APPLICATION PROFILE

ELEVATOR SILO FILTER

INTRODUCTION

At an elevator facility, a truck unloading system is used to move grain from the truck into storage silos. While conveying grain throughout the system, fine dust will become airborne creating a risk for dust explosion in practically every process section: (see Figure on page 3 from left to the right) truck unloading hopper, bucket elevator, silo and dust aspiration/filter system.

HAZARD

Sparks, static electricity, or smoldering embers are potential explosion ignition sources within the dust laden atmosphere of each process section. A possible spark source is tramp metal being introduced during truck unloading. Furthermore, misalignment or slipping of the belt, buckets hitting the wall, overfilling, or smoldering materials are potential sources in the elevator.

SOLUTION

In this example, the process to be protected is a truck unloading system for grain. The process is being protected by a combination of suppression, venting and chemical explosion isolation.

OPERATION

The Elevator boot cannot be vented because it is installed inside a pit which excludes venting through a duct. A suppression system was selected to protected the elevator boot: two pressure detectors (item 1) attached to the elevator boot will detect any explosion in its incipient stage, and will signal the suppression system's Explosion Protection Controller (EPC) (item 2). The control system will activate the suppression High Rate Discharge (HRD) container (item 3) and the Standard Rate Discharge (SRD) isolation containers (item 4) on the legs (one on each leg) which inject suppressant powder to extinguish the explosion and prevent propagation up through the legs. This event will typically be completed within less than 100 msec and the pressure developed will be less than 0.5 barg (7 psig).

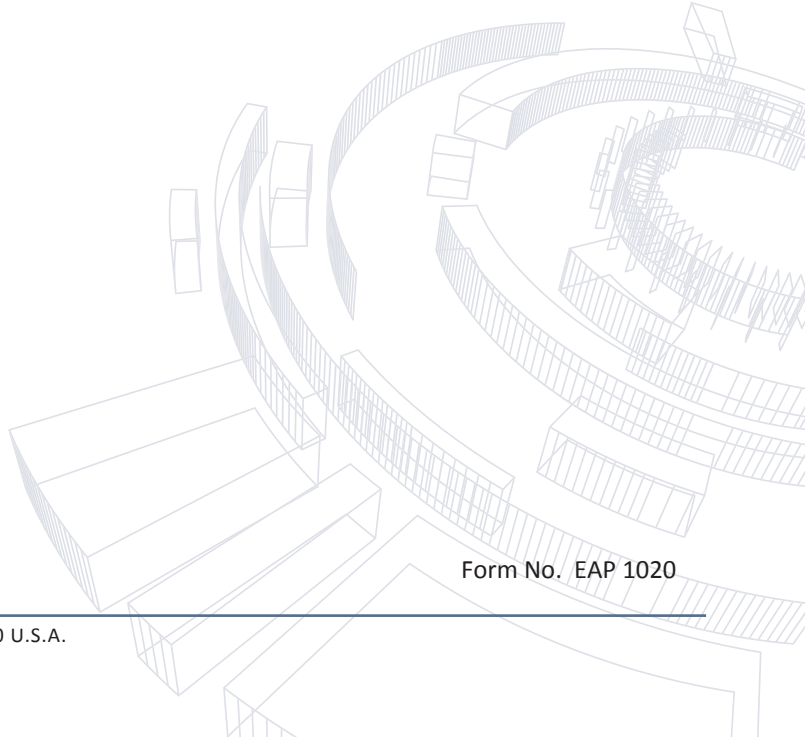
The elevator head is protected by venting (item 7), and additional venting along the legs (item 6) prevent pressure build up while the explosion propagates through the legs, with elevator boot being protected by suppression (see earlier). Explosion propagation through the dust aspiration is stopped through the chemical isolation barrier (item 9), activated by the rupture indicators of the earlier mentioned vent panels.

Venting of the silo (installed inside the building) is difficult to implement: a relatively large vent area would need to be ducted to the outside. Explosion suppression is relatively easy to implement installing 2 HRDs and 2 detectors, controlled by the third EPC (item 11). An SRD suppressor installed onto silo screw (item 12) will prevent explosion propagation through the screw.

The dust filter is protected by explosion venting (item 14) through a duct to the atmosphere. The rupture indicator of the explosion vent (not shown) is tied into the fourth EPC controller, and activates a SRD chemical isolation barrier (item 16) to stop explosion propagation upstream back into the process.

Further protection measures include:

- Item 17: Fike bus network to chain all EPCs together, exchanging status information between operator and field installed explosion protection system components.
- Relay contacts, in the EPCs or Relay Card (RC8), that switch over in case of explosion detected, or even system trouble. They are used to stop the process or bring it into a safe state.



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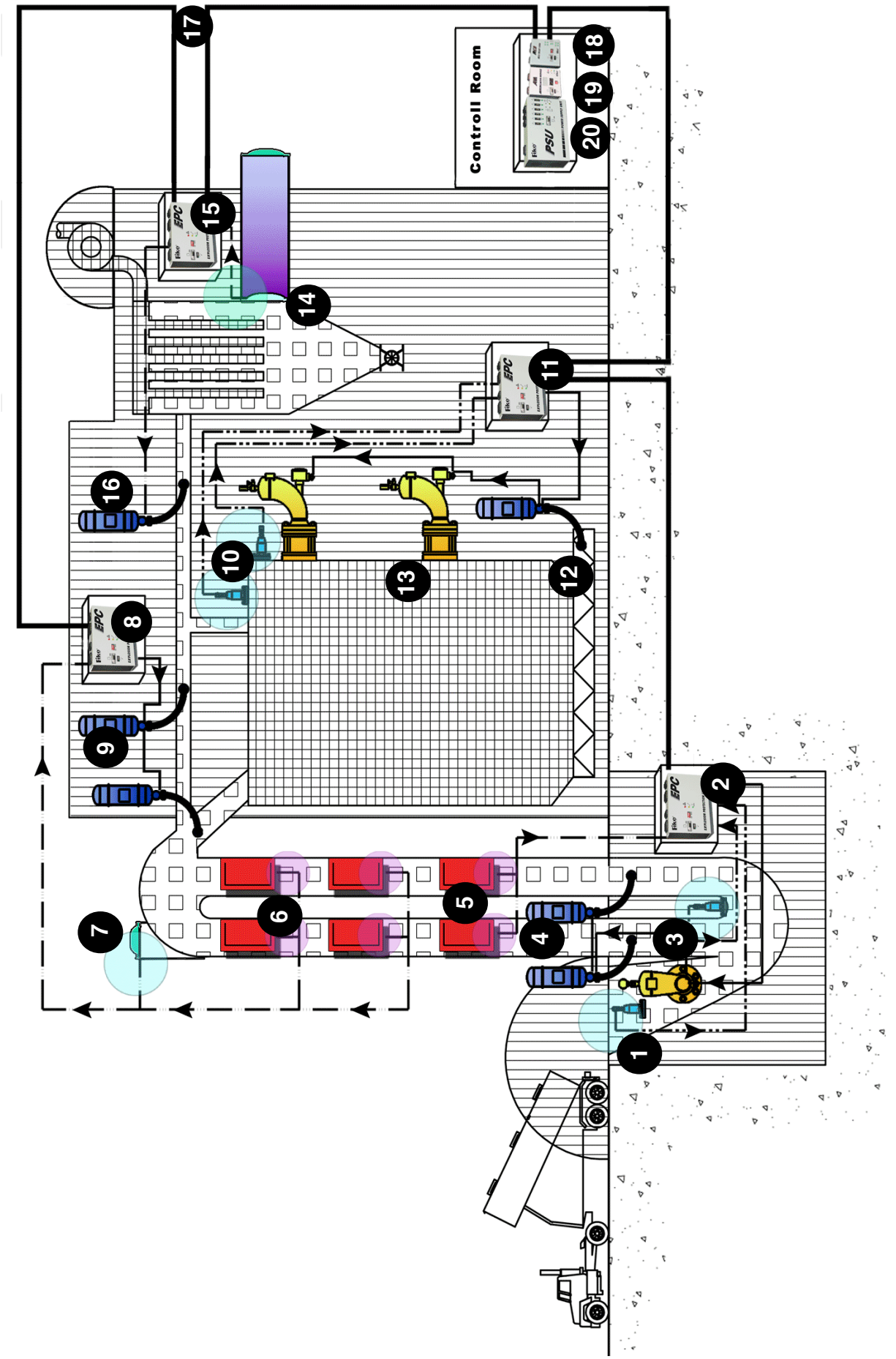
Item	Type of Device	Information	(Safety) Function
1	Integra® Explosion Detector	Input (A*)	Detects an explosion in its incipient stage originating in the elevator boot
2	Explosion Protection Controller (EPC) in Ex field enclosure	I/O, rated for area	Monitoring, releasing, alarming of suppression system protecting the elevator boot
3	HRD Suppressor on Elevator Boot	Output (D*)	Injects suppressant to extinguish explosion originating in elevator boot
4	SRD Isolation on elevator legs (chemical barrier)	Output (D*)	Injects suppressant into legs to stop explosion propagation
5	EGV Explosion Vent panel on legs	Vent	Opens to relieve explosion pressure and flame, rupture indicators used to trigger the suppression/isolation system of the elevator boot section
6	EGV Explosion Vent panel on legs	Vent	Opens to relieve explosion pressure and flame, rupture indicators used to trigger the isolation system (item 9) installed in the elevator outlet
7	EGV Explosion Vent panel on Elevator Head	Vent	Opens to relieve explosion pressure and flame, rupture indicators used to trigger the suppression/isolation system of the elevator boot section
8	EPC Controller in Ex field enclosure	I/O, rated for area	Monitoring, releasing, alarming of isolation system protecting the elevator outlet (item 9)
9	SRD Isolation on elevator outlet (chemical barrier)	Output (D*)	Injects suppressant into pipe to stop explosion propagation
10	Integra® Explosion Detector on Silo	Input (A*)	Detects an explosion in its incipient stage originating in silo
11	EPC Controller in Ex field enclosure	I/O, rated for area	Monitoring, releasing, alarming of suppression system protecting the silo
12	SRD Isolation on screw conveyor silo outlet (chemical barrier)	Output (D*)	Injects suppressant into screw to stop explosion propagation
13	HRD Suppressors on silo wall	Output (D*)	Injects suppressant to extinguish explosion originating in silo
14	Explosion Vent Panel and FQ	Venting	Opens to relieve explosion pressure and flame via a vent duct into the surrounding area outside the building. Rupture indicator used to trigger the isolation system (item 16) installed in the filter inlet
15	EPC Controller in Ex field enclosure	I/O, rated for area	Monitoring, releasing, alarming of suppression system protecting the filter inlet
16	SRD Isolation on filter inlet (chemical barrier)	Output (D*)	Injects suppressant into inlet pipe to stop explosion propagation
17	Bus networking	Protocol	Chaining of control system information and functionality
18	Relay Card (RC8)	SPDT	Additional relay contacts for process interface
19	Annunciator	I/O	Interface between operator and field installed EPACO components
20	Power Supply Unit (PSU) and Transformer and batteries (not shown)		To provide power to the EPACO system

(A): analog information, for example 4-20 mA signal*
(D): digital information, for example high/low or open/close*
I/O: input and output
SPDT: single pole, double throw



Form No. EAP 1020, April 2005. Specifications are subject to change without notice.