Development of a tool for evaluation of the risk of tasks

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Abstract

This work focuses on the development of a digital platform for assessment of the risk of the tasks at Alhandra Production Center, operated by Cimpor, an *InterCement* company. This platform is a pioneer tool in cement industry that improves the identification of risks and actions to ameliorate the work conditions at the company and consequently contribute to reduce the number of incidents and the associated costs [(1)].

Risk assessment of tasks consists in the identification of risks associated with an execution of a task [(2)]. These risks are recorded and added to the platform following a brainstorming session with operatives. The platform in fact is a database for risk assessment for each task. It is described the functioning of the company web platform. The measures to control risks of each task are described with a meticulous analysis of one of the tasks: reception and cleaning of alternative fuels.

Keywords: Risk analysis; Work accident; Digital platform of risk analysis task.

1. Introduction

Safety and health at work is an important issue. Every 15 seconds, 153 workers have a work-related accident [(3)]. In 2012, 3515 and 162 fatal work accidents were registered, in Europe and in Portugal, respectively. Of these, the majority of the victims were male, mostly due to the work activity (construction and industry). Those accidents lead to higher costs and cause loss of productivity [(4)].

Recently, in the unit in study, two fatal accidents were registered in 2011 and in 2014. The former occurred during a pipe cleaning in the cyclone 5 of line 5 (Figure 1) and the latter was due to hit by a stacker in an area restricted to pedestrians.

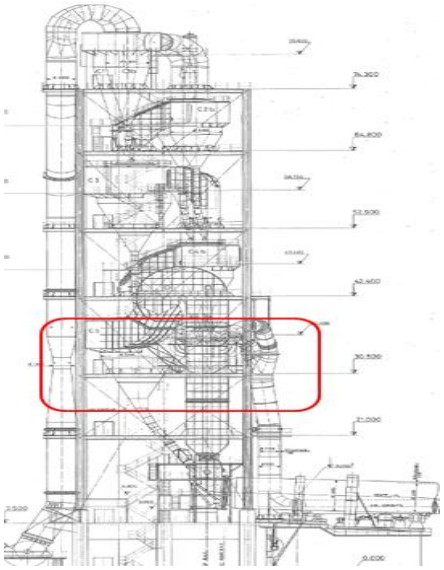

Figure 1. *Cyclone tower of production line 7 with cyclone 5 marked in red.*

These situations only enhance the necessity the company has of a better safety policy and of investment in accident prevention [(5)]. Prevention requires the study of the accident causes, which can be classified as human, material and organizational [(6)].

The assessment of the risk of tasks is a method recently chosen by the company to be implemented. It consists on the identification of risks in a specific task that could be a cause of accident. This kind of assessment promotes safety awareness and communication between workers and leadership positions [(2)]. For factory operatives to be aware of the risk of each, a voluntary behavioral change is essential [(1)]. Under the attractiveness point of view a digital platform is an innovative tool that may help workers to understand the risks of a specific task. Each risk in a certain task is therefore accompanied by a mitigation action to be followed by workers. This kind of platform, developed by the company, could improve work conditions and reduce incidents, and has the advantage of working as a database of risks and tasks, possible to be accessed everywhere in the plant.

2. Methods

Risk analysis is essential for the continuous improvement of decisions. As long as uncertainty is reduced, new problems can be detected leading to better solutions [(7)]. The methods can be direct or indirect, depending on the risk factors of the accident [(8)].

The risk assessment task analysis (ART, análise de risco de tarefa or Task Risk Analysis, TRA) method allows the detection of existing risks during the execution of a task, to improve the perception of risks in the work place. There are some steps required to be followed for carrying out that methodology i.e. assembling of a team qualified on the method and the revision of the task's risks.

Based on the guidelines of the ART method, a digital platform was designed, accessible by all plant workers. In it, it is possible to create new tasks, confer and edit existing ones, and print.

In order to create a new ART, it is mandatory to fill the spaces about the country, business, unit plant, and so on (Figure 2). Then the task and associated risks are registered. Risk evaluation corresponds to a value given by the multiplication of frequency (F), probability (H, Table 1) and severity (G) (Equation 1).

$$P = F \times H \times G \quad (1)$$

Table 1. Classification of probability.

Probability	H	Historic
Improbable	0,1	No incidents in the last years
Probable	0,5	1≤ incidents <5 last years
Imminent	1,0	≥ 5 Incidents in last years

3. Results and discussion

The elaboration of the ART is based on the tasks of the company's workers (Figure 2).

Figure 2. Partial print screen of the digital platform.

For clarity in the use of the platform the task "Reception and cleaning of alternative fuels" of line 7 is used (Figure 3). This task fits in the production department.

For this task in particular, general risks associated with the work area, risks associated with the work path, and those associated with the specific task were considered. Dust associated risks were considered general to the area, specially dust inhalation and eye contact. These can be mitigated through the use of a PFF1 face mask and close glasses. In 2010, the value of total inhalable dust in the area was below the detection limit and the value of breathable dust was 0,365 mg/m^3 (considered acceptable) [10].

When assessing the risks concerning the work path, two situations were considered: falling due to irregular ground and being hit by a passing vehicle. These can be mitigated by prohibiting use of mobile phone or radio while walking on said paths, avoid running, and only traverse in crossings and areas delimitated for pedestrians, as well as maintaining eye contact with passing drivers at full times.

Regarding the risks associated with the particular "Reception and cleaning of alternative fuels" task, these can be pinpointed to being hit by a vehicle, hose rupturing and explosions. Mitigation of the first risk can be achieved by employing a safety stail in the vicinity of the truck to isolate the area. Control of silo pressure, using a sensor and valves, can help mitigate

the risk of rupturing the hose [11]. To diminish the risk of explosions, systems of temperature, pressure and carbon monoxide probes, as well as pressure and blast valves can be employed; the silo is also equipped with glass wool isolation, level sensors and a coating sheet that minimizes the chance of formation of explosive atmospheres. [11].

Figure 3. Silo of combustible fuel of line 7.

The personal protection equipment (PPT) used in this case includes safety boots S3 HRO that resist penetration, water absorption and sole puncturing, a safety helmet with chinstrap, protection glasses that protect against particle projection, protective gloves, face mask PFF1 with valve to protect against fine dust, and protective clothes that comply with norms EN 13 688 for explosive atmospheres and requirements for high visibility EN 20 471 CAT 2 [9].

4. Conclusion

When a company follows the safety regulations and the workers are aware of risks, the probability of an accident to be registered is low.

This work contributes to the improvement and better implementation of a digital platform for task risk analysis. There appear to be several situations in the plant that require further attention and intervention to prevent accidents, including improvement of work, safety and health conditions, training workers on risks mitigation, and enforcement of legal safety regulations.

According to company history statistics, several incidents and accidents in the last few years (2011 to 2015) were registered. It is essential to improve the safety policy of the company and prevent accidents. The reported risk analysis methods help prevent occurrence of incidents to happen, as they are able to identify, evaluate and control the risks.

Workers will require training in the platform to learn how to use it. The platform has yet to be implemented in a real situation, in order to assess the need of further improvements. As it is, in essence, a dynamic tool, the risk analysis platform is able to be changed to include new risks associated with current or improved tasks.

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