DEVELOPMENT OF CONTINGENCY PLAN FOR CERAMIC INDUSTRY

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ABSTRACT

All production steps involving the manufacture of ceramic tiles can create a risk of large-scale accidents, which can affect the operation of the production unit, its employees, and the lives of the neighboring population. This work aims to establish a contingency plan that proposes actions to betaken in case of accidents. After the implementation of the plan, it is expected that the company is prepared for any occurrence of large companies and therefore, its consequences can be minimized to the maximum. For construction of the analysis of the contingency plan of each stage of the process, as well as the plant of the company seeking to evaluate the most critical points and that can generate greater accidents, after analysis of risk and severity, being possible the actions to be taken and the responsibilities in case of any occurrence of this kind..

KEYWORDS

Contingency plan, emergency, disaster, risk analysis.

I. INTRODUCTION

A ceramic industry has several processes that include the different unit operations ranging from dough mixing operations including milling and atomisation, forming step which includes the pressing, decorating step which includes the enameling and serigraphy, step consisting in sintering firing of ceramic product and in some cases finishing step, as the grinding process. In addition to these processes, other sub-processes can be considered as support, as for example, power generation with coal burning, treatment of effluents and tributaries, etc..

Each of these steps/processes have inherent risks, some of them of small proportions and others that may have catastrophic proportions depending on the intensity in a given accident to occur. Considering each of the intrinsic risks of procedures and risks inherent to natural forces, such as windstorms, etc., is of great importance to establish a contingency plan with actions to be taken in each of the situations. The plan aims to standardize the standardize security procedures to be adopted in urgent and emergency cases, mitigating risks and reducing the impacts and losses by establishing communication and mobilization procedures for control, in case of contingencies that might occur in the sectors of industry, providing security for workers and neighborhood.

The contingency plan is a description of the file system of crisis prevention and control your operating mechanism and is the fundamental basis for emergency disposal [1]. The contingency plan is as "a coordinated set of protocols for managing adverse event, expected or future adverse" [2]. Every emergency is unique, but with a study about them will be easier to make predictions and planning, so

it's very important to have more attention for the preparation to face such emergencies, and in the planning process to manage, overcome and if retrieve them. [3]

To establish a contingency plan, it is necessary to the understanding of some concepts with regard to safety. The Security job consists of all efforts to keep the risk of major accidents and the risk of working environment under control. [4] Environmental Conditions to work security, refers to conditions that influence the opportunities an organization, organizational unit, or individual has to control the risk of major accidents and environmental risk at work [5]. Different stakeholders, such as the Government, regulators, researchers and organisations claim that the environmental conditions are important to organizational safety and the working environment, it is extremely important to study the conditions of the environment for safe conditions in an industry. [4] organizations, industries need to develop strategies that enable them to prioritize the security requirements when conflicts occur. [6]

In a contingency plan in terms of content, must focus on specifying the organization system and emergency command, as well as responsibilities and Division of labour, relevant departments of emergency security in order to ensure that resources are allocated effectively and that the emergency work is implemented quickly. [7]

In many cases, the contingency plan established by the industry has not only views involved safety as well as environmental safety, major plans for dealing with pollution accidents are becoming increasingly important due to the increased frequency and intensity of pollution accidents. [8] therefore besides the security person and property, a contingency plan must be well prepared also from the safety of the environment.

The events must be provided for in a plan which are considered disastrous, contemplate impending or actual events that threaten people, property or the environment and which require a coordinated and rapid response. [9] These emergency situations were classified in natural disasters and problems caused by humans. The catastrophic events caused by nature, such as floods, are called natural disasters and cannot be controlled by human beings, [10]. The disasters caused by man are known as technical partner disasters. [11] After the end of the disastrous event, the disaster recovery effort should begin directly to restore social, economic and political routines normal encompasses multiple activities [12]

So that a plan can be drawn up in advance is necessary the following reflections: Identify business processes important for the Organization and system services that automate these processes and assess impacts in case of failures and identify how and who should do the same. [13] best practices for disaster planning include the complete risk assessments, mitigation activities, such as the decentralization of research assets in high-risk areas and the development and testing of response strategies and recovery plans, including preparing for a prolonged disruption of infrastructure. [14] the Disaster Planning is required to ensure that the damage and losses are minimized, business continuity planning is required to solve prolonged interruptions of trade. [14] the work has focus on Disaster Planning, or accidents that require contingency.

Disaster planning and business continuity is based on four of the following main steps: Preparation: continuous cycle of planning, assessment and corrective action, to ensure effectiveness during incidents; Answer: prevention of loss of life or injury to people or property, on the damage caused; Recovery: actions taken to return to a normal situation or even safer after an emergency; Mitigation: sustained actions defined to reduce or eliminate the long-term risk. [14]

For a better understanding of the study, besides the introduction, the structure of the article is given as follows. Section II is the methodology applied, section III is intended for results and discussion, and finally section IV and V with the conclusion and future work.

II. METHODOLOGY

The main steps in the development of the contingency plan adopted in this work can be divided as follows:

-Analysis of the productive process;

-Quantification of the company;

-Quantification of employees exposed;

-Definition of responsibilities: pre, during and post disaster disaster disaster;

-Risk analysis: types, probability, severity and classification;

-Actions for mitigation of incidents;

-Vanishing points, simulated etc..

To assess risks present in a production process is necessary to have knowledge of all the steps involved, the flowchart in Figure 01 describing the basic steps of production of ceramic coating:

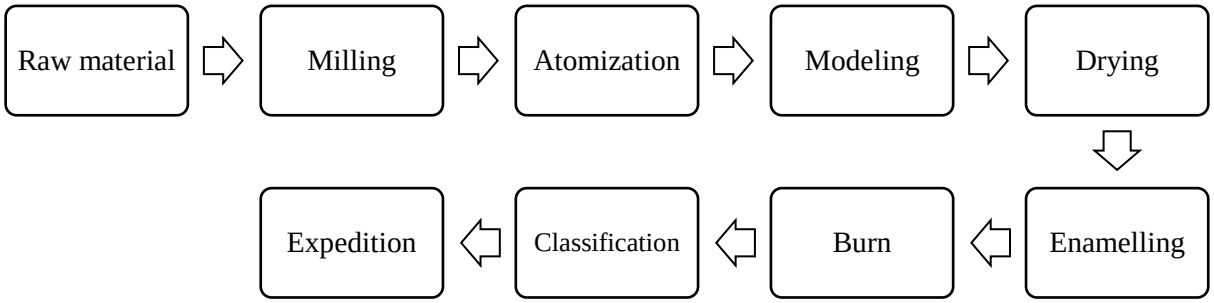

Figure 01: flow chart of the manufacturing process of ceramic tiles

It is important to note that only major risks are considered in this plan, smaller proportions risks such as noise, dust, ergonomic risks among others, that do not require contingency action will not be studied.

It is necessary to carry out the measurement of the area of the company and the number of employees per shift of work that may be exposed to any incident that may occur. It is also necessary to quantify the number of employees who have training to act in times of disasters or incidents.

Those responsible should also be established, in this case sought to list major responsibilities the managers of the sectors and responsible for the unit's security system, lower degree of responsibility tasks have been assigned to members of the Voluntary Fire Brigade and other employees. The activities were divided into pre disaster activities, activities during the disaster and post disaster. Activities that relate to environmental containment were assigned to the professional environment of the company.

The events that will be considered in the plan are those whose accident scenarios are identified in the risk analysis with the potential to extrapolate the limits the company's severity. The plan includes also those emergencies that may cause minor damage to the safety and health of people or generate panic in other units and in the neighboring communities.

After listing the main risks of the industry, to a detailed analysis has been carried out the assessment of probability of occurrence in 5 different levels, the probability of an event can be classified as rare until a likely event, and evaluation of severity of Occurrence, ranging in 4 levels with severity of catastrophic despicable alternating, this classification is shown by the table 01. The intersection of information pertaining to Likelihood and Severity have shown if the risk is negligible, minor, moderate, serious or critical.

Table 01: analysis of probability and Severity – Preliminary Risk Analysis

Probability analysis		*Severity analysis*	
Level	*Category*	*Value*	*Category*
The	Rare	(I)	Despicable
(B)	Extremely Remote	II	Marginal
(C)	Remote	III	Review
(D)	Reasonably Likely	IV	Catastrophic
And	Likely		

Source: adapted from DE CICCO, FANTAZZINI

Other critical points to be defined is to establish communication network in case of any disaster, escape routes and evacuation and simulated training.

III. DISCUSSION AND ANALYSIS

The discussions will be held on the basis of each item described in the contingency plan. The plan should be reviewed annually or whenever there is any significant change in the manufacturing process or the company's layout. Training and simulated must also be carried out annually.

3.1. Responsibilities

The following shall be described briefly the main responsibilities of each individual included in the contingency plan, based on bibliographical revisions of plans of different industries and business sectors [16, 17, 18, 19]:

SESMT management (service specializing in safety engineering and occupational medicine): Composed by work safety engineer, job security, occupational physician, nurse, nursing work work. The security engineer at work will be the administrator of the Contingency Plan. Responsible for the implementation of the plan and for the support and advice to other sectors, taking into account efficiently, described in the plan.

Fire Brigade Volunteers professionals: Composed by Brigade volunteers, properly trained. The captain of the BBV is the Coordinator of the Contingency Plan. Responsible for combating the sinister, providing first aid, assess damage to facilities, equipment and human resources.

Maintenance and mechanical professionals: Composed by the mechanics and electricians. Responsible for identifying the minimum equipment required for the continued production, ensuring the availability of basic equipment and support necessary to the functionality.

Security professionals at work: Composed by occupational safety technicians and members of CIPA. Responsible for participating in the review of the plan, determining security policy and ensuring a minimum level of safety in the process.

Management Professionals: Composed by supervisors, coordinators and managers of the unit. Responsible for ensuring the availability of necessary resources, administrative and communications services for the other teams.

Environmental professionals: The environmental engineer. Should mitigate environmental impacts, as well as arrange for the removal and proper disposal of waste generated as waste disposal plan and effluents.

3.2. Risk Analysis

The main risks and they can take great proportions, cause damage to person, property or the environment and therefore require a contingency measure/action are described below in table 02. Next is evaluated the probability of occurrence and severity according to the 01 table, shown earlier, with this analysis it is possible to establish the risk classification:

Table 02: parsing and classification of Risks

Risks	*Probability*	*Severity*	*Classification*
Fire in electrical installations	(C)	II	Moderate Risk
Fire into fuels	(C)	IV	Serious Risk
Fire in the Pavilion	(D)	III	Serious Risk
Gas leak	(D)	II	Moderate Risk
Fuel Explosion	(B)	IV	Moderate Risk
Explosion of electrical equipment	(D)	II	Moderate Risk
Events resulting from lightning Fall	(D)	II	Moderate Risk
Spraying	(D)	III	Serious Risk
Flooding	(C)	II	Lower Risk
Collapse	(C)	III	Moderate Risk
Accidents involving machinery and Equipment	And	III	Critical Risk
Effluent spills	(B)	III	Lower Risk
Spills of Tributaries	(B)	II	Negligible Risk

Source: Authors

3.3. Actions for Incident mitigation

Are described below the actions to be taken by the above listed in the case of each of the events caused by the assessed risks. After each of the actions it is necessary to send a report of occurrence of loss, which will be used to further review and adaptation of the contingency plan. The stock is based on contingency plans available in the literature of industries from various areas of expertise [16, 17, 18, 19]:

Fire in Electrical Installations: Fire alarm, requesting the presence of the fire brigade, inform SESMT the occurrence, detailing it and clarifying the actions that will be taken by the fire-fighting team, if necessary, request the presence of the Military Fire Department . The electrical power supply system must be immediately de-energized, applying release actions, isolation, lock, raqueteamento and warning. Remove all the effective staff of the affected area, leading them to sheltered and protected areas, as well as signal the area. Use the fire extinguishers applicable to burning materials, collect the waste generated and disposal plan as. If the occurrence come to swell and there is the possibility of spreading to other areas to inform the SESMT and prepare for evacuation of the site.

Fire in fuels: Fire alarm, requesting the presence of the fire brigade, inform SESMT the occurrence, detailing it and clarifying the actions that will be taken by the fire-fighting team, if necessary, request the presence of the Military Fire Department . Interrupt the flow of fuel, by closing valves, where installation is being operated. Do not use water jet on the surface of liquids in combustion, use the fire extinguishers applicable to burning materials, collect the waste generated and disposal plan as. If the occurrence come to swell and there is the possibility of spreading to other areas to inform the SESMT and prepare for evacuation of the site.

Fire in Pavilion: Fire alarm, requesting the presence of the fire brigade, inform SESMT the occurrence, detailing it and clarifying the actions that will be taken by the fire-fighting team. The electrical power supply system must be immediately de-energized, applying release actions, isolation, lock, raqueteamento and warning. Evacuate and flag the affected area, using fire extinguishers applicable to burning materials. If you escalate the problem inform SESMT and wait for foreign aid. The residue

should be sent to the treatment system, before your discard. Going on rivers or springs in the vicinity should be built protective barriers.

Gas leak: Inform SESMT the occurrence, interrupt fuel flow, by closing valves, where installation is being operated. If there is the possibility of spread of the occurrence as a function of the winds (gas leak) or thermal effect/radiation (fire) is established to plan the orderly evacuation of the place and the people are directed to the meeting point closer/insurance.

Fuel Explosion: Fire alarm, requesting the presence of the fire brigade, inform SESMT the occurrence, detailing it and clarifying the actions that will be taken by the fire-fighting team. Request the presence of the Military Fire Department. Interrupt the flow of fuel, by closing valves, where installation is being operated. If there is the possibility of spread of occurrence is established to plan the orderly evacuation of the place and the people to be directed to the nearest meeting point/insurance. Do not use water jet on the surface of liquids in combustion, use the fire extinguishers applicable to burning materials. Collect the waste generated and disposal plan, as if the occurrence come to swell and there is the possibility of spreading to other areas to inform the SESMT and prepare for evacuation of the site.

Explosion of electrical equipment: Fire alarm, requesting the presence of the fire brigade; Inform SESMT the occurrence, detailing it and clarifying the actions that will be taken by the fire-fighting team. Request the presence of the Military Fire Department. The electrical power supply system must be immediately de-energized, applying release actions, isolation, lock, raqueteamento and warning. Remove all the effective staff of the affected area, leading them to sheltered and protected areas, as well as signal the area. Use the fire extinguishers applicable to burning materials. Collect the waste generated and disposal plan as. If the occurrence come to swell and there is the possibility of spreading to other areas to inform the SESMT and prepare for evacuation of the site.

Events resulting from fall of spokes: Fire alarm, requesting the presence of the fire brigade; Inform SESMT the occurrence, detailing it and clarifying the actions that will be taken in case of fire; Request the presence of the Military fire in case of fire, the electrical power supply system must be immediately de-energized, applying release actions, isolation, lock, raqueteamento and warning. Remove all the effective staff of the affected area, leading them to sheltered and protected areas, as well as signal the area. If the occurrence come to swell and there is the possibility of spreading to other areas to inform the SESMT and prepare for evacuation of the site.

Destelhamento: Fire alarm, prompting evacuation to safety areas, inform the SESMT the occurrence, detailing it and clarifying the actions that will be taken. The SESMT informs managers for appropriate arrangements, the isolation and signage of the affected area and checked the extent of the damage. Is made the head count, to know if there are casualties. In the event is triggered the ambulance and medical attention. Remove all the effective staff of the affected area, leading them to sheltered and protected areas, as well as signal the area.

Flooding: Fire alarm, emergency evacuation safety areas requesting, inform SESMT the occurrence, detailing it and clarifying the actions that will be taken, the SESMT informs the managers to the appropriate measures; The isolation and signage of the affected area and checked the extent of the damage. Remove all the effective staff of the affected area, leading them to sheltered and protected areas, as well as signal the area.

Collapse: Fire alarm, requesting the presence of the fire brigade; Inform SESMT the occurrence, detailing it and clarifying the actions that will be taken; The SESMT informs the managers to the appropriate arrangements. The isolation and signage of the affected area and checked the extent of the damage. Is made the head count, to know if there are casualties. In the event is triggered the ambulance and Medivac, is provided the brace place and fire vehicles and equipment for the removal of debris.

Accidents involving machinery and equipment: Fire alarm, requesting the presence of the fire brigade, the SESMT tells managers to knowledge and support in solving problems. The isolation and signage of the affected area and checked the extent of the damage. If there are victims is thrown the ambulance and Medivac, are provided first aid equipment and fire-fighting. Is provided the removal of machinery and equipment casualties, except in cases that have victims when the location should be isolated and preserved for analysis and investigation of the causes.

Effluent spills: The officials involved shall communicate the Environmental team. The employees involved and/or team of Environment should promote effluent containment. Should be provided for sewage suction vacuum truck, for later disposal in External Sewage treatment plant.

Spills of Tributaries: The officials involved shall communicate the Environmental team. The employees involved and/or team of Environment should promote restraint of the affluent. Analyze the need to discard or arrange the suction of the affluent, for subsequent allocation in Effluent treatment plant.

3.4. Operational control

Should only address or remain in the area in an emergency employees who have prescribed assignments in the plan or are summoned by the coordination. It is the responsibility of the management and supervision of the effective guarantee given on the composition of the team of emergency and Contingency. To this end, they shall, obligatorily, communicate with the SESMT about presence of Rida in the composition of the group. In emergency situations, employees should retire quietly and neatly in the area in an emergency. Employees who are part of the emergency and Contingency team must be freed of their routine tasks immediately after the outbreak of the emergency.

3.5. Communication

All the people working or passing through the area where the emergency has occurred shall communicate it to the Contingency plan administrator or to the Coordinator of the plan if there is one. The unit must have a unique extension number for use in emergencies to facilitate communication between those responsible. The description of the emergency must be objective and clear and report the location and number of victims.

The communication to workers will be accomplished through sirens and 2 signal tones, solid touch 1 contingency evacuation signal.

If there is a need for the community media communication, this must be carried out by the company's communication professional.

IV. CONCLUSIONS

Accidents in organizations / establishments are always unexpected events, in which the lack of knowledge / training, combined with the evolution of events and the eventual loss of control, prevent the immediate response, in order to prevent their evolution, resulting in an aggravation the scale of its consequences. A pro-active attitude is therefore imperative in predicting possible failures and their consequences in order to equip organizations and establishments with the appropriate material means and to organize and train available human resources in order to respond effective and as fast as possible.

Elaborating an Emergency Plan, following the phases described, is essential for the safety of human and material resources in an organization or establishment. In summary, in order to prepare an Emergency Plan, it is necessary to: assess risks; prepare plans and manuals; prepare technical resources and materials; provide training to emergency teams; ensure the maintenance of the means of security and conduct periodic inspections and audits.

V. FUTURE WORK

Future work suggests a case study establishing a disaster action plan, knowing that some occurrences may not be foreseen, trying to minimize damages and resume the activity as quickly as possible, reducing production losses.

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