writing an OSHA citation. This description should include the OSHA code that the citation is issued under. In most cases within this data, it was the general duty code, which is normal for this situation. It should also include the type of equipment that was in concern and the make and model. This is useful for investigation and data compilation. The type of dust should also be stated in order to specify the material that is in question. In the case that multiple materials are used, the ingredients should be listed, specifying the most hazardous material. Additionally, these descriptions should be formatted into a more legible format, making investigation into these citations easier. Currently all the citations are provided in a single paragraph which makes it difficult to find certain information.

5.2.2 NFPA Standards

NFPA standards should also be stated within these citations. Within the citations that were analyzed, less than a quarter of the citations included NFPA standards. These standards are important as they provide companies with a regulatory target that they can implement within their system. Each citation should include an NFPA standard as it provides a more specific regulation compared to the OSHA code, which was usually the general duty clause. This will give companies a better perspective into proper mitigation efforts.

5.2.3 Descriptions

This does not necessarily apply to what is within citations, but OSHA should provide descriptions to various terminology that is used within citations. The terminology used may be easily understood by someone within OSHA or engineers experienced with OSHA citations, but for people such as shareholders or the public, it may be difficult to understand. For example, the difference between a referral and a complaint, or key words such as deflagration. This does not need to be provided within the citation, but OSHA should have a separate web page outlining key terminology.

6 Conclusion and Recommendations

In conclusion, the objectives of this project have been met. The project began with compiling data from OSHA citations into a more legible format. The OSHA data was reformatted into a spreadsheet and some of the key terminology was discussed in order to analyze the data. In addition, some mitigation options were listed in order to provide discussion based around the hierarchy of controls. Finally, key information that should be outlined in OSHA citations was discussed in order to make suggestions around what should be provided within. This will allow the information surrounding cases to be easily found and mitigation options can be determined. For future work in this regard, possible mitigation efforts could be done on a case basis along with some description into some of the terminology in OSHA citations. Because there were only a few terms that initially were somewhat ambiguous, they were not discussed. For example, the difference between a complaint and a referral in citations.

7 References

Eckhof, R. k., & Amyotte, P. R. (2009). Dust Explosion Causation, Prevention and Mitigation: An Overview.

Helmenstine, A. M. (2019, January 11). Retrieved from Thoughtco: https://www.thoughtco.com/explosions-deflagration-versus-detonation-607316

Hughes Environment. (2015, February 3). Retrieved from https://hughesenv.com/understanding-dust-explosion-pentagon/

Maitland, G. (2015, July 15). *The wisdom of Trevor Kletz – the 'founding father' of inherent safety*. Retrieved from ichemeblog: https://ichemeblog.org/2015/05/15/the-wisdom-of-trevor-kletz-the-founding-father-of-inherent-safety-day-353/

OSHA. (n.d.). Retrieved from https://www.osha.gov/pls/imis/establishment.inspection_detail?id=1259793.015

Appendix A

This appendix outlines the descriptions of the reformatted OSHA citations. They will be labelled by their inspection number. *NOTE: Citations 1297749.015, 1275487.015 and 1280845.015 did not provide a description.

1259793.015

OSH Act of 1970 Section 5(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or were likely to cause death or serious physical harm to employees in that

employees were exposed to combustible dust flash fire and other fire hazards presented by an indoor enclosureless filter media dust collector collecting stainless steel and paint dusts from two upstream sander/metal finishers connected via a non-conductive PVC ducting sytem.

The dust collection system was located, constructed, installed, and operated in a manner that exposed employees to combustible dust flash fire and other fire hazards.

(a) On or about August 30, 2017, an Agent Dustkop (model FT40-SP, S/N 7448) enclosureless filter media dust collector was located indoors and near a workstation to collect combustible stainless steel and paint dust from two upstream Timesavers sander/metal finishers.

In addition, the ducting system connecting the sander/metal finishers and the indoor enclosureless filter media dust collector was made of non-conductive PVC material and was not bonded and grounded. The location, construction, installation, and operation of the dust collection system exposed employees to combustible dust flash fire hazards.

1250461.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to

employees in that employees were exposed to the hazards of exposure to potential combustible dust, fire, deflagration and explosion hazards.

Marshall Ingredients, LLC, Process Room, on or about or about 8/7/17: The employer operates two manufacturing lines that dry and pulverizes fruit products into powders. The powders were sampled and determined to be explosive. The employer did not implement procedures for managing and/or mitigating fire and explosion hazards of combustible agricultural dusts or related particulate solids.

The areas with the hazards include, but are not limited to, the rotary dryers, cyclones, metal detectors, hammer mills and baggers. Deficiencies include but are not limited to: a) Dust Hazard Analysis (DHA) not performed; b) Controls not in place to prevent sources of ignition such as but not limited to static electricity, sparks and heat; c) Fire and Spark prevention, detection, suppression systems not in place; d) The employer did not have deflagration protection at all affected areas; e) The employer had improperly installed backflow prevention devices in the exterior dust collection area.

Among other methods, one feasible and acceptable abatement method to correct these hazards are to comply with relevant provisions in NFPA 61 (2017) Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities and NFPA 652 (2016) Standard on the Fundamentals of Combustible Dust, such as:

1) Chapter 4, Section 4.1.2 of NFPA 61, which requires that the employer identify, assess the consequences and manage credible fire, flash fire and explosion hazards associated with their facility; and communicate the hazards to affected personnel.

2) Chapter 7, Section 7.1.1 of NFPA 652 and NFPA 61, which requires the employer to conduct a Dust Hazard Analysis.

3) Chapter 8, Section 8.3.9.4.4.1 of NFPA 61, which requires each dryer located inside a building to be protected by a permanently install fire protection system, explosion suppression system, or both, in accordance with applicable NFPA standards.

4) Chapter 8, Section 8.8.4.1 of NFPA 61 which requires that equipment requiring explosion prevention shall be protected by containment, suppression, inerting, or explosion venting.

1256134.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm, including severe burns, to employees resulting from employee exposure to dust explosions, deflagration, or other fire hazards, where enclosureless dust collectors were inside a building.

On or about August 7, 2017, in the West Warehouse #2 area of the wood shop building, two enclosureless dust collectors were exhausting wood dust from rip saws and wood molding machines, etc.

The employer did not ensure that these dust collectors operated in accordance with the provisions of manufacturers recommendations and recognized consensus standards, in that the dust collectors were not separated by a distance of at least 20 feet; filters bags were patched and not replaced and the dust collectors were operating with maximum air handling capacities in excess of 5000 CFM.

1269702.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm, in that employees were exposed to explosion, deflagration or other fire hazards from combustible dust:

Employees were exposed to combustible fertilizer dust hazards in the following instances:

a) Main Material Elevator, Main Building - The riser trunk was not dust tight and allowed combustible dust to escape, settle and accumulate on equipment and other surfaces.

b) Main Material Elevator, Main Building - The system containing combustible dust was not provided with adequate explosion venting.

c) Upper Doghouse, Delivery Hopper - The distance between the out-flow chute and the openings in the floor, that feeds the individual hoppers, did not prevent the accumulation of combustible dust.

d) Upper Doghouse, Delivery Hopper - On about October 11, 2017, nonsparking scoops or shovels were not utilized to clean areas containing combustible dust.

1255618.015

OSH Act of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm in that employees were exposed to struck by hazards from collapsed sections of overhead, indoor dust collection system ductwork resulting from the condition of the overloading of interior duct work systems:

(a) On or about August 6, 2017 the employer had not ensured that employees were protected from the hazards associated with overloaded sections of overhead ductwork associated with the conveyance of friction material particulates to an outdoor dust collection system. Duct conveyance velocities were inadequate and did not prevent accumulation of particulates within the duct work itself.

This condition resulted in the mass accumulation of particulates that, along with the weight of the ductwork itself, exceeded the strength of the ductwork's support system and resulted in the collapse of a section of duct work within the facility.

1266870.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm including severe burns, to employees in that employees were exposed to a dust explosion, deflagration, or other fire hazards

from combustible powder paint dust created from electrostatic painting operation that was connected to a cyclone and a Silvi & C. srl, model IMP/POLV, SN 32 16 2298 dust filter box that do not have deflagration venting separating each part of the system.

Ignition sources inside the building at the paint area include dryer ovens, Wagner manual guns with an output voltage of 100, 0 KV, automatic powder guns inside the booth, and spark from metal compressor tanks striking concrete floor.

a) Electrostatic Powder Paint spray finishing operation area: On or about September 28, 2017 and at times prior to, employees were exposed to combustible powder paint dust with a KsT value of 17.76 bar meters per second and a class II dust from dust collection system to include cyclone and filter box that do not have deflagration venting separating each parts of the system with ignition sources such as dryer ovens, wagner paint guns and sparks from tanks striking concrete floor.

Another Citation was given during the same incident:

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm including injuries from crushing or amputation hazards to employees in that

employees were exposed to crush by or falling object hazards from improperly secured compressor tanks hanging from conveyor/monorail hooking systems.

a) Paint Area: On or about September 28, 2017 and at times prior to, the employer exposed employees to struck by hazards from improperly secured compressor tanks hanging from threaded attachment method.

b) Paint Area: On or about September 28, 2017 and at times prior to, the employer exposed employees to struck by hazards from improperly secured compressor tanks hanging from main C-Hook with three hanger hooks attachment method.

Another Citation was given during the same incident:

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm including injuries from crushing or tip over of racks and stored items to employees in that

employees were exposed to crush by or falling object hazards from storage racks not being secured to the concrete floor.

a) Paint Area: On or about September 28, 2017 and at times prior to, the employer exposed employees to crushing hazards and injuries from storage racks not being secured or bolted to concrete floor.

b) Hydro Area: On or about September 28, 2017 and at times prior to, the employer exposed employees to crushing hazards and injuries from storage racks not being secured or bolted to concrete floor.

c) Hydro Area: On or about September 28, 2017 and at times prior to, the employer exposed employees to crushing hazards and injuries from storage racks not being secured or bolted to concrete floor.

1279599.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that caused or were likely to cause death or serious physical harm in that employees were exposed to combustible dust explosion, deflagration, or other fire hazards

while working at or near a dust collection system which was not adequately designed to prevent or minimize employee exposure in the event of a deflagration or other uncontrolled fire event:

(a) On or about November 29, 2017 the dust collector system that was connected to the indoor product silos was not designed with explosion prevention systems and/or explosion deflagration

systems to prevent a combustible dust explosion and/or fire inside the bag house from propagating back through the exhaust duct into the workplace.

1259598.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that caused or were likely to cause death or serious physical harm in that

employees were exposed to combustible dust explosion/deflagration hazards presented by two indoor dust collection systems, consisting of upstream primary cyclone filters and downstream filter media dust collectors, handling combustible powder coating paint dust that were installed and operated in a manner that exposed employees to several hazardous outcomes in the event of an internal deflagration:

On or about August 29, 2017 employees were exposed to the following conditions:

a) Powder Paint Line 1 had an indoor cartridge media dust collector and upstream cyclone that were used to collect combustible powder coating paint dust from the associated powder paint booth.

(i) The dust collector and cyclone both contained explosion venting that terminated indoors. This exposed employees to explosion products hazards (i.e. flame front, pressure wave, projectile building components, unburned product dust cloud, etc.) that could result in severe burns, trauma, and/or death in the event of an explosion.

(ii) The cyclone and dust collector lacked deflagration (flame front) propagation protection (isolation) for the following connections: The dirty air inlets and the clean air outlets.. This exposed employees to propagating flame front hazards that could result in severe burns and/or death in the event of an internal deflagration propagating through unprotected vessel connections/openings.

b) Powder Paint Line 2 had an indoor cartridge media dust collector and a upstream cyclone that were used to collect combustible powder coating paint dust from the associated powder paint booth.

(i) The dust collector and cyclone both contained explosion venting that terminated indoors. This exposed employees to explosion products hazards (i.e. flame front, pressure wave, projectile building components, unburned product dust cloud, etc.) that could result in severe burns, trauma, and/or death in the event of an explosion.

(ii) The cyclone and dust collector lacked deflagration (flame front) propagation protection (isolation) for the following connections: The dirty air inlets and the clean air outlets.

This exposed employees to propagating flame front hazards that could result in severe burns and/or death in the event of an internal deflagration propagating through unprotected vessel connections/openings.

Among other methods, feasible methods to correct these hazards would be to follow the provisions found in the following National Fire Protection Association (NFPA) standards:

NFPA 33 - Standard for Spray Application Using Flammable or Combustible Materials, 2016 edition - Section 15.8.3, (deflagration venting in accordance with NFPA 68).

NFPA 652 - Standard on the Fundamentals of Combustible Dust, 2016 edition - Sections 8.9.4 (equipment isolation) and 8.9.3.2 (deflagration venting in accordance with NFPA 68).

NFPA 654 - Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Dust Particulate Solids 2017 edition - Sections 7.1.4.1 (deflagration venting in accordance with NFPA 68), and 7.1.6.1 (equipment and upstream work area isolation).

NFPA 68 - Standard on Explosion Protection by Deflagration Venting, 2013 edition - Sections 5.2.3, 6.6.1, and 8.9 (measures to reduce risk to personnel from the effects of fireball temperature and pressure).

NFPA 69 - Standard on Explosion Prevention Systems, 2014 edition - Chapter 11 (deflagration control by active isolation) and Chapter 12 (deflagration control by passive isolation). Specifically, these options include (but are not limited to) the following:

(1) For explosion/deflagration vents on the system enclosures which vent directly indoors: Provide deflagration venting through listed flame-arresting and dust retention devices in accordance with NFPA 68 - OR - consider utilizing vent ducts to direct vented material from the enclosures to safe, outdoor locations in accordance with NFPA 68.

(2) For the lack of deflagration propagation protection (isolation) on the incoming (dirty air) inlets of the system enclosures: Provide isolation between the cyclone and the upstream process and between the dust collector and the cyclone in accordance with NFPA 69*.

(3) For the lack of deflagration propagation protection (isolation) on the return air exhaust (clean air) outlets of the system enclosures: Provide isolation between the cyclone and the dust collector and between dust collector and the return air exhaust outlet in accordance with NFPA 69*.

Alternatively, for the clean air outlet of the dust collector, ensure that the exhaust air is ducted to a safe, outdoor location and away from any return air inlets.

*Examples of passive isolation devices are flow-actuated flap valves, passive float valves, and flame front diverters. Examples of active isolation devices include fast-acting mechanical valves, actuated pinch valves, and chemical suppression barriers. Abatement certification and documentation are required for this item.

Abatement Schedule

STEP 1 -A combination of administrative controls shall be implemented as an interim protective measure until feasible engineering and administrative controls can be permanently implemented.

STEP 2 -A written detailed plan of abatement shall be submitted to the Area Director outlining a schedule for the implementation of engineering and/or administrative measures to control employee exposures to the hazardous condition as referenced in this citation. This plan shall include, at a minimum, target dates for the following actions which must be consistent with the abatement dates required by this citation:

(1)Evaluation of engineering/administrative control options;

(2)Selection of optimum control methods and completion of design;

(3)Procurement, installation and operation of selected control measures;

(4)Testing and acceptance or modification/redesign of controls; All proposed control measures shall be approved for each particular use by a competent certified safety professional, professional engineer, or other technically qualified person.

STEP 3 -Abatement shall have been completed by the implementation of feasible engineering and administrative controls upon verification of their effectiveness in achieving compliance. Date by Which Violation Must be Abated:

STEP 1 - 30 Days by Which Violation Must be Abated:

STEP 2 - 60 Days by Which Violation Must be Abated:

STEP 3 - 90 Days.

1275989.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm

including injuries from crushing or tip over of racks and stored items to employees in that employees were exposed to crush by or falling object hazards from storage racks not being secured to the concrete floor.

a) Paint Area: On or about November 8, 2017 and at times prior to, the employer exposed employees to crushing hazards and injuries from storage racks not being secured or bolted to concrete floor.

Another Citation was given during the same incident:

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm including severe burns, to employees in that

employees were exposed to a dust explosion, deflagration, or other fire hazards from combustible powder paint dust created from electrostatic painting operation.

a) Electrostatic Powder Paint Spray Finishing Operation Area: November 8, 2017 and at times prior to, employees were exposed to fire and explosion hazards from combustible powder paint dust air separation system and powder paint recovery box being located inside of the building.

b) Electrostatic Powder Paint Spray Finishing Operation Area: November 8, 2017 and at times prior to, employees were exposed to fire and explosion hazards from combustible powder paint dust process that was not protected from deflagration hazards.

1274530.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which is free from recognized hazards that were likely to cause death or serious physical harm to employees in that

employees were exposed to fire, deflagration, and explosion hazards from ST-1 combustible fiber-reinforced plastic dust(s).

On or prior to 11/03/17, exterior baghouse-type dust collectors and interior enclosureless-type dust collector(s) used in processes including but not limited to:

cutting, machining, and sanding of fiber-reinforced plastic materials, were not designed, installed and maintained to protect employees from fire and explosion hazards in that:

(a) Wallins Corners and Genesee Lane Facilities -- Exterior baghouse and interior enclosureless dust collector(s) utilized in processes producing combustible dust(s) were not equipped with explosion and deflagration protection.

(b) Wallins Corners and Genesee Lane Facilities -- Inlet and return air ductwork for baghouse dust collector(s) was not equipped with explosion and deflagration protection to prevent an explosion or flame-front from propagating through the ductwork and back into the facility.

(c) Wallins Corners and Genesee Lane Facilities -- Inlet ductwork for baghouse and enclosureless dust collector(s) was not designed to control static ignition hazards.

1272259.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to combustible cellulose dust explosion, deflagration, and other fire hazards as a result of working at or near a dust collection system consisting of a filter media dust collector that was not located, installed, and equipped to prevent employee exposure to hazards associated with an internal combustible dust deflagration:

(a) Applegate Wisconsin, LLC. production facility: The indoor DCE, Inc. Dalmatic Dust Collector (Type DLM 2/5/15, S/N IG641971) was used to collect combustible cellulose insulation dust from upstream milling processes.

The dust collector was not located, installed, and equipped to prevent employee exposure to hazards resulting from an internal deflagration. Employees working at or near the dust collector were exposed to combustible cellulose dust deflagration hazards associated with the effects of an explosion (flame front, pressure wave, projectile fragments, etc.) and/or propagation of a flame front resulting from an internal deflagration. The indoor dust collector:

(1) contained explosion/deflagration venting enclosure openings that terminated indoors;

(2) had missing explosion/deflagration venting membranes that had been replaced with non-approved materials; and

(3) lacked means of deflagration propagation protection for the upstream process.

1262338.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which was free from recognized hazards that were causing or likely to cause death or serious physical harm to employees:

a) Global Metal Powders, LLC. On or about September 8, 2017, employees were potentially exposed to fire and explosion hazards from a dust collector that was not equipped with devices and systems to prevent the propagation of explosions and associated flame fronts from the dust collector through the associated dust collection system ductwork.

The dust collector collected combustible dust from materials including, but not limited to, chromium powder and other powdered metals.

1280334.015

29 CFR 1910.22(a)(1):

The employer did not ensure that all places of employment, passageways, storerooms, service rooms, and walking-working surfaces were kept in a clean, orderly, and sanitary condition:

(a) VAR FURNACE AREA, STUB WELDER - The employer did not ensure that the accumulation of titanium dust was removed from the bottom of the stub welder chamber. A flash fire occurred when the titanium electrode fell inside of the welding chamber, disturbing the dust which ignited.

The stub welder operator sustained first and second degree burn injuries, on or about November 30, 2017.

In the Alternative 29 CFR 1910.141(a)(3)(i):

Places of employment were not kept clean to the extent that the nature of the work allowed:

(a) VAR FURNACE AREA, STUB WELDER - The employer did not ensure that the accumulation of titanium dust was removed from the bottom of the stub welder chamber. A flash fire occurred when the titanium electrode fell inside of the welding chamber, disturbing the dust which ignited.

The stub welder operator sustained first and second degree burn injuries, on or about November 30, 2017.

Abatement certification required within 10 days after abatement date. The certification shall include a statement that abatement is complete, date and method of abatement, and states employees and their representatives were informed of this abatement. ----------
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ISA held on April 13, 2018 - changed standard from 1910.22(a)(1) or in the Alternative 1910.141(a)(3)(I) to the following OSH ACT of 1970 Section (5)(a)(1):

1267703.015

OSH Act of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm in that

employees were exposed to combustible agricultural dust deflagration, explosion, and other fire hazards while working inside facilities containing indoor dust collection systems that were not designed to prevent or minimize employee exposure in the event of an internal deflagration:

(a) Brolite Products, Inc.: On or about October 3, 2017 the employer operated the Packaging Line Dust Collector (Camco filter media-dust collector / baghouse) inside of the facility without the means to protect employees from the hazards associated with

(1) a dust collector explosion resulting from the pressures associated with an internal deflagration in the dust collector and

(2) propagation of a deflagration from and internal dust collector to connected upstream equipment and/or outside of the units material discharge hopper.

(b) Brolite Products, Inc.: On or about October 3, 2017 the employer operated the Mixing Room / Tower Dust Collector (BISCO filter media-dust collector / baghouse) inside of the facility without the means to protect employees from the hazards associated with

(1) a dust collector explosion resulting from the pressures associated with an internal deflagration in the dust collector and

(2) propagation of a deflagration from and internal dust collector to connected upstream equipment and/or outside of the units material discharge hopper.

Among other methods, feasible and acceptable means of abatement would be to follow the guidance in the

National Fire Protection Association's (NFPA) "Standard 61 Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities, 2017 ed." - Sections 8.3.4.2 (dust collector location), 8.8.4(equipment protection), and 8.8.5 (equipment isolation).

Specifically, provide indoor dust collectors with a recognized means of explosion protection and deflagration propagation protection (isolation). Indoor dust collectors can be protected from explosion hazards through either deflagration venting provided in accordance with the requirements of NFPA 68 "Standard on Explosion Protection by Deflagration Venting, 2013 ed." or through the use of a dry chemical deflagration suppression systems provided in accordance with the requirements of NFPA 69 "Standard on Explosion Prevention Systems, 2014 ed."

Deflagration propagation protection (isolation) methods include both passive and active isolation technologies as outlined in NFPA 69.

An example of a passive isolation system technology that could be used on the upstream (dirty-air / inlet) side of a vented, indoor dust collector includes the use of a flow-actuated flap valves designed in accordance with the requirements of NFPA 69.

An example of a passive isolation system technology that could be used on the material discharge of a dust collectors hopper include rotary valves (material chokes) designed in accordance with the requirements of NFPA 69.

An example of an active isolation system that could be used to protect a dust collectors upstream ducting inlet and a dust collectors material discharge hopper outlet includes the use of a dry chemical deflagration suppression system provided in accordance with the requirements of NFPA 69.

1273034.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which was free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to potential fire, explosion, and deflagration hazards.

a) In the tower dryer system, on or about 10/25/17: Equipment such as, but not limited to the dryer, cyclones, ducts, and bagging dust collector contained potentially explosive atmospheres during normal operations while handling combustible powdered products. The employer did not ensure that the equipment was equipped with a means of protection to prevent explosion and deflagration.

b) In the V-bottom dryer system, on or about 10/25/17: Equipment such as, but not limited to the dryer, cyclones, and ducts contained potentially explosive atmospheres during normal operations while handling combustible powdered products. The employer did not ensure that the equipment was equipped with a means of protection to prevent explosion and deflagration.

c) On the baghouse of the V-bottom dryer system, on or about 10/25/17: Explosion vent panels on the baghouse were designed to release indoors in the penthouse.

1272047.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to dust explosion, deflagration, and other fire hazards when using equipment not designed for use in an environment normally expected to contain airborne combustible dust:

a) At the facility, in Silo 3: On October 20, 2017, employees used a compact skid steer track loader not rated for use in atmospheres normally expected to contain airborne combustible wood dust, exposing employees to fire and explosion hazards.

b) At the facility, in Silo 3: On October 20, 2017, employees used a mini excavator not rated for use in atmospheres normally expected to contain airborne combustible wood dust, exposing employees to fire and explosion hazards.

c) At the facility, in Silo 3: On October 19, 2017, employees used a compact skid steer track loader not rated for use in atmospheres normally expected to contain airborne combustible wood dust, exposing employees to fire and explosion hazards.

1278584.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which was free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in-that

employees were exposed to combustible dust explosion and deflagration hazards while working at or near the indoor combustible dust collection systems which were not adequately designed to prevent or minimize employee exposure in the event of an explosion or deflagration:

(a) An indoor Donaldson Torit Dust Collector in the North Mixing Area, which was used for collecting a combustible mixture of polyvinyl (PVC) homopolymer powder combined with other ingredients, lacked means of explosion and deflagration protection.

In addition, the dust collector lacked means of explosion and deflagration protection (isolation) for the upstream processes and the area below unit's material discharge.

1272727.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that caused or were likely to cause death or serious physical harm in that

employees were exposed to the hazards of dust explosions, deflagrations, and other fire hazards:

Production area: On or about 10/24/2017, the enclosureless dust collection system for the Timesavers 200 mechanical-feed wide-belt sander, which processed wood products, was not located, equipped, and used in a manner safe for its indoor location.

Employees were exposed to the hazards of dust explosions, deflagrations, and other fire hazards due to the indoor location of the employer's dust collection system, potential sparks originating from tramp metal getting entrained into the exhaust system, mechanical failures causing overheating of components, sparks from the non-explosion-proof fan which was operating approximately 25 feet away with a damaged power cord, and static electricity discharges.

1274754.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that caused or were likely to cause death or serious physical harm in that

employees were exposed to the hazards of dust explosions, deflagrations, and other fire hazards: Range 1 Flock Room: On or about 11/2/17, the flock modules, which apply flock onto cloth, were not equipped and used in a safe manner.

Employees were exposed to the hazards of dust explosions, deflagrations, and other fire hazards due to potential sources of ignition including, but not limited to, electrostatic grids in the flock

modules, static electricity discharges, sparks originating from tramp metal getting entrained into the system, and mechanical failures causing overheating of components.

On 11/2/17, an employee was burned when the combustible dust in the Range 1 flock machine ignited.

1296278.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which was free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees working at or near dry dust collection systems (indoor enclosureless bag separator and upstream ducting) handling combustible wood dust were exposed to wood dust fire hazards during the operation and maintenance of the dust collection system: On or about February 21, 2018,

a) An indoor enclosureless bag separator (Extrema DC-240.3 Portable Dust Collector) with positive pressure air-material inlet and two unenclosed dust filter bags was used to collected combustible wood dust fines from an Extrema wide belt sander.

Employees were exposed to the hazards of fire and flash fire from working in close proximity to the indoor enclosureless dust collector and upstream ducting and manually emptying the bags of collected combustible wood dust in the event of the presence of an internal fire, ember or spark.

1297478.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to fire and explosion from electrostatic ignition of combustible dust:

a) Silo room Flour silos, sifters, piping and hoppers were not grounded. A bulk sample of white flour from mixer #3 collected 2/23/18 was found to be an explosive Class II combustible dust with a hazard severity of 1.50. Violation occurred on or about 2/23/18.

b) Production, mixing area by white line Flour piping, hoppers and mixers were not grounded. A bulk sample of white flour from mixer #3 collected 2/23/18 was found to be an explosive Class II combustible dust with a hazard severity of 1.50. Violation occurred on or about 2/23/18

1295568.015

OSH ACT of 1970 Section 5(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to metal dust fire hazards as a result of working at or near multiple indoor dry-type dust collection systems that were collecting dust from upstream chrome and steel polishing machines:

(a) On February 16, 2018: A Hammond Machinery DK-8 - DusKolector - combination cyclone and enclosureless dust collector unit (S/N 16087) was used to collect chrome dust from a connected chrome polishing machine in the chrome polishing area. The unit was located indoors in near proximity to the polishing machine.

The system exposed employees to fire hazards such as, but not limited to, burns from flames or flash fire flame front and the inhalation of hazardous byproducts of combustion (i.e. smoke, toxic gases, etc.) in the event of a fire. In addition, the design of dust collection system (i.e. conveyance ducts and exhaust source) did not ensure that duct velocities were sufficient to prevent the accumulation of metal dust in the duct work.

(b) On February 16, 2018: A Hammond Machinery DK-8 - DusKolector - combination cyclone and enclosureless dust collector unit (S/N 35677) was used to collect chrome dust from a connected chrome polishing machine in the chrome polishing area. The unit was located indoors in near proximity to the polishing machine.

The system exposed employees to fire hazards such as, but not limited to, burns from flames or flash fire flame front and the inhalation of hazardous byproducts of combustion (i.e. smoke, toxic gases, etc.) in the event of a fire. In addition, the design of dust collection system (i.e. conveyance ducts and exhaust source) did not ensure that duct velocities were sufficient to prevent the accumulation of metal dust in the duct work.

(c) On February 16, 2018: A Hammond Machinery DK-8 DusKolector combination cyclone and enclosureless dust collector unit (S/N 17098) was used to collect chrome dust from a connected chrome polishing machine in the chrome polishing area. The unit was located indoors in near proximity to the polishing machine.

The system exposed employees to fire hazards such as, but not limited to, burns from flames or flash fire flame front and the inhalation of hazardous byproducts of combustion (i.e. smoke, toxic gases, etc.) in the event of a fire. In addition, the design of dust collection system (i.e. conveyance ducts and exhaust source) did not ensure that duct velocities were sufficient to prevent the accumulation of metal dust in the duct work.

(d) On February 16, 2018: A Hammond Machinery DK-8 DusKolector combination cyclone and enclosureless dust collector unit (S/N 12522) was used to collect steel dust from a connected steel polishing machine in the shipping and receiving area. The unit was located indoors in near proximity to the polishing machine.

The system exposed employees to fire hazards such as, but not limited to, burns from flames and the inhalation of hazardous byproducts of combustion (i.e. smoke, toxic gases, etc.) in the event of a fire. In addition, the design of dust collection system (i.e. conveyance ducts and exhaust source) did not ensure that duct velocities were sufficient to prevent the accumulation of metal dust in the duct work.

Among other methods, feasible abatement methods include following the provisions of the National Fire Protection Association's (NFPA) Standard 484 - Standard for Combustible Metals. 2015 ed. - Sections 9.4.1 and 9.4.10 (dust collection system design), 9.4.13.2 (dust collector location), 9.4.13.11 and 9.4.13.15.7.5 (prohibitions on recycling exhaust air into buildings), and 9.4.13.15.1 (indoor dry-type dust collector prohibitions).

Specifically, NFPA recognizes two methods of collecting combustible metal dust in industrial operations. These are:

(1) wet-type dust collectors located indoors near the point of dust generation and

(2) dry-type dust collectors located outdoors as close as possible to the point of dust generation.

NFPA also recognizes that there are some specialized applications where indoor dry-type dust collectors can be tolerable for the collection of metal dusts where wet-type dust collectors or dry-type outdoor dust collectors are not technically feasible.

For wet-type dust collections systems, follow the guidance in NFPA 484 (2015) Section 9.4.12 (wet-type dust collectors). Wet-type dust collectors, if used, must be installed and maintained in accordance with industry guidelines. For dry-type dust collectors, follow the guidance in NFPA 484 (2015) Section 9.4.13 (dry-type dust collectors), 9.4.13.14 (media collectors), and 9.4.13.15 (indoor-dry type dust collectors).

Dry-type dust collectors, if used, must include provisions for explosion protection, deflagration propagation protection (isolation), and fire protection. In addition, dust collection systems must be designed to maintained duct velocities between 3,500 ft/min and 4,500 ft/min.

Control options include ensuring that conveyance systems and ducting are designed in accordance with recognized and accepted good engineering practices such as those found in the American Conference of Governmental Industrial Hygiest's (ACGIH) publication "Industrial Ventilation - A Manual for Recommended Practice for Design".

For example, to achieve sufficient duct velocities in an effort to prevent the settling of dusts in the ducts: duct transitions should be smooth and angled (i.e. 30 - 45 degrees), duct diameters should increase after the branch duct entry points, and fans should be selected based on achieving appropriate capture and duct conveyance velocities. Exhaust systems should be designed, installed, and maintained by professionals having experience with the principles of industrial ventilation design.

1289686.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing, or likely to cause, death or serious physical harm to employees, including severe burns, in that

employees were exposed to dust explosion, deflagration, or other fire hazards from accumulation of combustible wood dust: On or about January 24, 2018, and at times prior thereto, in the cabinet shop, the employer did not provide for effective capture and control of combustible dust which was likely to ignite or explode, exposing employees to the hazards of fire and explosion.

1283599.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to potential fire, deflagration, and explosion hazards in a dust collection system.

a) Grinding Area, on or about 2/2/2018: Employees create combustible dust when using grinders to finish aluminum products. The aluminum dust is captured by the dust collection system which was not grounded and bonded, static dissipative filter media was not provided and air from the dust collector was recirculated back into the building exposing employees to fire, deflagration and explosion hazards.

Abatement certification must be submitted for these items.

1303375.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that

caused or were likely to cause death or serious physical harm in that employees were exposed to combustible dust explosion, deflagration, or other fire hazards while working at or near dust collection system which were not adequately designed to prevent or minimize employee exposure in the event of a deflagration or other uncontrolled fire event:

a. On or about 3/22/2018, at 2525 Davie Road Ste.330 Davie, FL 33317, at the dust collectors room, employees were exposed to combustible dust explosion and fire hazards from a Donaldson Torit model DF03-6 dust collector unit that was located inside the building without being vented to the outside or provided with proper explosion suppression systems.

b. On or about 3/22/2018, at 2525 Davie Road Ste.330 Davie, FL 33317 ,at the dust collectors room, employees were exposed to combustible dust explosion and fire hazards from a Donaldson Torit model DFT2-8 dust collector unit that was located inside the building without being vented to the outside or provided with proper explosion suppression systems.

c. On or about 3/22/2018, at 2525 Davie Road Ste.330 Davie, FL 33317, at the dust collectors room, employees were exposed to combustible dust explosion and fire hazards from a Donaldson Torit model DF02-16 dust collector unit that was located inside the building without being vented to the outside or provided with proper explosion suppression systems.

1292504.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees from fire and explosion hazards.

Employees working in a solid surface fabrication shop located at 1120 Ellerbrook Road, North Kansas City, MO 64116 were exposed to fire and explosion hazards while working around the DT-75 dust collector containing combustible/explosive materials in large quantity.

Among other feasible and acceptable methods to correct these hazards are:

a) Follow NFPA 654 Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible particulate Solids requires in paragraph 7.13.1.1.1. "Where an explosion hazard exists, air-material separators shall be located outside of buildings."

b) Follow NFPA 654 Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible particulate Solids requires in paragraph 6.4.1 " If a room or building contains a dust explosion hazard as specified in 6.2.3.1 that is external to protected equipment, such areas shall be provided with deflagration venting to a safe outside location

c) The requirements of NFPA 654 7.13.1.1.2 shall not apply when air material-separators are protected in accordance with 7.1.4 of this section, when air-material separators have a dirty-side volume of less than 8 ft3 (0.2 m3), when wet air-material separators meet all the criteria of 7.13.1.1.2(3)(a through c), and when an enclosureless air-material separators meet all the criteria of 7.13.1.1.2(4)(a through k).

1291035.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees from fire and explosion hazards.

Employees working in a solid surface fabrication shop located at 1120 Ellerbrook Road, North Kansas City, MO 64116 were exposed to fire and explosion hazards while working around the DT-75 dust collector containing combustible/explosive materials in large quantity.

Among other feasible and acceptable methods to correct these hazards are:

a) Follow NFPA 654 Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible particulate Solids requires in paragraph 7.13.1.1.1. "Where an explosion hazard exists, air-material separators shall be located outside of buildings."

b) Follow NFPA 654 Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible particulate Solids requires in paragraph 6.4.1 " If a room or building

contains a dust explosion hazard as specified in 6.2.3.1 that is external to protected equipment, such areas shall be provided with deflagration venting to a safe outside location

c) The requirements of NFPA 654 7.13.1.1.2 shall not apply when air material-separators are protected in accordance with 7.1.4 of this section, when air-material separators have a dirty-side volume of less than 8 ft3 (0.2 m3), when wet air-material separators meet all the criteria of 7.13.1.1.2(3)(a through c), and when an enclosureless air-material separators meet all the criteria of 7.13.1.1.2(4)(a through k).

1301249.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees:

This violation occurred on or about March 13, 2018, Employees were exposed to hazards from the accumulation of dust generated from cotton ginning operations where the housekeeping was less than adequate.

1303557.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which is free from recognized hazards that were likely to cause death or serious physical harm to employees in that

employees were exposed to dust explosion, deflagration or other fire hazards from hazards from dust collectors being located inside a building:

(a) At the workplace -- On or prior to 3/22/18, the AGET Dustkop FT64-D1-SP dust collector(s) were located inside the building and the dust collector and ductwork was not equipped with explosion and deflagration protection.

1308940.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which was free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to fire, explosion, and deflagration hazards:

a) On or about 4/3/2018, In the facility: Equipment such as, but not limited to cyclones, duct work, dust collectors and receiving containers associated with five Crucible Blaster Assemblies contained potentially explosive atmospheres during normal operation while handling combustible metals.

The employer did not ensure that the equipment was equipped and maintained with means of protection to prevent explosions, fires, and deflagrations.

Abatement documentation is required for this item.

1297275.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees:

A.) CKJK, LLC dba Pellheat, 150 Rose Street, Glen Hope, PA 16645, on or about February 23, 2018 and times prior thereto: Employees were potentially exposed to fire, burn, and deflagration hazards from a DISA dust collector that was not equipped with devices and systems to prevent the propagation of deflagration and associated flame fronts from the dust collector through the associated dust collection system duct work and back into the building.

The DISA dust collector was not equipped with approved devices to prevent the propagation of deflagration and associated flame fronts throughout the dust collection system. The dust collector collected wood dust.

1297264.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees:

A.) J.A.C.K. Wood Products, LLC, 150 Rose Street, Glen Hope, PA 16645, on or about February 23, 2018 and times prior thereto: Employees were potentially exposed to fire, burn, and deflagration hazards from a DISA dust collector that was not equipped with devices and systems to prevent the propagation of deflagration and associated flame fronts from the dust collector through the associated dust collection system duct work and back into the building.

The DISA dust collector was not equipped with approved devices to prevent the propagation of deflagration and associated flame fronts throughout the dust collection system. The dust collector collected wood dust.

1310941.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees exposed to combustible plastic fines/dust explosion and deflagration (flame front) propagation hazards associated with an outdoor dust collection system.

The unprotected dust collector was located in an area for which there was direct employee exposure and was also connected to upstream processes without means to prevent flame front propagation back into the work area via the dirty air inlet ducting.

(a) On or about April 25, 2018, in and near the production area, the outdoor Pacific Engineering Systems dust collector located along the West side of the building in the West parking lot was used for collecting combustible fines/dust associated with the transfer of polystyrene and polyethylene pellets and granules.

The collector:

1) lacked means of explosion protection and

2) lacked means of deflagration propagation protection (isolation) for the upstream processes and the area below the unit's material discharge hopper.

Among other methods, feasible and acceptable means of abatement include following the guidance contained in National Fire Protection Association (NFPA) Standard 654 "Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, 2017 ed." Sections 7.1.4.1 (explosion protection design), 7.1.6.1 (isolation of equipment and work areas) and 7.13.1.2.2 (AMS protection).

1307797.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to dust explosion, deflagration, and/or fire hazards:

a) Compressor Room adjacent to Hershey Room: Employees were exposed to fire and/or explosion hazards in that the air compressor system that provided energy for the cocoa powder packaging equipment was not designed to prevent transmission of energy from fire or explosion where materials such as cocoa powder that had been determined to be combustible or explosible were present.

On or about March 25, 2018, a fire occurred in the rotary screw air compressor(s) and their exhaust ventilation duct work system resulting in damage of three (3) compressors, exhaust ventilation duct work and most ceiling tiles and a portion of the roof above the compressors.

1336727.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees, including severe burns, to employees in that

employees were exposed to dust explosion, deflagration, or other fire hazards from dust collectors used at the facility:

A) Employees were exposed to fire and explosion hazards from a Sterling Systems dual stage dust collector consisting of cyclone and enclosure-less filter bag assembly which collected dust from a plastic grinder and was located inside of the facility, on or about August 8, 2018.

B) Employees were exposed to fire and explosion hazards from a Sterling Systems dual stage dust collector consisting of cyclone and enclosure-less filter bag assembly which collected dust from a plastic process stream and was located inside of the facility, on or about August 8, 2018.

ABATEMENT CERTIFICATION REQUIRED

1306379.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards of fire and explosion that were causing or likely to cause death or serious physical harm to employees.

On or about April 4, 2018, and times prior thereto, interior blast areas at tracks 9 and 10, where the dust collection system was insufficient to control fugitive dust, exposing employees to fire, deflagration and explosion hazards.

WATCO MECHANICAL SERVICES WAS PREVIOUSLY CITED FOR A VIOLATION OF THIS OCCUPATIONAL SAFETY AND HEALTH STANDARD OSH Act of 1970 5(a)(1), WHICH WAS CONTAINED IN OSHA INSPECTION NUMBER 587438 CITATION NUMBER 1, ITEM NUMBER 1 AND WAS AFFIRMED AS A FINAL ORDER ON 12/16/2013, WITH A FINAL ABATEMENT DATE OF 12/10/13, WITH RESPECT TO A WORKPLACE LOCATED AT 17000 PREMIUM DR, HOCKLEY, TEXAS 77447.

1325312.015

Section 5(a)(1) of the Occupational Safety and Health Act of 1970:

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing, or likely to cause, death or serious physical harm to employees, including severe burns, in that

employees were exposed to dust explosion, deflagration, or other fire hazards from accumulation of combustible wood dust:

On or about June 26, 2018, and at times prior thereto, in the cabinet shop, the employer did not provide for effective capture and control of combustible dust generated during the operation of woodworking equipment. Dust was allowed to accumulate on equipment and building surfaces, exposing employees to the hazards of fire and explosion due to the ignition of the combustible dust.

1305884.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish the employees employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm in that

employees were exposed to potential fire, deflagration and explosion hazards:

a) Mill Work Area: The plastic flex hose connecting the Timesavers Incorporated sanding machine, model 137-1HD/60 serial number 24131F, to the wood dust collection system was not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18.

b) Mill Work Area: The plastic flex hose connecting the Mikron 645 Multi Moulder serial number MRO449 to the wood dust collection system was not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18

c) Mill Work Area: The plastic flex hose connecting the Extrema shaper to the wood dust collection system was not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18.

d) Mill Work Area: The plastic flex hose connecting the SCMI T110i to the wood dust collection system was not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18.

e) Mill Work Area: The plastic flex hose connecting the Northtech Planar, model NT-24-10HCVS serial number 040423, to the wood dust collection system was not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18.

f) Stair Mill Area: The plastic flex hose connecting the Powermatic table saw to the wood dust collection system was not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18.

g) Interior Door Area: The plastic flex hoses connecting the Wise Door router machine, model 8800E serial number 8800E-148, to the wood dust collection system were not grounded or otherwise equipped to prevent the airflow from generating static electricity, on or about 4/3/18.

h) Fabrication Department dust collection system: When air from the Murphy Rodgers Dust Collector model MRSE-16-4D serial number 1108 was allowed to recirculate back into the work area, the employer failed to ensure that it was equipped with a spark detection system and an abort gate to prevent a fire or explosion originating in the wood dust collector from re-entering the work area, on or about 4/3/18.

NOTE: IN ADDITION TO ABATEMENT CERTIFICATION, THE EMPLOYER IS REQUIRED TO SUBMIT ABATEMENT DOCUMENTATION FOR THIS ITEM. FAILURE TO COMPLY WILL RESULT IN AN ADDITIONAL PENALTY OF $1000.00 IN ACCORDANCE WITH 29 CFR 1903.19.

1333923.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees:

a) In the Saw Area, on or about July 30, 2018 - Employees were exposed to fire and explosion hazards resulting from the use of two Murphy-Rodgers, Inc. enclosureless dust collectors, models MRT-10A and MRT-12AS, which were located in the Saw Area. Employees used the enclosureless dust collector to collect combustible wood fiber dust while cutting wood fiber panels.

b) In the Saw Area, on or about July 30, 2018 - Employees were exposed to fire and explosion hazards resulting from the use of a nonconductive PVC pipe to vacuum accumulated combustible wood fiber dust around the two enclosureless dust collectors into the enclosureless dust collector duct work.

c) In the Saw Area, on or about July 30, 2018 - Employees were exposed to fire and explosion hazards resulting from the use of a PVC ducting hose to connect the PVC pipe used to vacuum accumulated combustible wood fiber dust to the enclosureless dust collector duct work.

d) In the Saw Area, on or about July 30, 2018 - Employees were exposed to fire and explosion hazards resulting from the use of PVC ducting hose to connect three saws used to cut wood fiber panels to the enclosureless dust collector duct work.

1317654.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees due to

employees being exposed to the fire hazards from combustible and ignitable plastic dust through the recirculation of air from a media-type dust collector that exhausted directly into an occupied building.

a) On or about May 22, 2018, the outdoor United Air Specialists media type dust collector was being used for collecting polyester, polypropylene and polystyrene dust from upstream process systems including grinders/granulator, air-material separators (cyclones) and various in-line fans/blowers.

The dust collector directly exhausted filtered air indoors without a means to detect and prevent the transfer of hazardous byproducts of a dust collection system fire, such as smoke or toxic gases, into the facility through the dust collector's exhaust air system.

Among other methods, one feasible and acceptable method of abatement would be to follow the National Fire Protection Association's (NFPA) Standard 654 "Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, 2013 ed." - Sections 7.12.2.5 (fans/blowers located in the dirty air stream), 7.12.3 (fire protection downstream of fan), 7.13.1.6 (exhaust air), and 7.15 (size reduction equipment).

Specifically, ensure that exhaust-air ducting terminates at an outdoor location and away from return air inlets. Alternatively, returning the dust collector's exhausted air into the building is possible provided that provisions are incorporated to prevent transmission of smoke and toxic gases back into the building through technologies such as a fire detection and abort/extinguishment system.

In addition, ensure that recognized ignition source controls are provided for upstream equipment to include the installation of foreign material exclusion or removal systems (i.e. magnetic separators, grates, etc.) upstream of all size reduction equipment systems (i.e. grinders/granulators) and ensure that the construction of fans/blowers located in the dirty air ducting is out of spark-resistant materials and spark reduction technology concepts.

1313626.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees working indoors at or near a cartridge dust collector collecting metal dust were exposed to associated fire hazards during system operation as the exhaust air was being discharged directly into the work area:

a) MW Industries, Inc. dba Mohawk Spring Corporation, Schiller Park, IL- On May 3, 2018, the Donaldson Torit Oval cartridge dust collector (model # DF03-018) labeled "C" used to collect a mixture of carbon and stainless steel dust from an upstream automated grinding operation exhausted filtered air directly into the work area.

Employees working inside the building were exposed to the hazardous byproducts of an internal dust collector fire (i.e. smoke, toxic gases, embers, flames, etc. from burning metal dust and/or filter media) as a result of the exhausting of filtered air into the building.

Among other methods, one feasible means of abatement would be to follow the guidance in the National Fire Protection Association (NFPA) Standard 484 Standard for Combustible Metals, 2015 ed. Sections 9.4.13.11 and 9.4.13.15.7.5 (recycling of exhaust air) and prohibit the recycling of exhaust air from dry-type dust collectors into the buildings by exhausting directly outdoors to a safe location, away from any air intakes.

1334443.015

OSH Act of 1970 Section 5(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely cause death or serious physical harm to employees in that

employees were exposed to combustible dust deflagration and explosion hazards presented by two outdoor filter-media dust collectors (baghouses) handling combustible color concentrate additives and ingredients dust. The dust collectors were installed and operated in a manner that exposed employees to several hazardous outcomes in the event of an internal baghouse deflagration:

a) On or about July 31, 2018, the outdoor Flex-Kleen Model 120-WSTS-196 (III) filter media-type dust collector (baghouse) was used for collecting combustible color concentrate additives and ingredients dust from upstream process systems including mixers, blenders, mills, and an extruder:

i. The Flex-Kleen Model 120-WSTS-196 (III) filter media-type dust collector (baghouse) lacked a means of explosion protection.

This exposed employees working at or near the collector to hazards associated with the potential for rupture of the vessel from elevated internal pressures in the event of a deflagration occurring within the collector.

The hazards include potential exposure to ejected flame front, pressure wave, and enclosure fragments.

ii. The Flex-Kleen Model 120-WSTS-196 (III) filter media-type dust collector (baghouse) lacked a means of deflagration propagation protection (isolation) for the upstream connected processes (dirty air inlet).

This exposed employees working upstream of the collector to burn hazards associated with the potential for flame front propagation outside of the collector and into upstream systems in the event of a deflagration occurring within the collector.

b) On or about July 31, 2018, the outdoor Flex-Kleen Model 120-WSTC-225 (III) filter media-type dust collector (baghouse) was used for collecting color concentrate additives and ingredients dust from upstream process systems including pulverizers, extruders, choppers, and mixers:

i. The Flex-Kleen Model 120-WSTC-225 (III) filter media-type dust collector (baghouse) lacked a means of deflagration propagation protection (isolation) for the upstream connected processes (dirty air inlet).

This exposed employees working upstream of the collector to burn hazards associated with the potential for flame front propagation outside of the collector and into upstream systems in the event of a deflagration occurring within the collector.

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees:

a) Door shop: On or about September 28, 2018 and at times prior thereto; duct work leading into and out of the LMC dust collector bag system, which posed a fire/deflagration hazard, lacked fire/deflagration isolation devices to prevent a fire/deflagration in the collector from travelling back into work areas.

b) Door shop: On or about September 28, 2018 and at times prior thereto; dust from woodworking equipment with ignition hazards was carried to dust collector inside ductwork that had no spark detection or fire suppression.

Abatement certification AND documentation ARE required for this item.

1336668.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees in that

employees were exposed to the hazard of flash fire from the ignition of a suspended cloud of combustible titanium metal powder when emptying the metal powder from a non-metallic duct.

a) On or about 8/7/2018, in the Plasma Spray Area, employees were exposed to the hazard of flash fire from the ignition of suspended combustible titanium powder dust when emptying titanium powder collected in a PVC pressure relief pipe connected to a plasma spraying chamber.

Employees removed titanium dust from the inside of the PVC duct via gravity unloading and without means to control for static electric discharge from the human body (i.e. no personnel bonding/grounding) and without means to control for dispersions of dust that produce dust clouds.

In addition, the duct itself was constructed of a non-conductive material.

1329863.015

OSH ACT of 1970 Section (5)(a)(1):

The employer did not furnish employment and a place of employment which were free from recognized hazards that were causing or likely to cause death or serious physical harm to employees from fire and explosion hazards.

Employees working at Executive Coach Builders, Inc. located at 4400 West Production Street, Springfield, MO, 65803 where the employer exposes employees to fire and explosion hazards while working around the Belfab dust collector containing large quantities of combustible/explosive materials.

Among other feasible and acceptable methods to correct these hazards are:

a) Follow NFPA 664 Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities paragraph 8.2.2.5.1.4 which outlines dust collector installation.

b) Follow NFPA 654 Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible particulate Solids requires in paragraph 7.13.1.1.1. "Where an explosion hazard exists, air-material separators shall be located outside of buildings."

c) Follow NFPA 654 Prevention of Fire and Dust Explosions from the Manufacturing Processing, and Handling of Combustible particulate Solids requires in paragraph 6.4.1 " If a room or building contains a dust explosion hazard as specified in 6.2.3.1 that is external to protected equipment, such areas shall be provided with deflagration venting to a safe outside location