

Safety in The Chemical Industry

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ABSTRACT: *The chemical industry is a capital-intensive industry and is a very important contributor to the wealth of any country. However, some aspects of the industry can be productive or harmful depending on their effect on the environment. The hazards due to potential accidents such as fire and explosion have increased. This paper provides a brief introduction into the priority of safety in the chemical industry.*

KEY WORDS: *chemicals, chemical industry, safety*

I. INTRODUCTION

Chemicals have become an indispensable part of human life, sustaining activities and development, preventing and controlling many diseases, and increasing agricultural productivity [1]. The chemical industry produces chemicals which may be solids, liquids or gases, flammable, explosive, corrosive and/or toxic. Some of these products are potentially hazardous at some stage. Despite this, the chemical industry actually has a lower number of accidents as compared to other industries. This is due to many factors. First, safety is at the top of the chemical industry's agenda. The chemical industry is finding ways to satisfy its increasingly sophisticated, demanding, and environmentally-conscious consumers. Second, regulations are in force in every major country for the safe management of chemicals. In Europe, for example, regulations are enforced through REACH (Registration, Evaluation Authorization and restriction of Chemicals). REACH places the responsibility on both manufacturers and importers to ensure that all chemicals produced in quantities greater than one ton a year do not adversely affect human health or the environment [2].

Safety in the chemical industry is about preventing people from being harmed by work or becoming sick from work. This is naturally linked with other safety concerns such as process control, laboratory safety, equipment safety, electrical safety, fire safety, and hazardous waste disposal. Working with chemicals poses some risks which include burns, skin injuries, asthma, allergies, cancers or even death. Chemical hazards can claim lives, cause injury, and damage facilities that may take a long time to repair.

II. PROBLEM AWARENESS

Although the chemical industry is known to be one of the safest industries in the US, it has faced scrutiny in the wave of several recent accidents. The industry operations have become complex and larger and inventories of dangerous chemicals have increased. The chemical industry's experience of accidents, fires, and explosions is of continued concern. The hazards include accidental spills of toxic substances, exposure of the workers, environmental pollution, chemical plants' emission, and physical hazards such as fires, blasts, and explosions [3]. The occurrence of accidents, as determined by their frequency or severity, is the index of hazard. Freedom from accidents is important for success in chemical operations. In industrial applications, safety is usually regarded as a critical system property. A comprehensive assessment of industry safety requires a systematic integration of all the relevant factors [4].

III. SOLUTIONS

All accidents can be prevented and safety can be managed. Managing safety involves management, incorporating human factors, and regulation.

- **Management:** In the chemical industry, the responsibility of safety falls upon management and leadership and is required by law, insurance companies, and environmentally-conscious consumers. The initiative must come from the top. Management must be committed to safe operations to include safety education and training to employees. By providing open communication, creating a stable workforce, practicing safety protocols and driving a safety culture, the chemical industry has produced change. Safety management practices are reducing accidents and injuries in the workplace. Responsible Care (RC) is an example of industry self-regulation that developed in the 1980s and 1990s. Responsible Care companies have reduced the number of incidents that resulted in a product spill, fire, explosion or injury [5].

- **Human factors:** Besides management executing their accountability, human factors should be incorporated into hazard identification and risk reduction. Human factors involve elements of psychology, physiology, ergonomics, sociology, management science, and engineering. The major role of human factors is to design, develop, and maintain work systems that improve efficiency and keep people, plant, and the environment safe [6]. It is a means of preventing chemical accidents. New technologies can contribute to this.
- **Regulation:** There is an ongoing discussion on whether government regulation and oversight is necessary or that chemical companies can be trusted to guarantee safety of their operations. In reaction to chemical disasters that took place in England, the European Union issued chemical industrial safety regulations in 1982 [7]. In the US, regulations are offered by federal, state, and local agencies. There are the Environmental Protection Agency and the Occupational Safety and Health Agency (OSHA). Regulatory bodies have put requirements in place that address safety issues. At the international level, ISO 31000 provides guidelines for risk management.

IV. CHALLENGES

The chemical industry is facing several challenges in the 21st century which must be overcome in order to help society maintain and improve its standard of living and do so in a sustainable way. Perhaps the greatest challenge lies in finding ways to reduce our dependence on non-renewable resources to produce energy. Another challenge faced by companies in the US and Europe is to cut their costs while ensuring that they conform to the best practice in protecting the environment. Chemical industry may be prevented from adopting effective safety management practices due to lack of time and lack of risk consciousness.

V. CONCLUSION

Regardless of taking the appropriate safety measures mentioned above, major industrial accidents can still occur due to design error, human error, mechanical failure, and poor management [8]. Therefore, safety will continue to be an important issue in the chemical industry. The American Chemical Society (ACS) regarded “safety” as the core value of the society in 2016. Educators are obligated to give their students practical skills that will help them to be successful in their chosen careers. The chemistry and chemical engineering curriculums should include competencies (such as safety) needed to work in a chemical industry or lab [9].

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