

Investigation And Analysis of a Fatal Occupational Accident

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Abstract

Following the reporting of an occupational accident that occurred in a cement plant and resulted in the death of two workers during a cement unblocking operation, we conducted an investigation whose objective is to identify the causes and factors that led to the accident and prevent other possible accidents. The method used in analyzing the accident is the fault tree analysis conducted immediately after the accident. The facts were gathered concerning the individual, the task performed, the equipment used, and the work environment. The accident, which occurred two and a half hours (2:30) after the start of the shift, caused two victims who were buried under tons of cement. Their activity consisted of almost manually removing the cement stuck to the walls of the silos. The fault tree analysis highlights factors related to the environment and tools. The individual factor, essentially linked to the professionalism and expertise of the construction manager, is also implicated. The occurrence of this accident has a multifactorial origin, particularly work organization and negligence of risks, and to avoid other accidents we favor evaluating situations before intervention and periodic maintenance of work facilities.

Keywords

Cement silo maintenance and cleaning, cement silos, cement unblocking, fault tree analysis method.

1. Introduction

Following the reporting of a work accident in a cement plant that resulted in the death of two workers during a cement deburring operation, we conducted an investigation with the objective of searching for the causes and factors that led to the accident and prevent other possible accidents. According to researches, five main factors such as Employees factor, State policy factor, Workplace factor, Economic factor, and Employer factor are related to work accidents can be listed (Barreto, 2000, Ceylan 2012, Chau 2010, INRS, 2020, Nezzal 2023)

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2. Objective

Objective is to identify the causes and factors that led to the accident and prevent other possible accidents

3. Method

The method used in analyzing the accident was constructing a cause-tree immediately after the accident occurred.

3.1 Gathering of facts

The gathering of facts covered the individuals involved, the task being performed, the equipment used, and the environment in which the work took place:

3.2 Individuals

- The response team consisted of 04 workers and a crew leader employed by a cement silo maintenance and cleaning company (Company B)
- The crew leader: 40 years old, he has over 12 years of experience in cement silo deburring.
- Three workers worked on the same silo for 07 months with another cement silo maintenance and cleaning company.
- One newly hired worker (I1).

4. Results

4.1 Task

- Their activity consisted of dislodging the cement stuck to the silo walls.
- Use of a suspended platform with an electric winch, transporting a worker tasked with dislodging the hard cement stuck to the walls of the silo using a jackhammer.
- One worker was above the silo operating the platform's electrical movements.
- Worker I1 and another worker were at the bottom of the silo to guide the rotational movements of the walkway using two ropes.
- The crew leader was at the bottom of the silo with the 02 workers to supervise and coordinate the work.
- Two (02) hours after the start of the shift, a collapse of the stuck material occurred.

4.2 Equipment

- Use of a jackhammer to scrape the hard cement stuck to the walls.
- Suspended platform with an electric winch, the rotational movements of which were guided by 02 operators using two ropes.

4.3 Environment

- Cement stuck to the walls for 03 years, the former director did not establish an agreement with a cement silo maintenance and cleaning company.
- Maintenance and cleaning of the silo was started by another company (Company A), which caused cracks to appear in the cement stuck to the walls of the silo.
- Company A fell behind schedule to complete the operation which led the cement plant to terminate the agreement.
- The remaining work was contracted to Company B.
- An assessment of the remaining work volume was done by the company supervisor and crew leader.
- The crew leader considered the remaining work easy to carry out. Figure 1 showing the location of the response team members at the silo (Figure 1 and Figure 2).

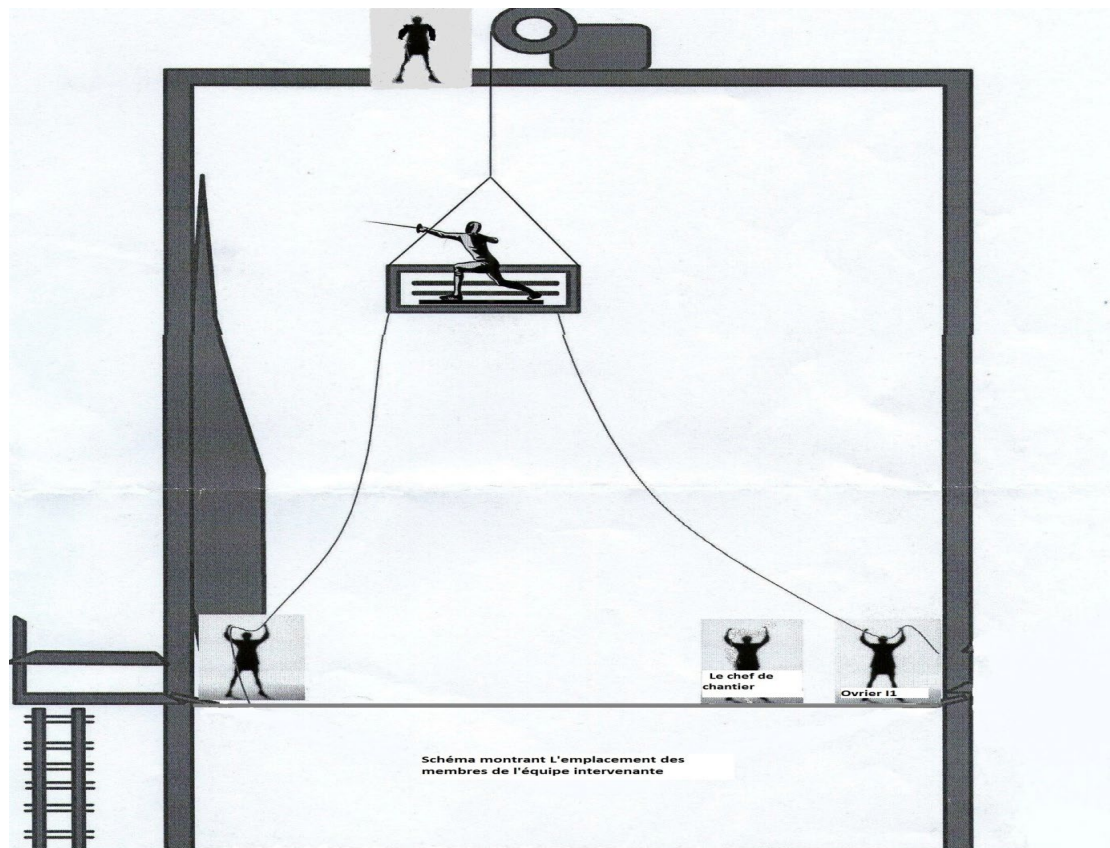


Figure 1. The location of the response team members at the silo

5. Discussion

5.1 Accident history

The accident occurred at 8:20 am where a crew consisting of a crew leader and four workers employed by a cement silo maintenance and cleaning company (Company B) started work at 6:00 am. Their activity consisted of dislodging the hard cement stuck to the walls of a silo which had caused the extractors to clog. This operation had been started by another deburring company (Company A), which caused cracks to appear in the cement stuck to the walls of the silo. Company A fell behind schedule to complete the operation which led the cement plant to terminate the agreement. An assessment of the remaining work volume was done by the crew leader who considered it to be easy. To carry out this deburring, they used a suspended platform with an electric winch. The crew leader was present at the bottom of the silo to supervise and coordinate the work, two other workers (I1 and another) were with the leader underneath the walkway to guide the rotational movements of the walkway using two ropes. Another worker was above the silo in charge of the platform's electrical movements. The operator who was on the platform dislodged the hard cement using a jackhammer, when a collapse of the stuck material occurred. The accident occurred when a large section of cement stuck to the silo wall detached and buried the workers and crew leader who were at the bottom of the silo. The worker who was near the silo's manhole cover was ejected outside of the silo. The crew leader and worker I1 died, buried under the collapse. Organisation des faits.

5.2 Cause-tree

Cause of a deadly accident in a cement plant (death of the crew leader) presented in figure 2 and. The causal analysis of a fatal accident in a cement plant leading to the death of a worker presented in Figure 3

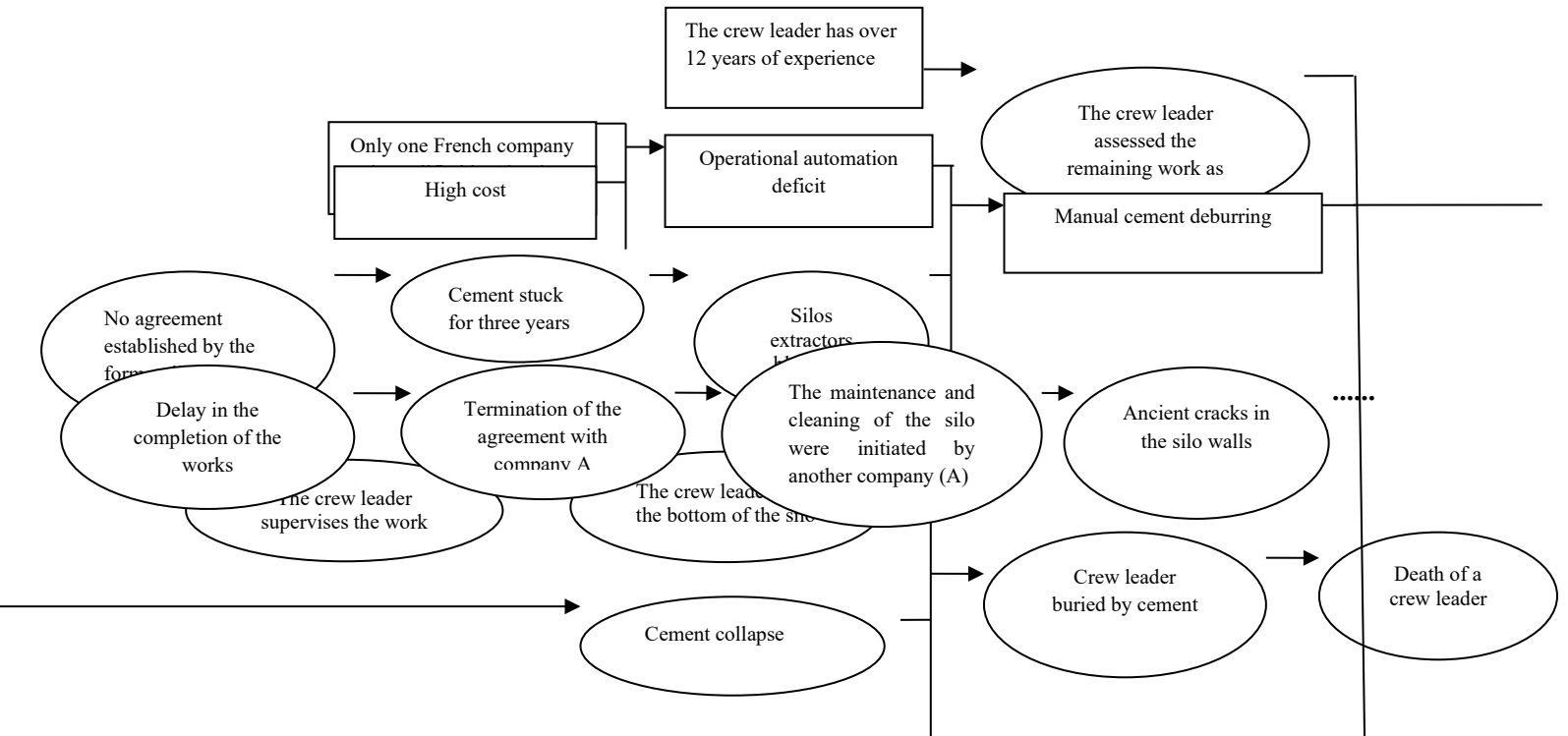


Figure 2. Cause-tree of a deadly accident in a cement plant (death of the crew leader)

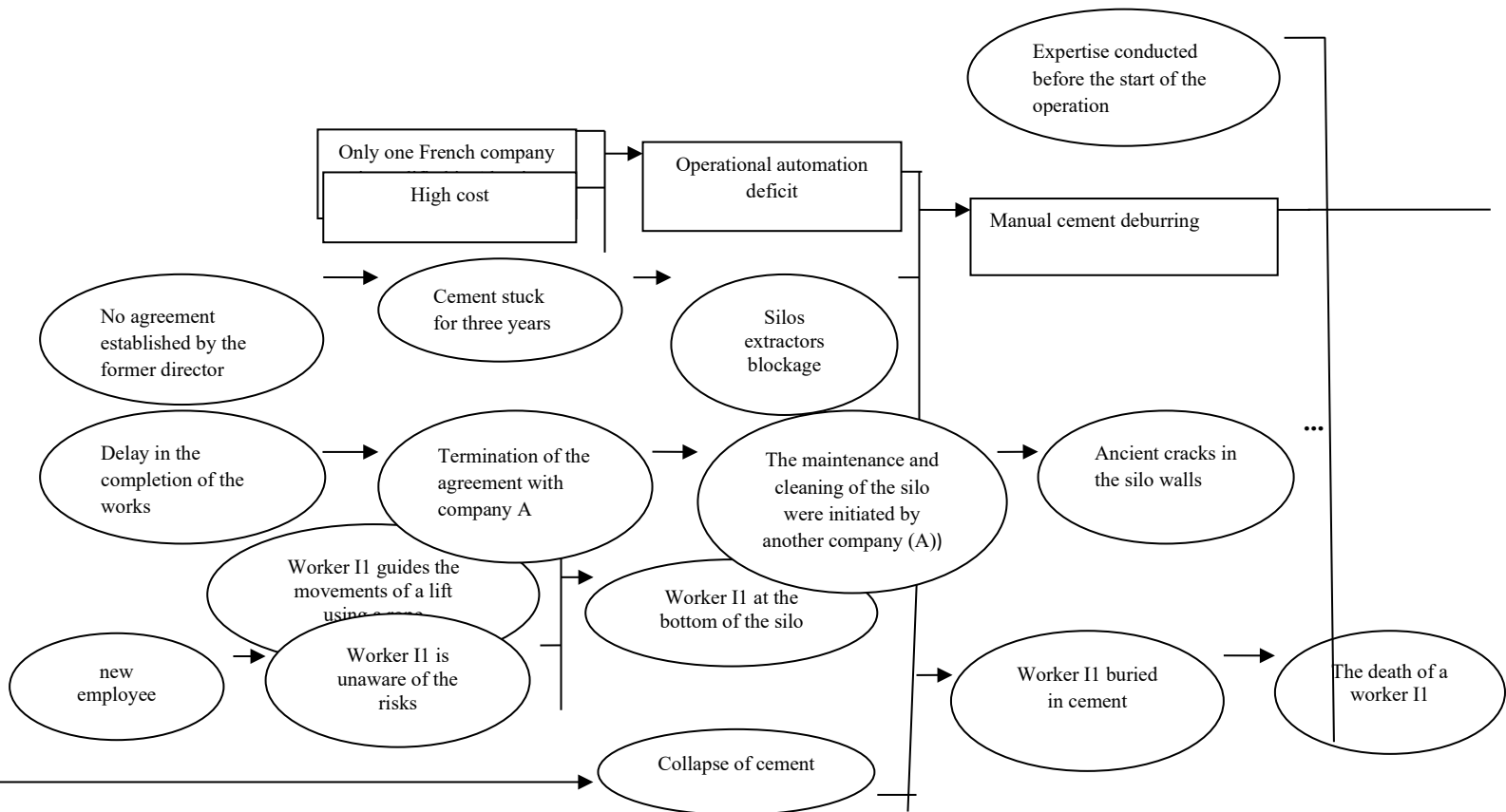


Figure 3. The causal analysis of a fatal accident in a cement plant leading to the death of a worker

5.3 Corrective Measures

Enforcing organizational provisions that prevent workers from being positioned at the bottom of the silo, eliminating the risk of being buried in the event of cement collapse.

- Conducting a risk assessment (on site) before the start of any intervention operation by a team trained in occupational health and safety.
- Periodic maintenance and cleaning of work equipment (silos)
- Training the staff of silo maintenance and cleaning companies in cement deburring and informing them of the risks.
- Automating the operation to eliminate the danger at the source.

6. Conclusion

The occurrence of this accident has a multifactorial origin, notably the work organization, negligence of risks, and particularly the method used since it is inherently dangerous itself. To prevent other similar accidents, we recommend adopting new techniques that comply with safety regulations.

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Biographies

Dr. CHENOUF Nassira obtained her Doctor of Medicine degree in 2012. She then pursued residency training in Occupational Medicine from 2013 to 2018, graduating with a Specialization Diploma in Occupational Medicine. Since November 2018, Dr. CHENOUF Nassira has been working as an Occupational Health Physician in the Occupational Medicine Department of the University Hospital where she completed her residency. In addition to her clinical work, Dr.CHENOUF Nassira is actively involved in research on work-related illnesses and occupational risk prevention. She regularly presents at national and international scientific conferences. She authored an article in a special COVID-19 issue published by the Algerian Society of Occupational Medicine. Dr. CHENOUF Nassira also participated in a health survey of education professionals in Algeria.

Benhassine Wissal is MD, PhD and Professor in Occupational Medicine; she graduated from universities of Constantine and Batna 2. She is ergonomic graduated from university of Tlemcen, Algeria. She is a teacher-researcher at the Faculty of Medicine of Batna where she contributes to the training of medical students. She trains specialist doctors in Occupational Medicine. She is the head doctor of the occupational medicine department at the university hospital center of Batna Algeria where she set up an occupational pathology unit and installed a occupational mental health consultation. She conducts research in the field of mental health at work, the organization of work in healthcare structures and emergency services, the diagnosis and monitoring of work-related musculoskeletal disorders, mainly back pain. She is an expert doctor for the social insurance funds of three Wilayas. Currently, she is working on a research project on the work organization of Emergency Services and its impact on employee well-being and patient safety.