SAFEX CONGRESS - POLAND
May, 2014

Mining Services

Initiation on systems automated plant pyrotechnic fire – Challenges with automated operations!

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Introduction

Initiating Systems Automated Plant Pyrotechnic Fire

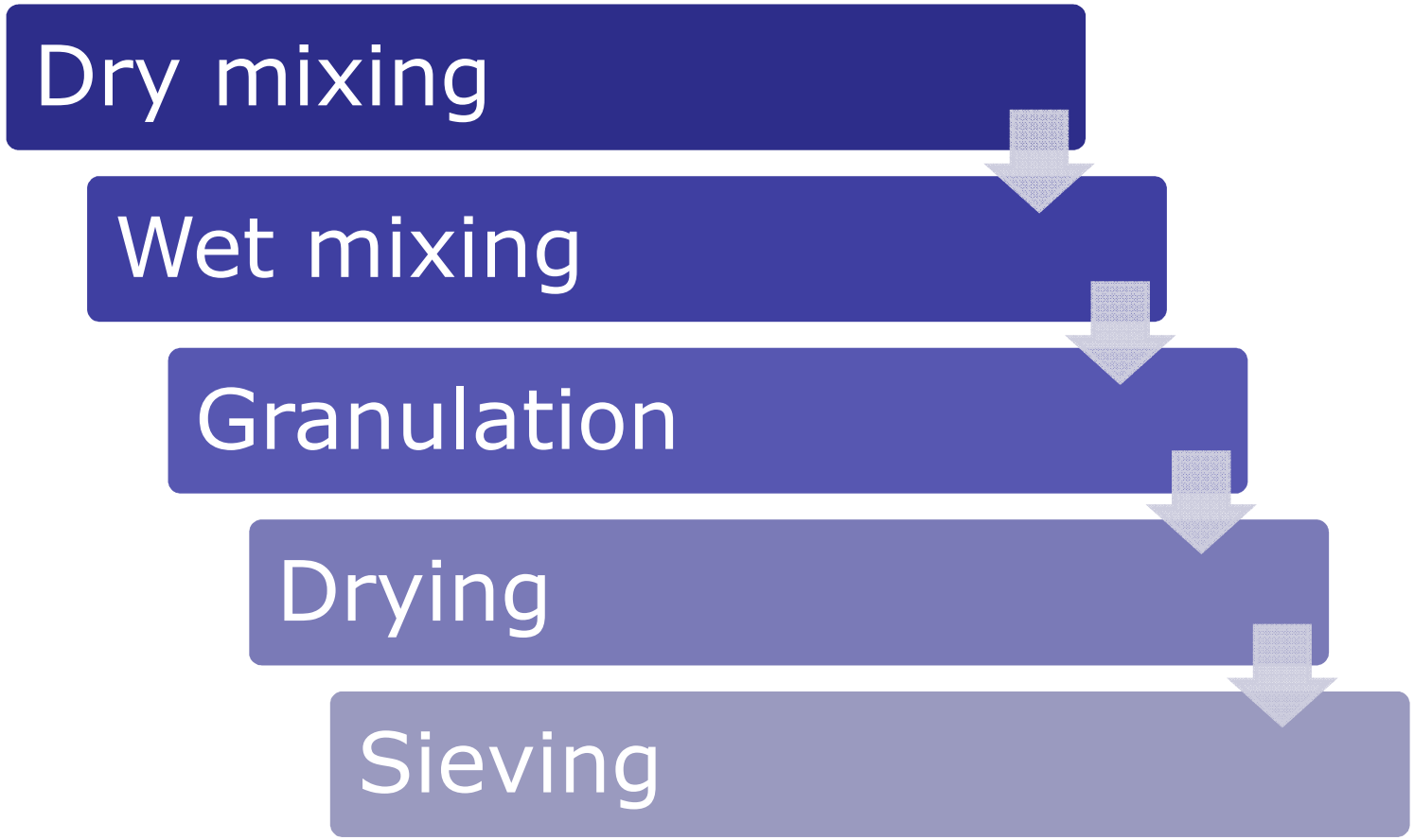
When: 06/12/2011

Time: 23h48

Where: Initiating Systems Automated Plant – (ISAP) – Modderfontein, South Africa

Background

- Pyrotechnic compositions form the chemical delay in shock tube and electric initiating systems



Process

Drying oven
1 tray (3 kg)

Sieving Compartment

1 tray is Automatically loaded into the tipper

Tray is tipped dispensing the powder into the sieve

Powder is sieved

Tipper is off loaded automatically

Background

- Employee was burnt in a pyrotechnic fire.
- The fire occurred while he was **manually loading** a tray of G pyrotechnic powder into an **automated** tipping machine above the sieve.
- After the incident the Plant Manager found:
  - The **door** to the Auto Sieving compartment **open**.
  - **5 burnt trays** on the racks behind the sieving machine,
  - **one burnt tray** upside down on the floor.

Background

- A trolley with 6 trays of un-burnt dry G-composition parked in the passage outside the compartment.

- At the time of the incident the compartment was under constant video surveillance that recorded the sequence of events leading up to the incident.

What Transpired?

- It was evident from the footage that the Automated Loader was parked in its home position.

  (When the automated loader is in the home position the operator can open the interlocked door to the compartment and enter the compartment at will.)

- The employee was performing the loading process manually

  (loading a tray of G pyrotechnic powder into the auto tipping machine).

What Transpired?

- The following images were downloaded from the video monitoring camera and shows the sequence of events that took place in the Sieving Compartment in which the employee was burnt.

Sequence of Events 1

Employee entered the compartment at 23:47:43 and removed the top tray from the loading rack.

Sequence of Events 2

Employee approached the auto tipper at 23:47:57 with a tray of dry G - composition.

Sequence of Events 3

Employee grabbed the auto tipper hatch to open it. The tray was held precariously in his right hand only.

Sequence of Events 4

Employee tried to insert the tray of G composition into the auto tipper but lost his grip on the tipper hatch which began to fall under gravity.

Sequence of Events 5

The falling hatch struck the side of the tray of G composition and the employee lost his grip on the tray.

Sequence of Events 6

The Tray of G composition began to fall whilst the employee tried to move his left hand down to catch it.

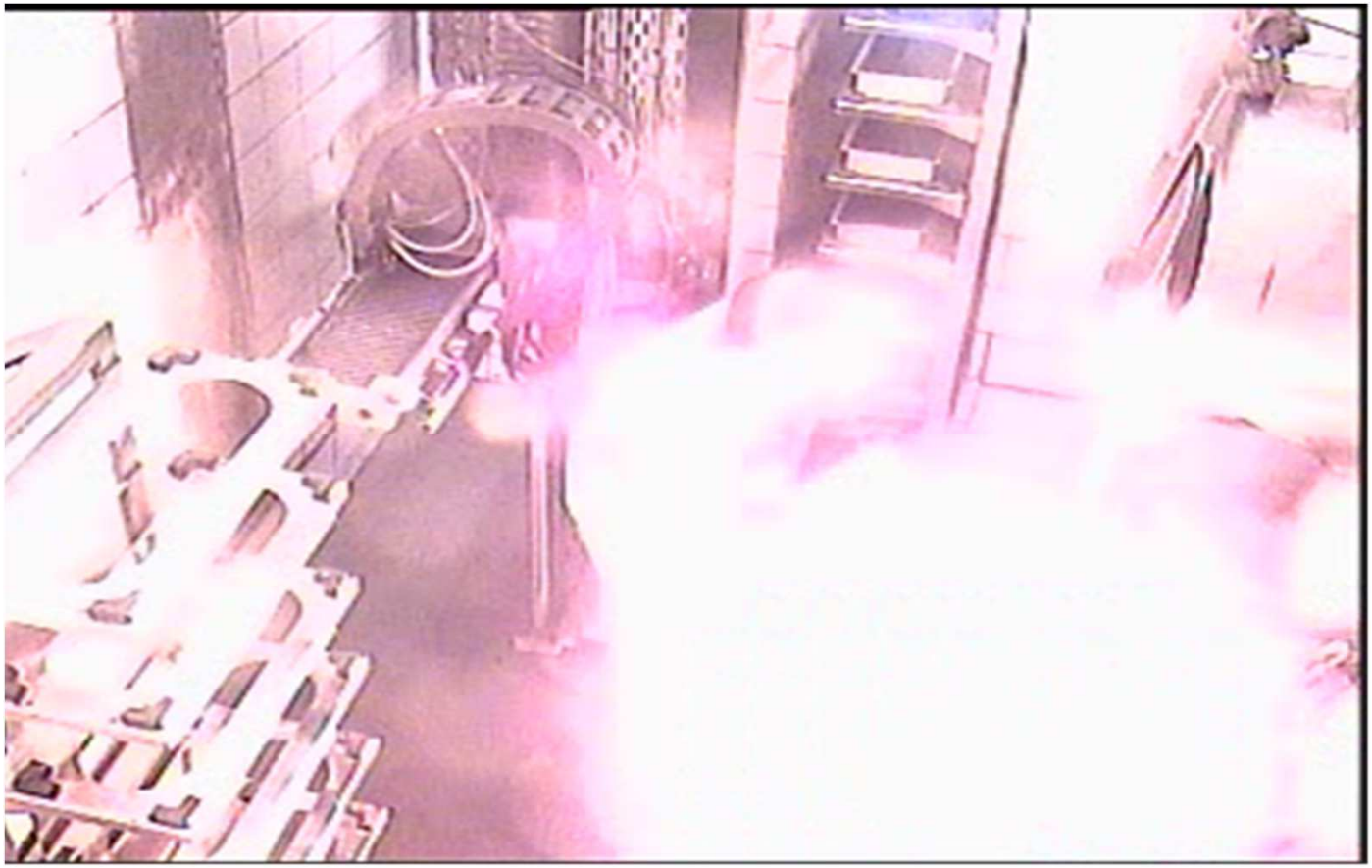
Sequence of Events 7

The employee was unable to catch the tray which struck the side of the Auto sieving machine and initiated the G Composition at the point of impact.

Sequence of Events 8

The G Composition initiation spread.

Sequence of Events 9



Even further spread and the employee engulfed in flames.

After the Fire

- After the fire, the employee rushed out of the compartment and ran to the safety shower at the south side of the building.

- He stood under the shower for some time and removed his full length rubber gloves and dropped them on the floor.

After the Fire

- The fire drenching system activated within 12ms after detecting the flash from the fire.
  - This system sprayed water across the inside of the doorway.
  - On either side of the outside of the doorway in the corridor outside the compartment – this possibly saved his life.

Injuries and Damage

- About half an hour later an ambulance arrived and the injured employee was taken to the local Hospital.
- The Injured sustained burns on his ear, head and knees.
- Equipment was damaged and air lines, sensors, cables, buckets, socks and protective bellows were burnt.
- The compartment was blackened from the fire.
- Repairs to the equipment and compartment eventually took four days.

Damage

PPE

Normal

- 2 Piece Flame retardant overall
- Safety glasses
- Long rubber gloves
- Dust mask
- Conductive shoes

Final Remarks

- Good explosives practices remain applicable, manual processes or automated processes.
- On-going Basis of Safety Training is critical.
- Camera monitoring proved to be essential in establishing root causes as well as identifying non-conformances. Supervision Complaisance.
- Continue with actual planned job observations to test the conformance levels and understanding.
- Assess PPE requirements and conformance.

Final Remarks

- Zero tolerance rules remains applicable – ensure that these rules are adhered to – example when working with pyrotechnic powders.
- Shortcuts more often than not only shortens your life. Bypassing of interlocks should not happen at all.
- Emergency equipment and proper emergency plans are critical – saved this employee's life.
- Sharing the learning is critical – group wide and industry wide.

Root cause – Human Behavior

Take Home Messages

Humans are unpredictable resulting in systems and safe work procedures only being effective if they are followed

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