EXPLOSION DURING THE OPERATION OF DOSAGE OF PRIMARY EXPLOSIVE

By

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DATE AND TIME OF INCIDENT
SATURDAY, June 30th 2012 at 22.15

INCIDENT LOCATION

Company Name:
MAXAM FANEXA

Company Facility:
Factory of Santiváñez (Bolivia)
Dosage of primary explosive (70% Lead Azide and 30% Lead Styphnate) building (D05)

PROCESS OUTLINE

The explosion took place in the post of dosage of primary explosive. In this room, the following operations were carried out:

- Warm up the machine and inspection of all systems.
- Bring the container with the primary explosive and place it on the overturn device
- Leave the room to remotely empty the container onto the feeding hopper
- Start the remote dosing operation into the shells
- Stop the machine
- Empty the feeding hopper into the lower containers
- Remove the containers and take them to the magazine
- Disassemble the dosing device and clean all equipment

DESCRIPTION and IMPACT of the INCIDENT

At 22:15, the operator of the post was performing the daily final cleaning of the machine. At the very moment of starting to remove the second container from the surface of the machine on which it was placed, it detonated.

This second container had approximately 40 gr of explosive and picked up the finest dust. It is also notable that this second container was located further from the position of the operator than the first container that had already been removed.

In this picture, taken after the accident and with some corrective actions already implemented, the relative position of the first and second container can be seen from the operator´s point of view.

EXAMINATION OF THE SITE OF THE INCIDENT

At the place of the accident, it became a proven fact that the most damaged spots were those where primary explosive waste had built up, particularly:

- Stainless steel funnel through which primary explosive waste travelled to the container placed on the lower part of the machine.
- Surface on which the container with the primary explosive was placed.

LIKELY CAUSE OF INCIDENT

The management of the plant, aided by the different supporting teams (Engineering, Safety) made an analysis of the possible causes of the accident:

Sabotage/ Suicide

This scenario is unlikely due to the fact that the accident took place at the end of the day when the amount of explosive was not as high as it could have been. In addition, the operator did not have any known psychological problems, which rules out the likelihood of attempted suicide.

Heat/Fire

There is no evidence suggesting the existence of a source of heat or flame.

Lightning strike

On that day, no storms took place and the area shows a low rate of occurrence of this kind of phenomena.

Spark from electrical short circuit

The electrical wiring and connects were inspected and were ruled out as the source of the ignition.

Electrostatic discharge

The operator used cotton clothes and antistatic shoes. The relative humidity in the area was kept above 60%. The grounding wire of the equipment was inspected and showed no problems. Additionally, the operator used gloves at the time, thus avoiding any charge flow between his hand and the container.

Impact

This possibility was ruled out based on the fact that no foreign object that could have caused the impact was found on the site of the explosion. Also, the container itself could not have impacted hard against the surface for it was handled very close to it.

Friction

This hypothesis was widely debated and it is the one that was regarded as most likely for the following reasons:

- The container that detonated was the one that picked up the finest dust and became coated on both inside and outside walls with the primary explosive.
- The surface upon which the container and the explosive were placed was not completely smooth but showed a certain degree of roughness.
- The place where the container was located did not allow the operator to have a good visibility of the object he was to remove and also forced him into a position that did not favour a good balance of his body, thus increasing the likelihood of making mistakes.

LIKELY CAUSE OF INCIDENT

From these hypotheses it can be deducted that the operator, not having good visibility of the container, did not take in the presence of fine dust next to its base.

Then, the operator dragged the container creating friction between its base and the surface on which it was supported.

The energy engendered by the friction was over the threshold and ignited the dust present on the surface.

ACTIONS TO PREVENT RECURRENCE

In order to avoid the impregnation of the surfaces of the container with dust, it will contain a certain amount of water that will minimize the presence of dust.

The surface upon which the container was located was changed to a smooth, soft, antistatic surface.

The amount of fine dust created in the operation was decreased by performing a pre-sieving of the primary explosive. This diminished the presence of dust on the surfaces of the equipment.

TAKE HOME MESSAGE

This highlighted the increasing risks when handling primary explosive with a very fine particle size.

It is vital to reduce as much as possible the amount of explosive to be handled at a time.

It is necessary to perform risk assessments in which cleaning, adjusting and incidence solving tasks are taken into account more thoroughly.

Thank you for your attention