



Safety is for life.



HOW TO PROTECT WHAT?

Consulting | Engineering | Products | Service

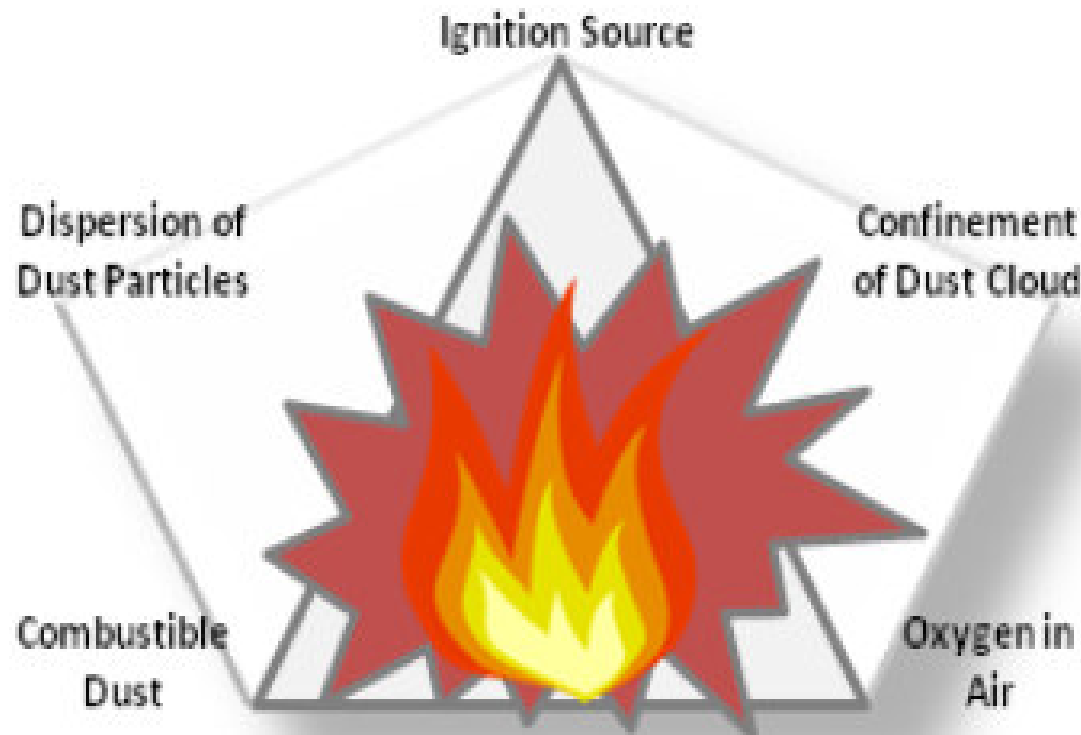
Andrea Vincenzi
Senior Consultant Explosion Safety

07-08/12/2018



WHAT ARE THE CONDITIONS TO GENERATE A DUST EXPLOSION?

Dust Fire & Explosion Pentagon



Before dust can explode:

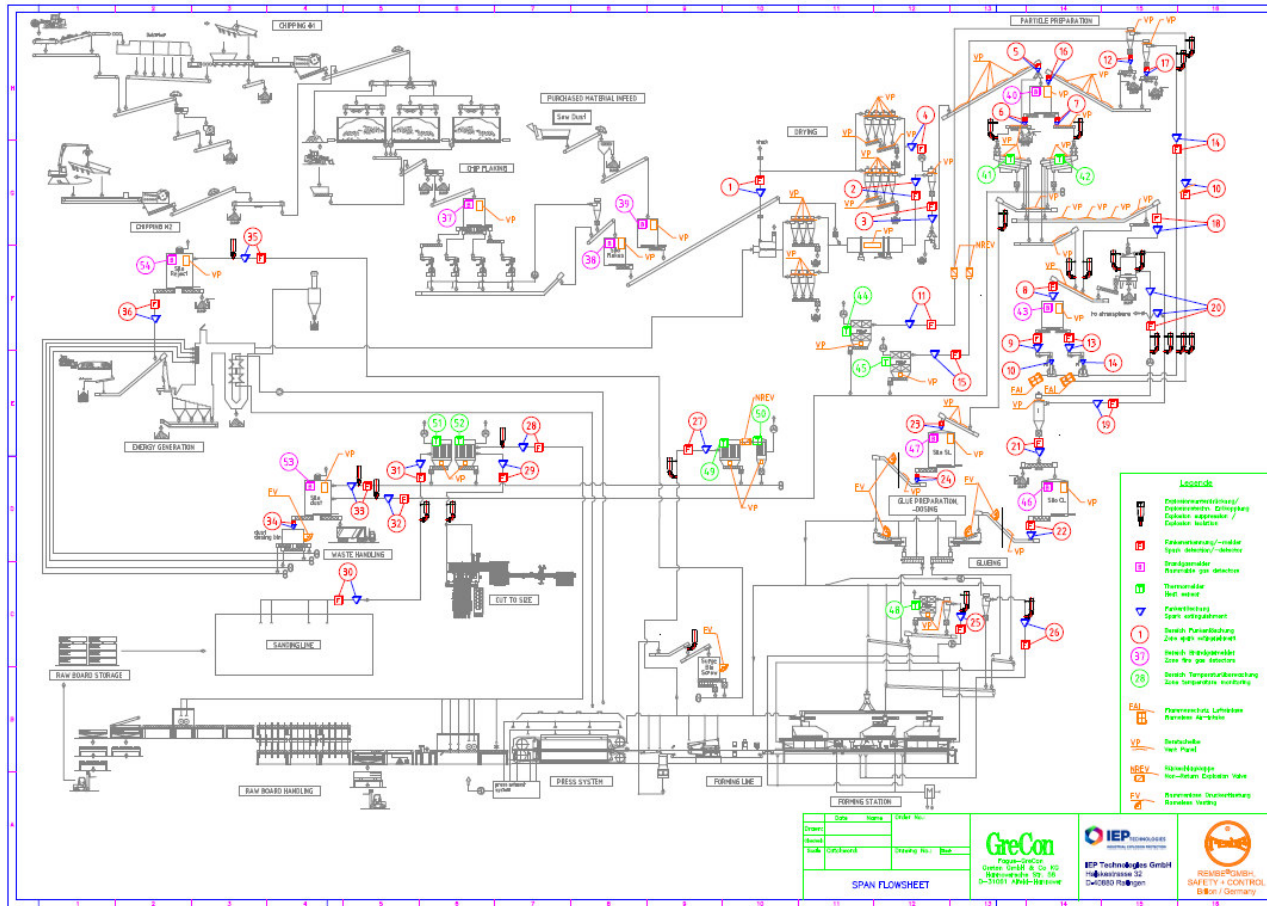
- The dust must be combustible.
- The dust must be capable of becoming airborne.
- The dust must have a size distribution capable of flame propagation.
- The dust concentration must be within the explosion limits.
- An ignition source must be present.
- The atmosphere must contain sufficient oxygen to support and sustain combustion.



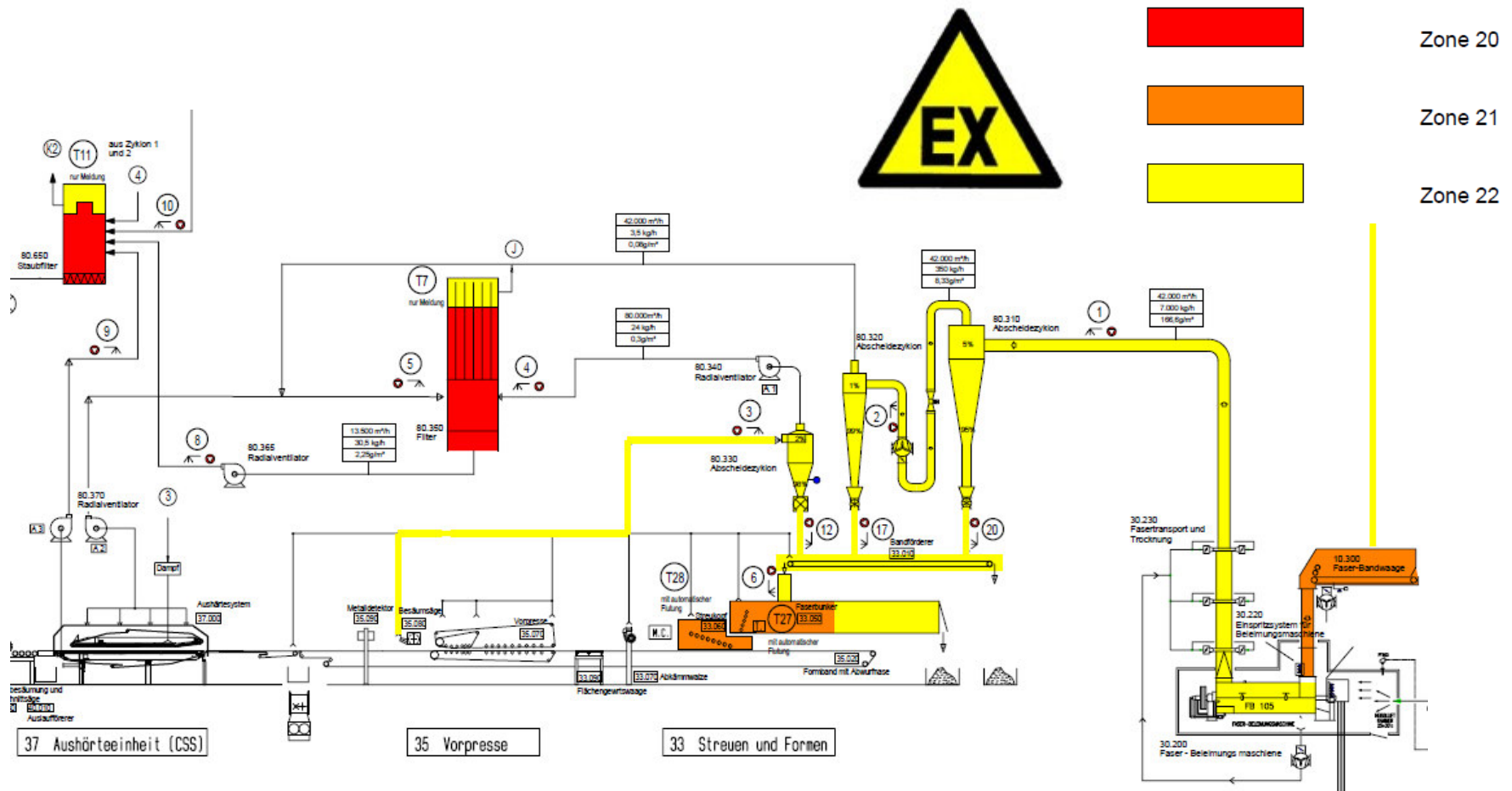
EXPLOSION PROTECTION PRINCIPLES



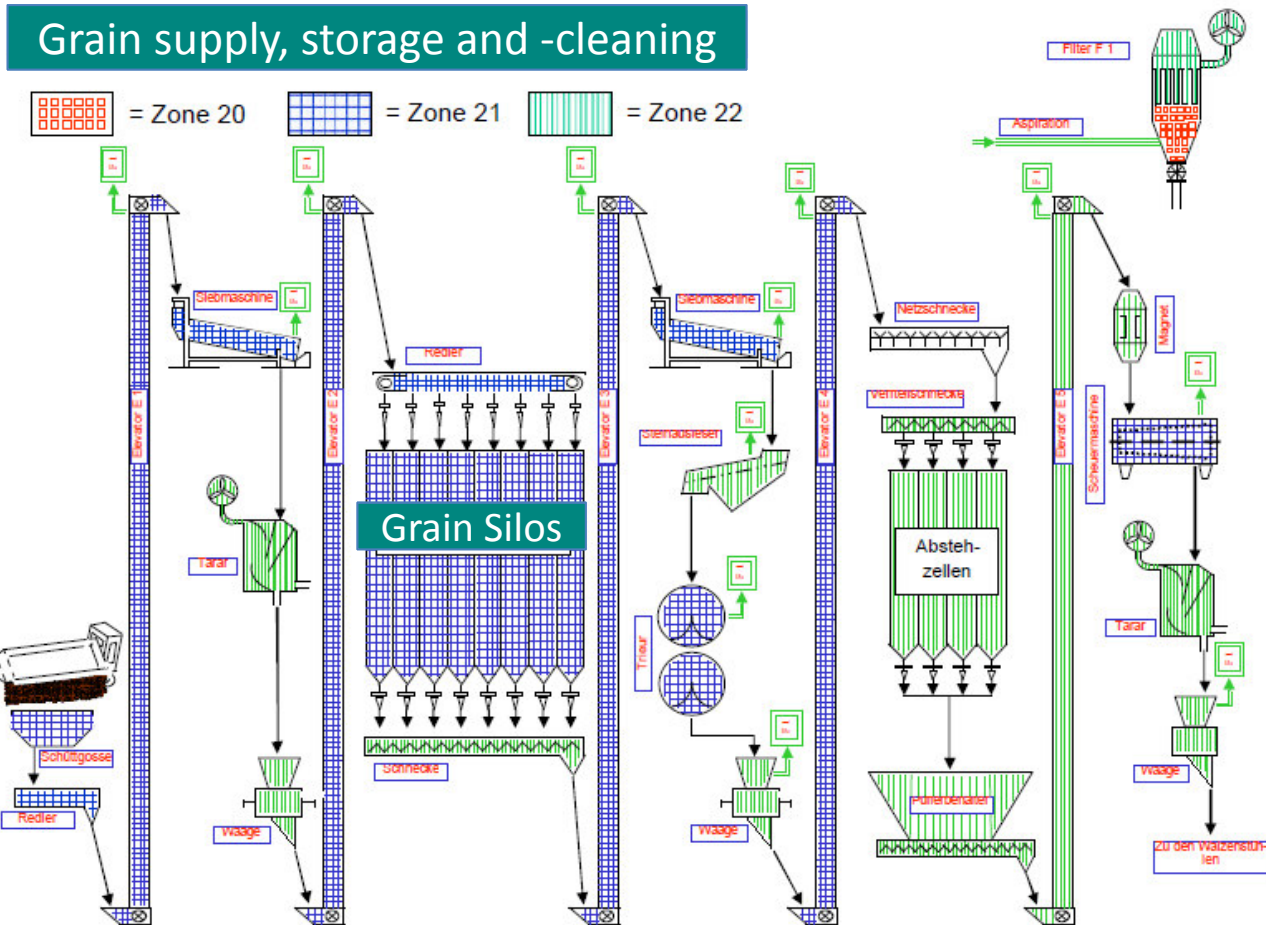
Typical Plant Layout (example particle board plant)



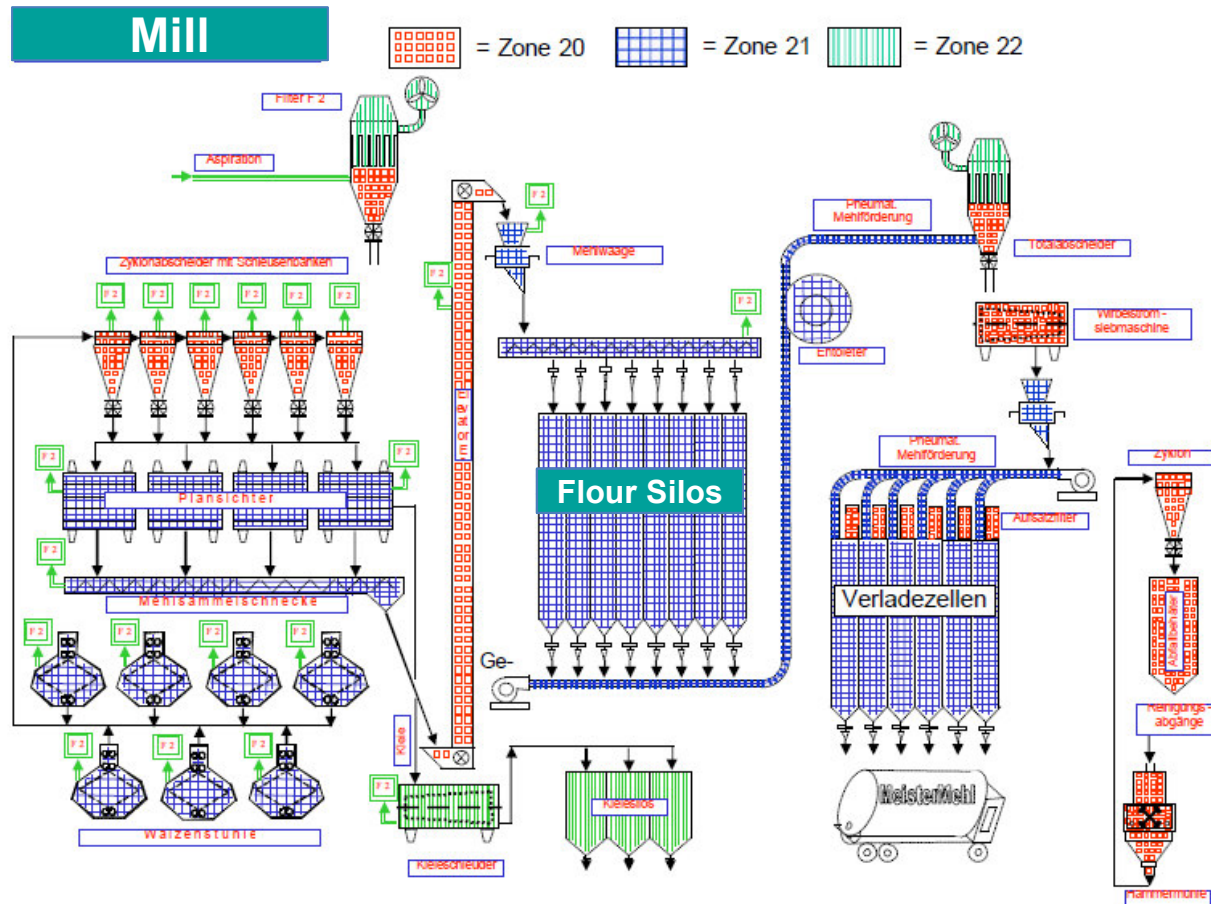
Layout (Example MDF-Plant)



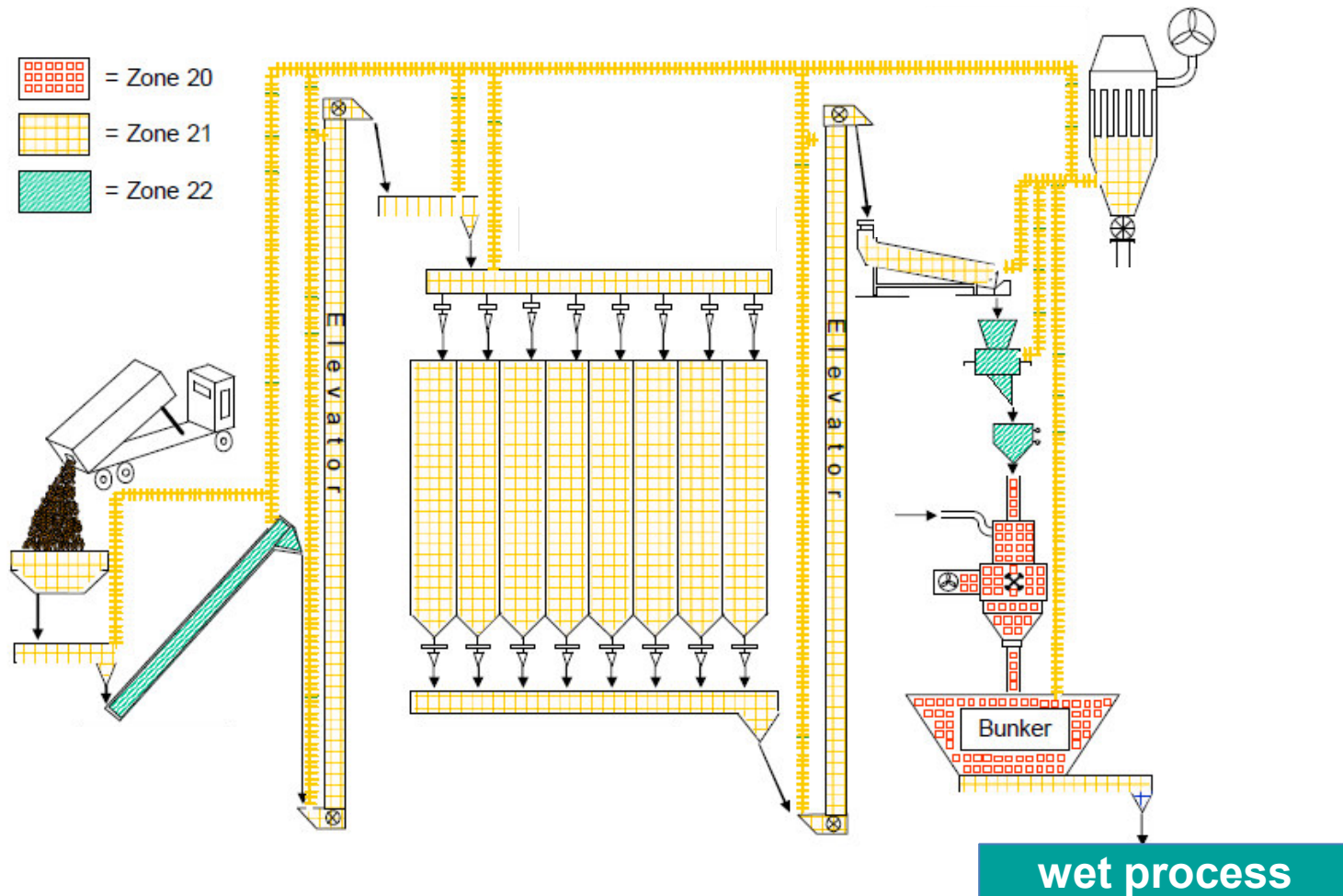
Typical Layout (Example of a flour mill)



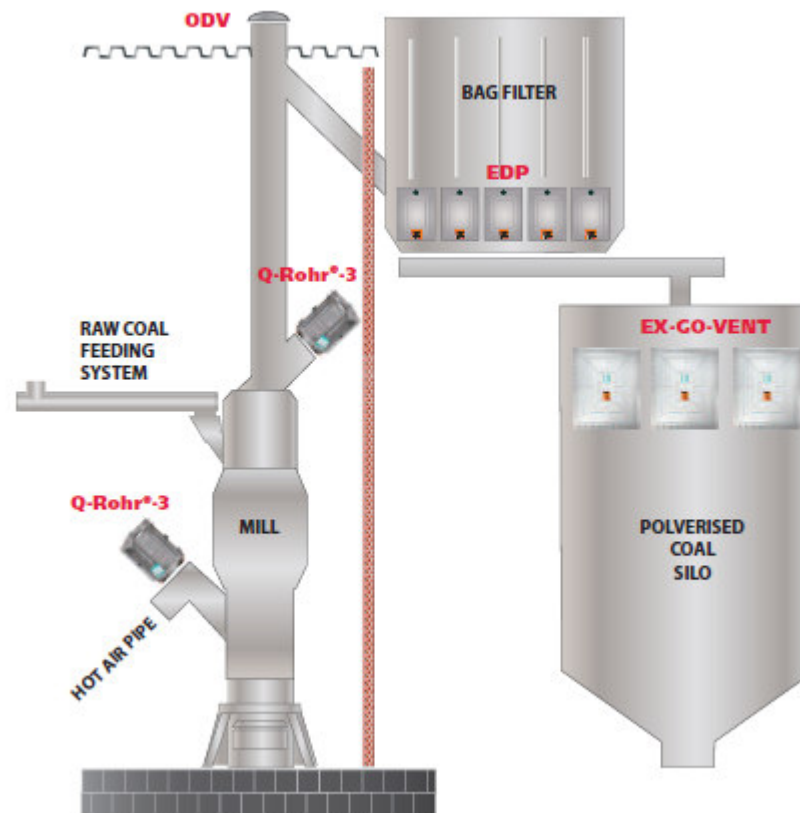
Typical Layout (Example of a flour mill)



Typical Layout (Example of a brewery)



Typical Layout (coal grinding plant / cement)



Explosion risk at typical plant equipment:

Equipment	probability of explosion	Effect of explosion	Risk
Chain conveyor	Very low	Moderate	Small
Screw conveyor	Low	Moderate	Small
Bucket elevator	High	Large	Very large
Silo and bunker	Low	Very Large	Large
Filter	High	Large	Very large
Grader	Low	Moderate	Small
Mill system	High	Large	Very large

©Gerald v. Laar – Inburex 2008

→ But how to protect them?



DUST COLLECTORS – OUTSIDE

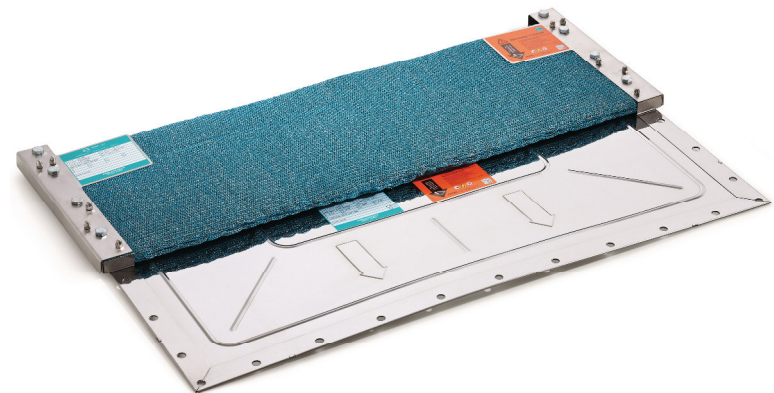
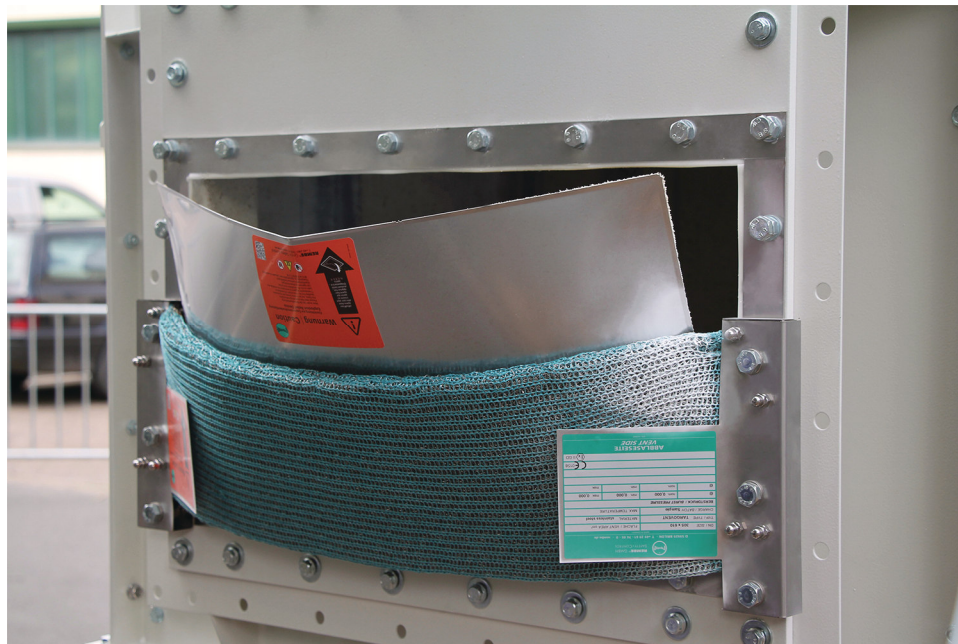


Safety is for life.

Andrea Vincenzi

Seite / Page 11
07-08/12/2017

DUST COLLECTORS – OUTSIDE

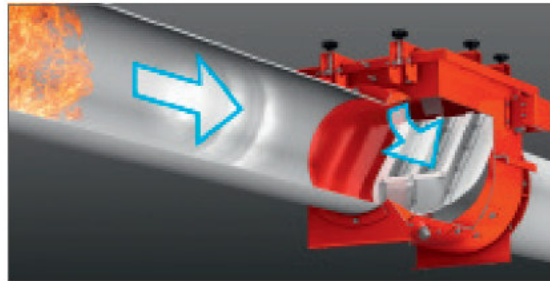
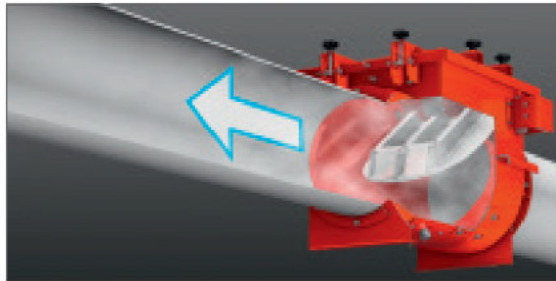
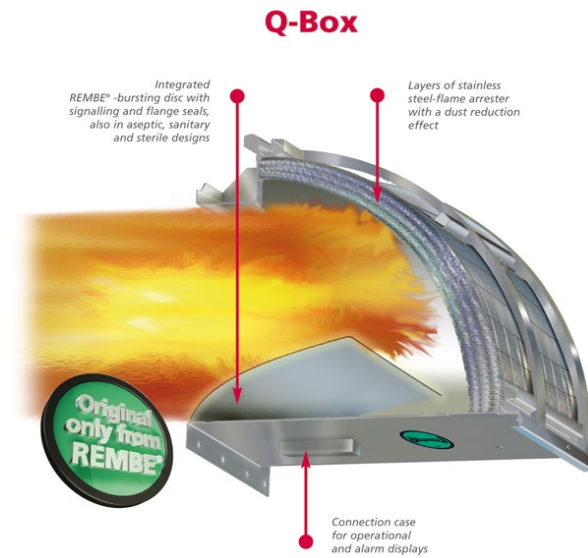
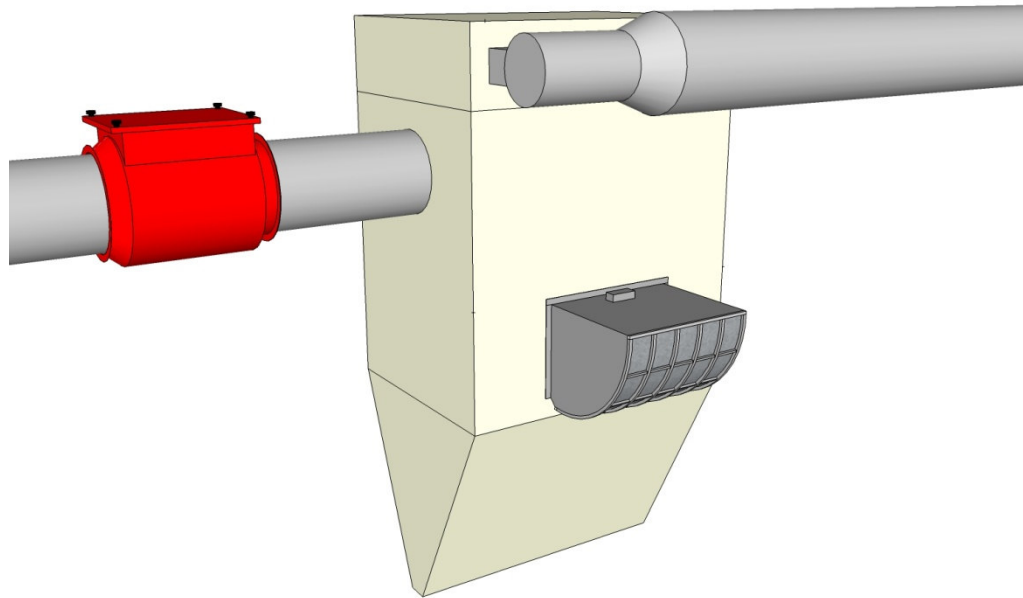


Safety is for life.

Andrea Vincenzi

Seite / Page 12
07-08/12/2017

DUST COLLECTORS – INSIDE



Safety is for life.

Andrea Vincenzi

Seite / Page 13

07-08/12/2017

FLAMELESS VENTING



Safety is for life.

TOZ PATLAMASI TAHLİYESİ

REMBE® Q-Rohr® ile ve onsuz



Safety is for life.

Andrea Vincenzi

Seite / Page 14

07-08/12/2017

SILOS



Safety is for life.

Andrea Vincenzi

Seite / Page 15
07-08/12/2017

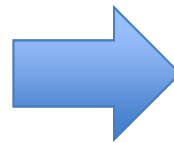
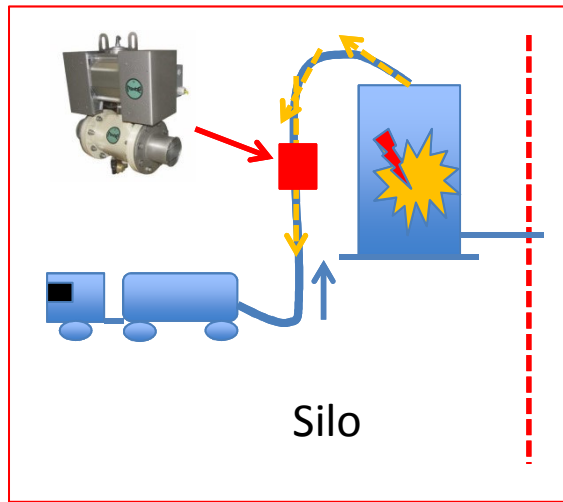
VENTING OF SILOS



Safety is for life.

Andrea Vincenzi

ISOLATION OF SILOS



Safety is for life.

Andrea Vincenzi

Seite / Page 17
07-08/12/2017

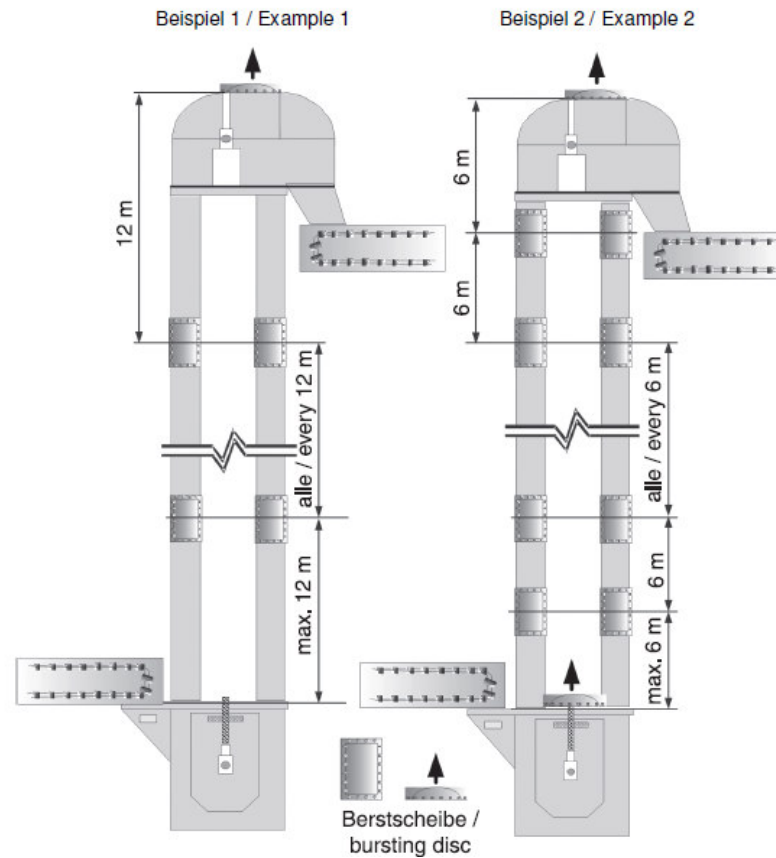
SILOS → ELEVATORS



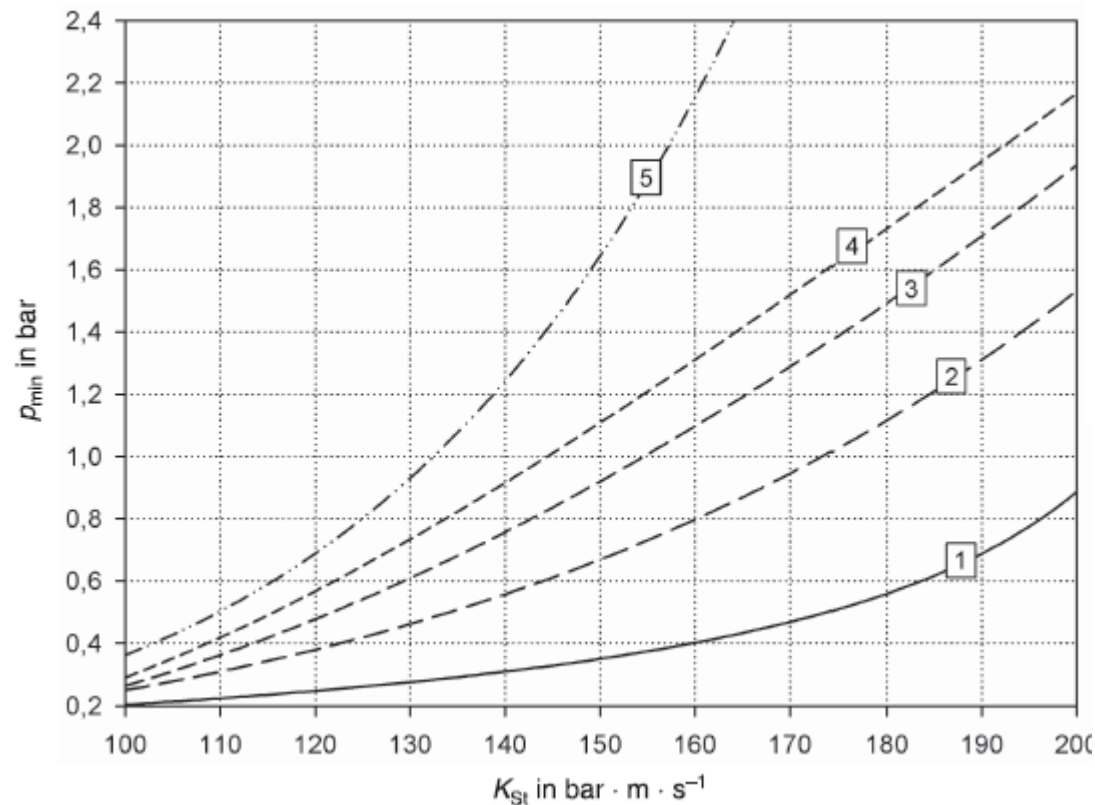
Safety is for life.

Andrea Vincenzi

ELEVATORS PROTECTION ACC. TO VDI 2263-8.1



ELEVATOR PROTECTION ACC. TO VDI 2263-8.1



Number	Venting
1	head + boot + shafts (3 m distance)
2	head + boot + shafts (6 m distance)
3	head + shafts (3 m distance)
4	head + shafts (6 m distance)
5	head + shafts (12 m distance) or only head to a maximum shaft length of 12 m

Figure 3. Required minimum explosion resistance p_{min} of the elevator depending upon the K_{St} value

Due to the reduction in heat dissipation in the case of plastic buckets, the explosion resistance values of the elevators are to be increased as follows:

K_{St} in $\text{bar} \cdot \text{m} \cdot \text{s}^{-1}$	Percent increase
< 100	20 %
100 to 150	35 %
> 150 to 200	50 %



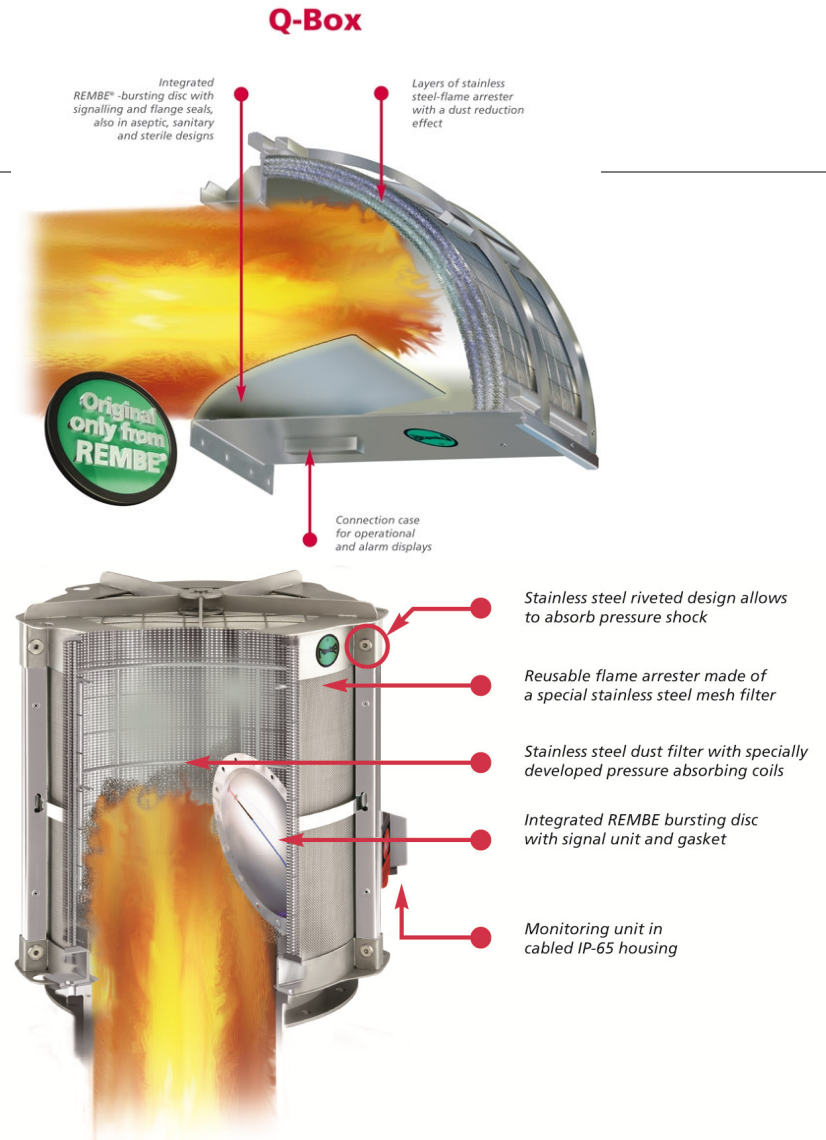
VENTING OF ELEVATORS



Safety is for life.

Andrea Vincenzi

MILLS



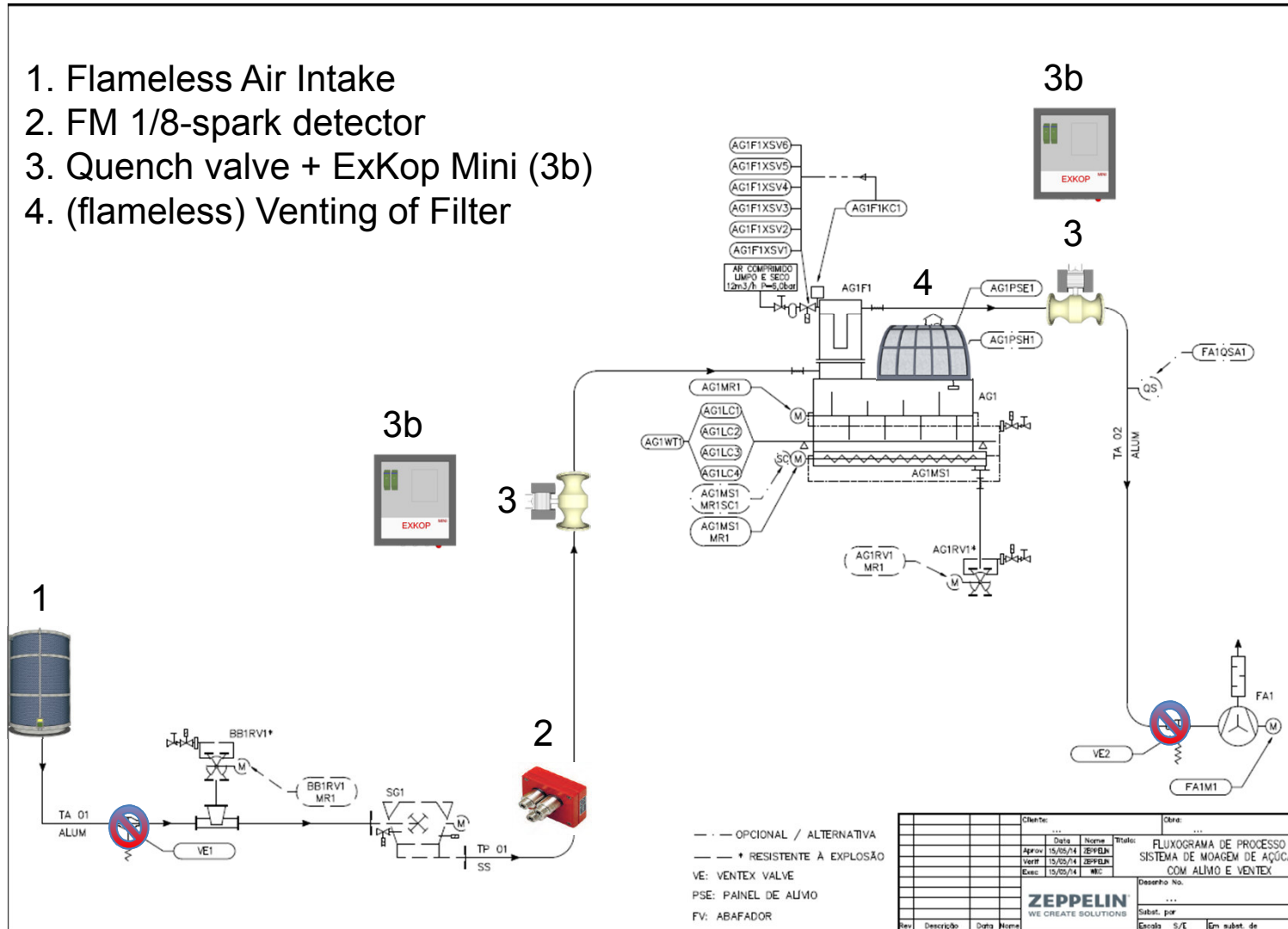
Safety is for life.

Andrea Vincenzi

Seite / Page 22
07-08/12/2017

MILLS

1. Flameless Air Intake
2. FM 1/8-spark detector
3. Quench valve + ExKop Mini (3b)
4. (flameless) Venting of Filter



Safety is for life.

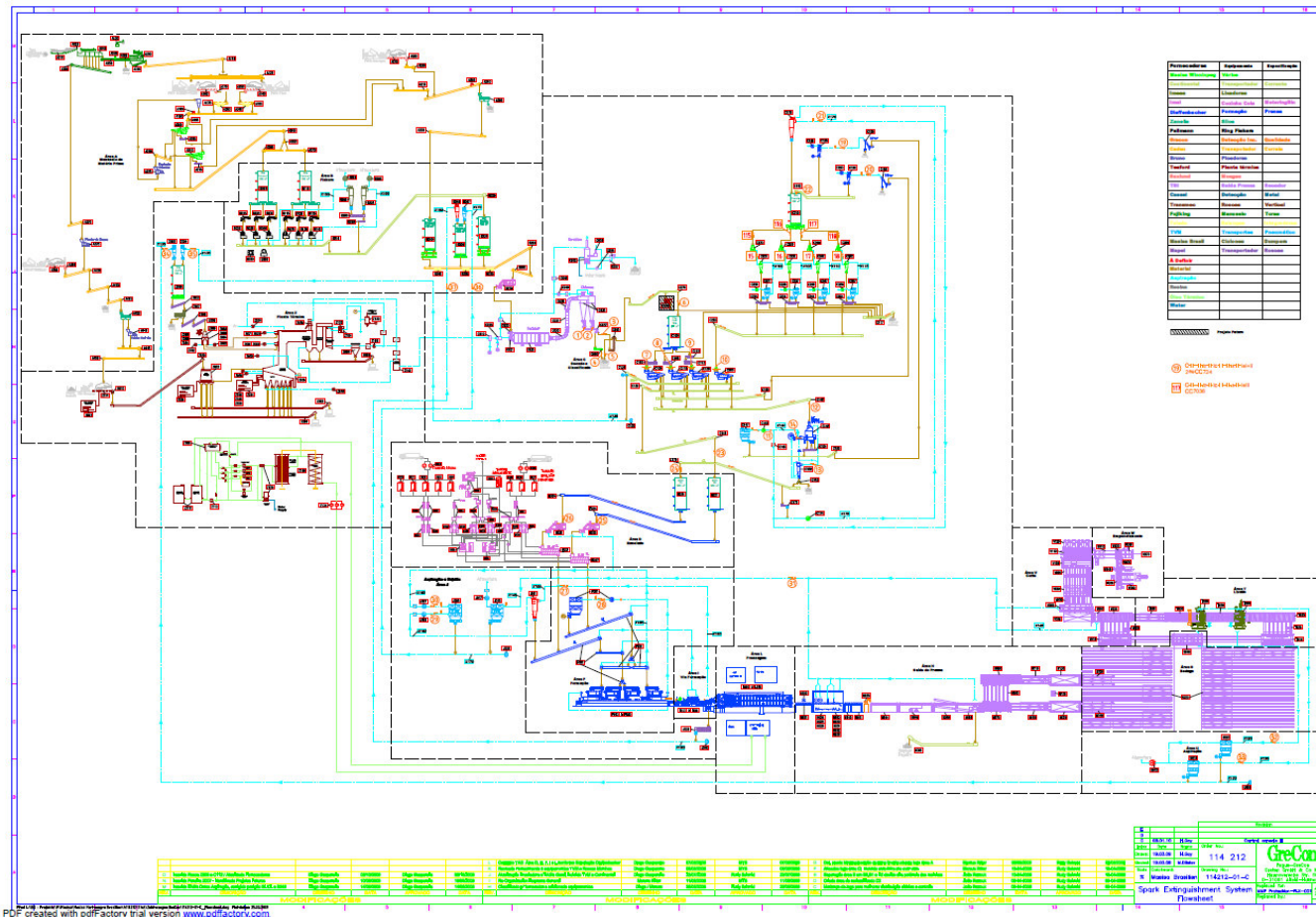
Andrea Vincenzi

MILLS



Safety is for life.

The real Challenge: Complex Facilities



Safety is for life.

Andrea Vincenzi

The real Challenge: Complex Facilities

	Explosion Prevention and Protection						Isolation						Remarks	Risk Matrix												
	Risk without the suggested changes	Farado - Ground monitoring system	FM 118 - spark detector	EGY 586 s 920	TAPECHVENT 920 s 920	Q-Box II 395 s 920 (ECP)	Q-Box II 586 s 920 (ECP 2000 mmWC)	Q-Rohr-3 DN 600	Sanitary Cover (SAC) for Q-Box II 395 s 920	Sanitary Cover (SAC) for Q-Box II 586 s 920	RSK - Signalling Unit	Quenchvalve II DN 80			Quenchvalve II DN 100	Quenchvalve II DN 125	Quenchvalve II DN 150	Expok mini controller (MSR/RFID)	Expok mini controller (RFID/RFID)	Expok (6 lines / 8 outlets)	Q-Flap Compact S1 DN 100	Q-Flap Compact S1 DN 200	Q-Flap Compact S1 DN 250	Q-Flap Compact S1 DN 315	Q-Flap Compact S1 DN 400	
F																										
Sugar truck unloading station	8	1																								
Elevator sugar receiveal	10					2		2			1					1										
Flour truck unloading station	8	1	1									1			1											
Big Flour Silo	5				1																					
Sugar Silo S1@ B3E	10				3										1											
Sugar Silo S2@ B3E	10				3																					
Sugar Silo S3@ B3E	10				3																					
Dust Collector HIOP2	10					1		1															1			
Vacuum hopper VHP1	9				1			1																		
DC-H172	9							1			1							1								
S167-DC Sugar Day bin	10					1					2						1									
Batter manufacturer DC (Type: Nederman)	6																									
CHKDC01 (Type: Nederman)	6																									
CHKDC02 (Type: Nederman)	6																									

Probability	6	7	8	10
	5	6	8	9
	4	5	7	8
	3	4	6	7
	2	3	5	6
Severity	1	2	4	5



The real Challenge: Complex Facilities

	Risk without the suggested changes	Explosion Prevention and Protection								Isolation								Remarks						
		Farado - Ground monitoring system	FMI 118 - spark detector	EGV 586 x 920	TARGO-VENT 920 x 920	Q-Box II 305 x 610 (EDP)	Q-Box II 586 x 920 (EDP; 2000 mm/WC)	Q-Rohr-3 DN 600	Sanitary Cover (SAC) for Q-Box II 305 x 610	Sanitary Cover (SAC) for Q-Box II 586 x 920	RSK - Signaling Unit	Quenchvalve II DN 80	Quenchvalve II DN 100	Quenchvalve II DN 125	Quenchvalve II DN 250	E-xkop mini controller (AGFKFD)	E-xkop mini controller (KFDKFD)		E-xkop (5 inlets / 9 outlets)	Q-Flap Compact Sx 1 DN 160	Q-Flap Compact Sx 1 DN 200	Q-Flap Compact Sx 1 DN 250	Q-Flap Compact Sx 1 DN 315	Q-Flap Compact Sx 1 DN 400
RISK OVERVIEW																								Risk with the suggested changes
Sugar truck unloading station	8	1																						4 Not in Compliance with AS/NZ S 4745 3.6.2. Earthing of the trucks is
Elevator sugar receiveal	10					2			2			1			1									5 Not in Compliance with AS/NZ S 4745 3.6.13. Lack of preventative m prevented. The flameless vents have to be placed on the head and I screws but has to be prevented via the aspiration pipe using a quick
Flour truck unloading station	8	1	1										1		1									4 Not in compliance with AS/NZ S 4745 3.6.10 as electrostatic discharg well as a spark detection system have to be installed. The spark det prevent spark discharges.
Big Flour Silo	9			1					3				"		"									5 Not in compliance with AS/NZ S 4745 3.6.17, 7.3.3, 3.7.1.2.2, 7.3.6 anc not in place. The (right) explosion panel that is facing the building I installed within a distance of 6m from the silo to additionally act as a
Sugar Silo S1 @ B3E	10			3					3					1		"								5 Not in compliance with AS/NZ S 4745 3.6.17, 7.3.3, 3.7.1.2.2, 7.3.6 anc and since explosion propagation mitigation measures are not in pla distance of 6m after Silo 3 on the aspiration pipe to act as an isolatio additional input. ATTENTION: The flexible joints are broken and dt
Sugar Silo S2 @ B3E	10			3					3					"		"								5 Not in compliance with AS/NZ S 4745 3.6.17, 7.3.3, 3.7.1.2.2, 7.3.6 anc and since explosion propagation mitigation measures are not in pla distance of 6m after Silo 3 on the aspiration pipe to act as an isolatio additional input. ATTENTION: The flexible joints are broken and dt
Sugar Silo S3 @ B3E	10			3					3					"		"								5 Not in compliance with AS/NZ S 4745 3.6.17, 7.3.3, 3.7.1.2.2, 7.3.6 anc and since explosion propagation mitigation measures are not in pla distance of 6m after Silo 3 on the aspiration pipe to act as an isolatio additional input. ATTENTION: The flexible joints are broken and dt
Dust Collector H(O)P2	10					1			1											1				5 Not in Compliance with AS/NZ 4745 7.3.6, 3.7.1.2.2, 3.6.6. The dust c cleaning pulse pressure expected to be filled with accumulated dus interconnected equipment explosion isolation is mandatory. We rec



REMBE SOLUTIONS:

CONSULTING

ENGINEERING

PRODUCTS

SERVICE



Safety is for life.

Andrea Vincenzi

Seite / Page 28

07-08/12/2017



**THANK YOU
FOR
YOUR ATTENTION**

REMBE® GmbH Safety+Control

Gallbergweg 21
59929 Brilon, Germany
T +49 2961 7405-0
F +49 2961 50714
info@rembe.de
www.rembe.de