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Safety Analysis in Soap and Detergent Industries

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***Abstract*: Workplace inspections are an ongoing process that play an important role in actively monitoring an organization's safety and adherence to safe practices. In this work soap and detergent factories of Indian state Chhattisgarh have been analyzed for accidental, incidental and occupational hazards. 171 workers (labours, operators and supervisors) of 11 soap and detergent factories inspected for their safety parameters and work practices. Five states Chhattisgarh, Madhya Pradesh, Orissa, Bihar and Jharkhand are the major market for local companies. They will come in contact of all machines & equipment and prone to different hazards. Soap and detergent industries have boilers, crushers, mixers, extruders, cage mils, filter pans, storage tanks and packing machines for their production work. I have used job safety analysis (JSA) methodology for my safety analysis. A job safety analysis is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. This process led me to the actual and predictable hazards of the soap industries. In this analysis all type of hazards are considered and their occurrence is documented.**

***Keywords*: safety analysis**

1. Introduction

The Indian soap and detergent industry includes more than 700 companies with combined annual revenue of about $17 billion. Indian per capital consumption of soap is at 460 gms per annum, where 70% of India's Population resides in the rural areas and around 50% of soaps are sold in the rural markets. In the same period, soap and detergent manufacturing industry in the Chhattisgarh state also capturing high growth rate. In Chhattisgarh apart from small scale social group adventures more than 600 labours working in more than 11 soap and detergent manufacturing factories.

A workplace safety analysis is the process of critically examining the workplace for the identification and mitigation of workplace hazards and to ensure that all standards are met and the workplace is in fact safe and free from any risks. Safety or occupational safety is an attempt to ensure the health of workers in a company. Health and safety at work can be interpreted as a promotion, protection and improvement of health status that as the height of cover the physical, mental, and social welfare of all workers in all workplaces. To reduce the chances of an accident or as a precaution against potential hazards must be identified hazards. By doing so the source of danger hazard identification can be so that potential accidents can be controlled. One way that can be used to identify hazards is to use a job safety analysis. Job safety analysis is an accident prevention technique that were used to identify potential risks and dangers associated with a worker and give risk control to reduce the risk and the harm.

Soap and detergent industries have boilers, crushers, mixers, extruders, cage mils, filter pans, storage tanks and packing machines for their production work. Labour working on this machines directly or indirectly are more prone to safety related issues.

2. Problem Identification

Job Safety Analysis has been used for identifying hazards and its consequences by analyzing all the processes which are being carried out in the workplace. Hazard identification intended for.

1. Identification of possible loss situations.
2. Measurement of the potential losses associated with these risks

A. Hazard identification

1) What jobs are appropriate for a safety analysis?

A safety analysis can be conducted on many jobs in your workplace. Priority should go to the following types of jobs:

- Jobs with the highest injury or illness rates;
- Jobs with the potential to cause severe or disabling injuries or illness, even if there is no history of previous accidents;
- Jobs in which one simple human error could lead to a severe accident or injury;
- Jobs that are new to your operation or have undergone changes in processes and procedures; and
- Jobs complex enough to require written instructions.

2) Where do I begin?

Our goal is to discover the following hazard scenarios:

- Where it is happening (environment),
- Who or what it is happening to (exposure),
- What precipitates the hazard (trigger),
- The outcome that would occur should it happen (consequence), and
- Any other contributing factors.

B. Hazard classifications

To classify hazard into different levels standard categorization of the university of Melbourne, health & safety audit workbook has been considered;

1) High risk

Where multiple regulated hazards are present in a significant proportion of the workplace operations, e.g. construction work, electrical work, working at heights, hazardous substance, dangerous goods, hazardous building materials, registered or regulated plant, confined spaces, hazardous manual handling and/or occupational noise.

2) Moderate risk

Where only a single regulated hazard is present in a significant proportion of the workplace operations, or where multiple regulated hazards are present, but in less than a significant proportion, of the workplace operations, e.g. construction work, electrical work, working at heights, hazardous substance, dangerous goods, hazardous building materials, registered or regulated plant, confined spaces, hazardous manual handling and/or occupational noise.

3) Low risk

Where regulated hazards are generally not present in the workplace operations. This includes office based administrative operations, non-laboratory or workshop based teaching/ learning/research operations, incidents like small burns, shocks, slips and falls.

3. Methodology

In this research, data collection for job safety analysis performed directly by observation to the operator. The result of observation and then recorded into the observation sheet. A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown. [4] A job safety analysis is an exercise in detective work. Steps for job safety analysis (JSA) are;

1. Involve employees in interactive talks on work and working culture without any direct interrogation and fact checks,
2. Review accident histories with all the proven and hidden facts with multiple source points and multiple observations. This may differ largely to the each-others context,
3. Conduct a preliminary job review with the help of experienced and non-experienced workers both. Because the level of difficulty can cause issues related to safety,
4. List, rank, and set priorities for hazardous jobs as described in the problem identification. This will help in time allocation and deep investigation of high risk hazards,
5. Outline the steps or tasks for measuring important parameters like- impact factor and cause, likelihood per month, risk category and controls required to eradicate hazards.

The examples that follow show how a job safety analysis can be used to identify the existing or potential hazards for each basic step involved in soap and detergent manufacturing process;

1) Worker bring coal from dumping yard in a trolley than he put coal into the furnace manually by using spade.

Fig. 1. Coal dumping

2) Removing the choked filter pan in hot condition for cleaning and spading for continuous smooth flow of detergent powder mixture.

Fig. 2. Removing filter pan and spading powder mixture

3) Due to some leakage or lack of cooperation between workers and valves silicate, lye, oil or other raw material spill or leak.

Fig. 3. Bad working condition due to spillage and leakage

Table 1
Part 1 - Job safety analysis (description)

Job Location	Task description	Hazards description
Furnace	Coal dumping	45°C -60°C working temperature near furnace and boiler
Crusher	Raw material dumping	45°C -60°C working temperature near furnace
Power source	Switching on & off the power supply	Wet surface, lack of cooperation
Furnace	Removing ash	Spraying water on ash
All over plant	Transfer & storage of material	Drains and grooves choked
Piping locations	Transportation of oils, lye, silicate, water and steam	Leakages of temporary and permanent joints,
All over plant	Supplying steam or other liquids	Direct contact with gases and liquids
Oil tanks	Stair up and provide steam to the oil tanks	Leakage and spillage in oil tanks
All over plant	Welding on machineries, equipment and plant	Welding on wet surface without PPE.
Storage tanks	Transfer of silicate and lye to tanks via pipes	Spillage and silicate stick and spread
Crusher	Pouring raw material in working condition	Spill over and flash over in crusher
Storage tank	Pouring raw material in working condition	Spill over tank
All over plant	Working near crusher, mixer and packing machine	Inhalation of raw materials through air
All over plant	Oiling and greasing of machines	Working on unstable platform with low friction surface

4) Worker stand on the grill cover of mixer machine and pour the materials from above. Worker clean the mixer by entering inside it.

Fig. 4. Pouring raw material and cleaning the mixer

One of the most important temporal characteristic of a hazardous event is the frequency of occurrence.

4. Result

Of the eight groups of machines that exist on soap and detergent manufacturing process job safety analysis (JSA) had been carried out in six group of machine leaving group of soap and detergent packing machines which has very low risk

Table 2
Part 2 - Job safety analysis (effects and controls)

Impact	Likelihood per month	Risk category	Hazard controls
Burn	2.7	Low	PPE, Restricted area, technological advancements, automatic chain mechanism.
Burn	1.6	Low	PPE, Restricted area, technological advanced mechanism.
Electric shock, slip,	0.1	Low	Clean and closed power source area, worker cooperation.
Burn, eye irritation	2.1	Low	PPE, technological advancements.
Slip and fall, disease	3.1	Low	Continuous cleaning, maintenance.
Slip and fall	0.9	Moderate	Urgent maintenance, pit type arrangement.
Burn, Skin and eye infection,	1.8	Moderate	PPE, timely maintenance.
Slip and fall, trapped	1.1	Moderate	PPE, Maintenance, work cooperation.
Electric shock, eye irritation, burn, slip	0.4	Moderate	PPE, welding safety parameters.
Skin irritation, burn	0.04	Moderate	Fixed transfer system with rigid structure.
Burn	0.2	High	Inclusion in small amounts with intervals, cooperation, PPE.
Burn	0.3	High	PPE, informative, regulatory sign boards in common languages.
Reparatory disease, lung infection	Every day	High	PPE, yoga, continuous health checkup.
Slip and fall	0.1	High	Stable platform, support structures, holding and safety equipment.

tendency. Based on overall JSA results, it is known that 5 of 14 potential hazards (35.7%) included in low risk category, 5 of 14 potential hazards (35.7%) included in moderate risk category while 4 potential hazards (28.6%) are of high risk category. 4 potentials which cannot be accepted that the potential burn and skin defection due to lye, silicate, caustic soda and hot slurry soap material, inhalation of raw material through air at very high concentration and working of unstable platform at low friction surface.

5. Conclusion

I have used job safety analysis (JSA) for highlighting the safety requirements in the growth oriented soap and detergent industry. Working without any personal protective equipment seems to be ubiquitous phenomena among labours in almost all the soap and detergent factories. JSA led me to the actual and predictable hazards of the soap and detergent industries and based on the results obtained, it can be easily concluded that the soap industry hasn't been given attention as much as petroleum industry or steel industry, however the occupational hazard of inhalation of highly concentrated soap and detergent particle in the factories possess much higher and eminent threat of

occupational disease. A combined effort of government, soap and detergent factory owners and workers can only eradicate the safety threats from its root.

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