IOP Conference Series: Materials Science and Engineering

PAPER • OPEN ACCESS

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To cite this article: N Fitriah and Mardani 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **536** 012041

Occupational Health and Safety in Chemical Engineering Laboratory of Politeknik Negeri Lhokseumawe

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Abstract. As well as we known each laboratory has some role and regulation conducted for occupational health and safety (OHS). OHS is a multidisciplinary concept that concentrates on the safety, health, and welfare of people engaged in work or employment and worker awareness of health and safety-related rights and responsibilities. The workers often forgot on their own security, firstly it was much found in a laboratory. Chemical engineering laboratory needs to apply occupational health and safety (OHS) to reduce some accidents like fire, toxicity and another factor it could be a hazard for the environment. Therefore, to improve about OHS, the employee will give knowledge and understanding how to applied OHS. This study seeks to examine the relationship and impact of occupational health and safety on employees' chemical engineering laboratory in Politeknik Negeri Lhokseumawe.

1. Introduction

Occupational health and safety is the most significant controversial issue in the success of industrial development. The German philosopher (1788-1860), Schopenhauer, emphasized the importance of health by stating that "health is not everything, but without health, everything is nothing". Therefore, a specific definition of health, safety and integration can both be seen as occupational health and safety is a holistic approach to total employee welfare at work [2].

According to WHO [3], occupational health includes actions for medical work, occupational hygiene, work psychology, safety, physiotherapy, ergonomics, rehabilitation, etc. Safety, on the other hand, involves protecting people from physical injury [4]. The International Occupational Hygiene Association (IOHA) generally defines occupational health and safety (OHS) as the science of anticipating, recognizing, evaluating and controlling hazards that arise in or from workplaces that can interfere with the health and welfare of workers, taking into account the possible impacts on the surrounding community and general environment [5]. As such, OHS can be seen to pay attention to the promotion and maintenance of the highest level of physical, mental and social well-being of workers in all occupations [6].

Most of the industrial incidents or major accidents that occur are due to lack of knowledge and competence at the right time. Employee security and safety expertise is an important key to an industrial process. Obtaining, maintaining, and strengthening these competencies is needed from an environmental, economic and social point of view [7].

Globally, health and occupational health costs have increased. Global financial losses due to workplace injuries and poor health exceed $ 1250 billion [8]. With conservative estimates, workers suffer from 270 million occupational accidents and 160 million occupational diseases each year [9]. Occupational injuries alone accounted for more than 10 million disability-adjusted life years (DALYs) lost, or healthy years of life were lost either defects or premature death and 8% of unintentional injuries worldwide [10]. Poor work health and reduced work capacity of workers can cause economic losses of up to 10-20% of a country's Gross National Product [3]. Globally, deaths, diseases and occupational diseases cause a loss of about 4% of the Gross Domestic Product [11]. These changes hamper development, especially for Africa and Asia. As discussed work accidents and disease costs contribute 10-20% of the nation's GDP.

Hazardous factors in the health of labor are generally classified into three overall categories, namely chemical, physical, and psychological. Hazardous chemical factors including hazardous substances and conventional substances or carcinogenesis from chemicals used and their placement. In addition, hazardous allergens can be increased even in situations where acceptable concentrations have been increased such as formaldehyde at 5-> 0.5 parts per million (ppm) and vinyl chloride monomer (VCM) at 500 -> 2.5 ppm. In addition, it is very necessary to determine the risk assessment of carcinogen exposure through a relatively quantitative evaluation to prevent the emergence of major health problems in the world of work [12].

In addition, measures to control exposure to toxic substances, such as ventilation and respiratory protection equipment such as gas masks. In general, gas masks consist of a canned absorber, air duct equipment, and cylinder mask. After the 1970s, this type of mask was made for a single use and was light. As a result, the design offers high-efficiency performance and high protection for people using the equipment. Perhaps the only problem that arises from this new design is that masks can be difficult to use during hotter summer months, which, in fact, can also be said for previous designs.

Although the original purpose of gas masks was to protect the public from larger biohazards or other dangerous biological factors, the bioindustry has used newer masks to protect against exposure to aerosols to smaller harmful contaminants such as enzymes and microbes, especially to the health of the workforce. overall. In this case, because many of the bio-substances are non-sensitivity pollutants, detection and response must occur within 30 minutes to offer optimal protection for the community.

Hazardous physical factors include conditions in which high temperatures and pressures are involved (for example, those who work in cryogenic or underground studies). Under these conditions, standards and repairs to accident prevention due to long-term exposure need to be considered specifically. In addition, other hazardous factors such as exposure to small radiation levels on cell phones to ultraviolet and infrared rays in the electromagnetic spectrum from the use of excimer lasers have been examined. Such lasers (more specifically known as "exciplex lasers") are forms of ultraviolet lasers that are commonly used in the production of electronic devices such as semiconductors.

With regard to the production of microelectronics as such, the health of workers in this particular field of production has special interests. Because of long working hours and rapid production pressure, many workers experience problems that range from nerve fatigue and lumbago to the cervicobrachial syndrome. However, because of technical innovations that began in the late 1970s, the design and use of robots were used to replace workers, so as to reduce the physical consequences of workers.

Harmful psychological factors, especially those caused by work-related stress problems, have increased dramatically after the turn of the 21st century. According to an investigation of middle and elderly workers, psychological problems due to stress account for about two-thirds of participants. On the other hand, because of an increase called technostress (or stress due to the introduction of new technologies) the Ministry of Health, Labour and Welfare have conducted an impact investigation that focuses on the tendency of aggravation from technological progress.

2. Experimental

This research was conducted using a literature review methodology that considers data sources from international journals relating to work safety, occupational health, and the relationship between work safety, health, and the environment. It also utilizes the resources of websites from Wikipedia, reports, discussions and other magazines. The desk review method is compiled based on data sources from the findings of OSH research in developing countries, research findings from prospective sustainable development, from research that shows the link between job security and innovation related to sustainable development, and the cost of accidents from different research databases. In addition to collecting data from journals, field surveys/observations were conducted. This observation was conducted to measure responses obtained from interviews with several employees and students.

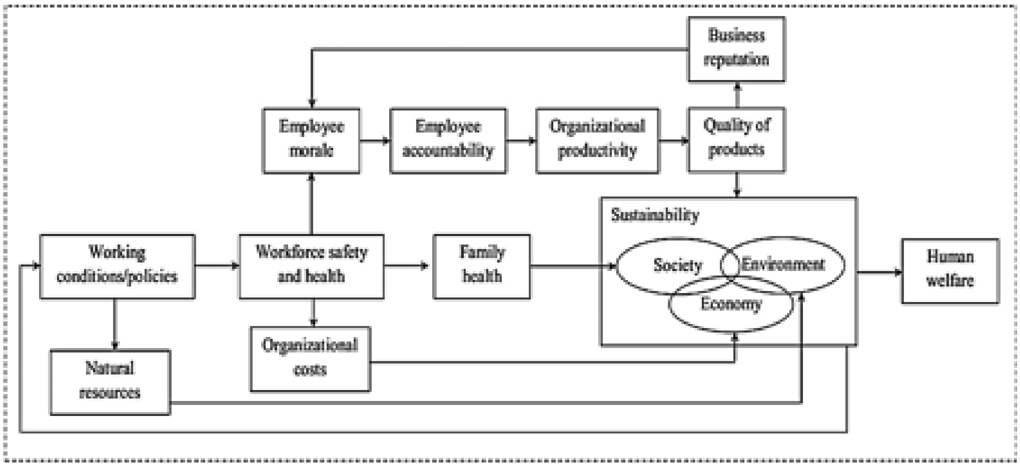

Figure 1. Safety, health & environment and linkages of sustainable development

Table 1. Responses and percentages of interview results

No.	Item Question	Number of Response Says (Yes)	Percentage	Number of Response Says (No)	Percentage
1.	Are there innovations in the laboratory?	2	6,89%	17	94,43%
2.	Does the employee have knowledge about occupational safety and health?	3	12,12%	18	98,99%
3.	Do you think innovation at work can reduce the cost of injury?	15	85,43%	2	11,71%
4.	Do you think 5 quality of life increases in reducing hazards at work?	16	87,55%	3	16,77%
5.	Do you think annual forum discussions bring innovative ideas and reduce problems at work?	18	95,44%	1	5,46%

3. Results and Discussion

From the results of interviews and field observations. Interview questions were prepared and responses were obtained from several laboratory employees. A number of respondents age between 20 and 30 years. This means that employees who work are at a productive age and if they face accidents, they are expensive for the citizens' economy. They have recommended work experience so that we can assume they are mature enough to provide reliable data.

The quote from Schopenhauer's answer to the thinking of companies stating that " health is not everything, but without health, is all nothing [13]. We can understand from this that health and safety are the initial issues of sustainable development. All in [14] also explained that Africa and Asia have the most unsafe practices and conditions in child labor management, employment, the informal economy, gender mainstreaming, labor statistics, labor inspection and maritime safety, HIV / AIDS and the world of work and migration international. Without a safe and healthy workplace, sustainable development cannot be expected as we can see from this research evidence.

Table 1, shows those interview responses as 'yes' or 'no' have been obtained in the workplace innovation experience. The responses obtained from the people interviewed with "yes" have been shown in parentheses and the rest for "no". Responses about the experience of innovation in the workplace (6.89%), employees have knowledge about occupational health and safety (12.12%), innovation in the workplace reduces injury costs (85.43%), quality of life improvement in reducing hazards in a workplace (87.55%) and forum discussion (95.44%).

The discussion above can correlate with other researchers who find the point of view. Totterdill [15] defines innovation as a change that leads to an increase in the workplace. This study tells that innovation supports the improvement of the workplace environment through continuous improvement tools so that the work environment becomes comfortable. Therefore, the ongoing development of an accent is accelerated due to a reduction in workplace accidents, illness and injury costs. A sustainable workplace environment means sustainable development for any country. From Eeckelaert et al. [16] also we can learn that such as financial and economic crises, unemployment, participation, social cohesion and climate change, and to increase innovation, productivity and growth through social innovation are the keys to sustainable development.

As shown in Figure. 1, working in safe and healthy conditions improves employee performance, increases their motivation and effectiveness, increases business productivity, and consequently improves product quality and reduces costs. and increase sales and revenue in the long run. The quality of products produced in the company affects the health of the community in the community and significantly influences the environment in which people work and live [17].

Aside from the employees, chemical engineering students must also understand the health and safety of work that is required when in the laboratory [7]:

1. Understand the inherent nature of safety and prevention of losses and the main sources of danger in chemical processes associated with explosions and toxicity.
2. Understand the principles of risk assessment and safety management and can apply techniques for assessment and reduction of processes from product hazards.
3. Understand the method of identifying process hazards (eg HAZOP), and assess environmental impacts.
4. Take care with specific aspects of safety and environmental problems, such as noise, hazardous area classification, help, and blowdown.
5. Have knowledge of the local legislative framework and how this applies to safety, health, and environmental management in practice and workplaces, from the perspective of everyone involved, including all stakeholders, operators, designers, contractors, researchers, visitors, and the public.

The principle needed to bring students closer to process security is [7]:

1. Teach insufficient rules, compliance and occupational health. Instead, students need to learn to practice various safety skills in accordance with fundamental scientific knowledge, technical guidelines, and good practices.
2. Dedicated teaching time is limited to overly tight schedules. Continual pressure to include new subjects in the allocation of curriculum time causes excessive workload for students and/or a drastic reduction in content for other topics.

Experienced lecturers are able and willing to teach insufficient safety. Indeed, young lecturers were not encouraged at the beginning of their careers to make time to prepare safety lessons, lectures, and tutorials.

4. Conclusion

Chemical education in relation to safety principles must be a priority. Although the integration of safety with chemical engineering education is important, it is not broad enough. It has been noted that several important obstacles to improving safety education still significantly slow down promotion and acceptance in universities.

The chemical engineering department must adjust and continue to modify their approach to safety education. Probably, a better strategy would be the third mentioned method which consists of including progressively and simultaneously comprehensive exposure to core chemical engineering courses including problems applied to safety as well.

In short, education in safety is a difficult mission and a formidable challenge that implies an important educational commitment. Because academic programs from university majors are always overloaded, teaching safety for undergraduate and graduate chemical engineering students must focus more on basic process safety topics, to avoid scattering the subject. Finally, let's share and agree with the words of Arezes and Swuste that states in [18] "Academic qualification is considered important because these specialists must be able to overcome new problems by applying knowledge and skills to situations that were not previously encountered ".

5. Acknowledgment

The authors express their gratitude and thanks to the Kemenristek-Dikti for Financial Support through the grant No 248/PL20/R15/SP2-PSNI/2018.

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