Journal of Human Development and Communication
Volume 1, 2012 [51–58]

Chemical Waste Disposal at the Workplace Vis-À-Vis the Occupational Safety and Health Act 1994 and the Environmental Quality Act, 1974

Azuddin Bahari, Hanum Hassan, Razli Ahmad

ABSTRACT

Bioprocess Engineering is involved in the design and development of equipment and also in the processes for the manufacturing of products from biological materials to finished product. The outputs from the process benefit mankind. The applications of bioprocess engineering in the production of biomaterials in order to obtain finished goods have in addition resulted in the creation of chemical waste which is hazardous. Having said about the benefit, the majority of us whether academicians, scientists, researchers and workers, who are involve in chemical handling, place less importance on the hazard related with the use of chemicals at the workplace. The effect on the aforementioned group will be occupational disease. In this Journal academicians, scientists, researcher's etcetera will present their latest research and development findings in the fields they are engage that are useful to human life and less priority is given to safety and health at the workplace. Hence, the authors aim in this journal to present a conceptual paper on the managing of chemical and disposal of chemical waste generate by Bioprocess Engineering at the workplace in accordance to the law so as to create a safe and conducive working environment at the workplace.

Keywords: Chemical waste, disposal, laws.

1.0 INTRODUCTION

Bioprocess Engineering deals with the design and development of equipment and processes for the manufacturing of products from biological materials to finished product that is needed by mankind. Application areas commonly associated with bioprocess engineering include the production of biofuels, design and operation of fermentation systems, development of food processing systems, application and testing of product separation technologies, design of instrumentation to monitor and control biological processes, and many more
(http://www.bae.ncsu.edu/undergrad/biopro_eng_info.htm)

2.0 PROBLEM STATEMENT

The applications of bioprocess engineering in the production of biomaterials in order to obtain finished goods have in addition resulted in the creation of chemical waste

which is hazardous. Hence, those involve in Bioprocess Engineering at the workplace are not only exposed to hazardous conditions but toxic chemicals and toxic chemicals waste. Hence, those workers, academician, scientists and researchers in Bioprocess Engineering workplace are expose to Occupational diseases at the workplace which was caused by or due to unsystematic use of these chemicals and unawareness of the risk cause by chemical waste.

The most common occupational diseases at the workplace are Occupational Lung Diseases, Occupational Skin Diseases, Musculoskeletal Diseases, Cardiovascular System Diseases, Reproductive System Diseases, Central Nervous System Diseases, Building Related Illness, Liver Disease, Renal Disease, Occupational Cancers etc.

Chemical wastes are classified as schedule waste and should be disposed in accordance to the law. If the Chemical wastes generated falls under the First Schedules of the Environmental Quality Act, 1974 (Environmental Quality (Scheduled Wastes) Regulation 2005), these waste are classified as schedule waste and should be disposed in accordance to the law. How should these wastes be disposed off?

3.0 AIM

To highlight to the workers, academician, scientists and researchers in Bioprocess Engineering workplace

a. On the need to manage chemicals and chemical waste generated at the workplace in accordance to the laws so as to create a safe and conducive working environment at the workplace.
b. Propagate understanding of the Occupational Safety and Health (OSH) Act 1994 and Environmental Quality Act, 1974,(Environmental Quality (Scheduled Wastes) Regulations 2005)

4.0 WORKING ENVIRONMENT IN BIOPROCESS ENGINEERING WORKPLACE

At the Bioprocess engineering workplace, where the activity to turn raw material to finished goods or by product and invention has also resulted in the creation of chemical waste which are hazardous. A chemical is hazardous based on: (MDC Publishers Sdn. Bhd, 2006)

a. Physiochemical properties (part A of scheduled I) i.e. explosive, oxidizing, extremely flammable, highly flammable or flammable or
b. Its health effects (Part B of scheduled 1) i.e. very toxic, toxic, harmful, corrosive, irritant, carcinogenic, teratogenic or mutagenic.

Hence to produce finished goods and invention, workers undertaking these work activities are exposed to various hazards such as Physical Hazard, Chemical Hazard, Biological Hazard, and Ergonomic Hazard. These hazards if not manage will cause accidents at the workplace. Hence, all these hazard need to be deal with in order to avert accidents and occupational diseases at the workplace. A chemical hazardous to health is a chemical that (MDC Publishers Sdn. Bhd, 2006):

a. Is listed in schedule I or II to these regulations.
b. Possesses any of the properties categorized in part B of Schedule I of the CPL Regulation. (P.U. (A) 143/97).
c. Comes within the definition of "pesticide" under the Pesticides Act 1974.
d. Is listed in the First Schedule of the Environment Quality (Schedule Wastes) Regulations, 1989.

Statistic from Social Security Organization (SOCSO) indicates that there are 55,186 (SOSCO Annual Report, 2009) reported industrial accidents in 2009 due to various causes as mention aforesaid at the workplace. On the same note, Occupational diseases too prevail at the workplace which was caused by or due to unsystematic use of these chemicals and unawareness of the risk cause by chemical waste. The numbers of occupational disease cases reported in 2009 are 949. Of the total number of cases, 50% of the occupational diseases reported were due to chemical exposure and other factors such as radiation and extreme temperature at the workplace.

The most common occupational diseases at the workplace are Occupational Lung Diseases, Occupational Skin Diseases, Musculoskeletal Diseases, Cardiovascular System Diseases, Reproductive System Diseases, Central Nervous System Diseases, Building Related Illness, Liver Disease, Renal Disease, Occupational Cancers etc.

Statistic from SOSCO at Table 1 by "Causing Agents" indicates that there are 949 (SOSCO Annual Report 2009) reported Occupational Diseases at the workplace. All being said about the benefit however not many academician, scientists, researchers and workers, entrepreneurs and business organizations fall short to be aware of the occupational safety and health risk related Bioprocess Engineering.

Table 1: Number of Occupational Diseases by Causing Agent – 2009

AGENTS CAUSES	Cases Reported
• Diseases Cause By Chemical Agent	75
• Diseases Cause By Physical Agent	401
• Diseases Cause By Biological Agent	5
• Diseases By Target Organ System	
• Occupational respiratory diseases	54
• Occupational Skin diseases	37
• Occupational musculo skeletal disorder	161
• Occupational Cancer	19

• Others (Miners' nystagmus)	197
Total	949

5.0 MANAGING CHEMICAL WASTE GENERATE BY BIOPROCESS ENGINEERING AT THE WORKPLACE

The laws which have bearing on safety and health issues in the Bioprocess Engineering workplace are the "Occupational Safety and Health Act 1994 and Environmental Quality Act, 1974 (Environmental Quality (Scheduled Wastes) Regulation 2005).

5.1 The Occupational Safety and Health Act 1994

The law requires the employers to maintain workplaces that are safe and healthful. With respect to safety and health at the workplace Occupational Safety and Health Act (OSHA) 1994 was enacted on 25th February 1994. In Malaysia, the Ministry of Human Resources, through DOSH, enforce the OSHA 1994. Thus the law requires the employer to carry out OSH Programs at the workplace so as to ensure a conducive working environment. The aim of the Act is to ensure safety, health and welfare of all persons at all places of work. This Act applies throughout Malaysia to the following industries (International Law Book Services, 2004) that is Manufacturing; Mining and Quarrying; Construction; Agriculture, Forestry and Fishing; Utilities – Electricity; Gas; Water; and Sanitary Services; Transport, Storage and Communications; Wholesale and Retail Trade; Hotels and Restaurants; Finance, Insurance, Real Estate and Business Services; and Public Services and Statutory Authorities

This Act does not apply to work on board ships governed by the Merchant Shipping Ordinance 1952, the Merchant Shipping Ordinance 1960 of Sabah or Sarawak or the armed forces.

With regards to chemical safety there is the there is the specific regulation specific for controlling chemicals at the workplace that is "Use Standard of Exposure of Chemical Hazardous to Health (USECHH) Regulations 2000" and "The Classification, Packaging and Labeling (CPL) Regulations 1997".

5.1.1 Use and Standard of Exposure of Chemical Hazardous to Health (USECHH) Regulations 2000

The USECHH Regulations came into effect beginning April 4, 2000. They apply to all places of work where chemicals or preparations hazardous to health are produced, processed, handled, stored, transported, disposed and treated. The USECHH regulation includes the provision of chemical health risk assessor (CHRA), occupational health doctor (OHD) and industrial hygiene technician to perform their respective roles in assessing the health risk

from chemical exposure. The duties of the employer stipulated under these Regulations are:

a. Identification of chemicals hazardous to health
b. Complying with the permissible exposure limits.
c. Conducting chemical health risk assessment.
d. Taking action to control hazardous exposure.
e. Labelling and relabeling chemicals hazardous to health.
f. Providing information, instruction and training.
g. Monitoring employee exposure at the place of work
h. Conducting health surveillance.
i. Posting of warning signs
j. Record keeping

Any person who contravenes any provision of these regulations shall be guilty of an offence and, on conviction, be liable to a fine not exceeding RM10,000 (Ten Thousand Ringgit) or to imprisonment for a term not exceeding one year or to both, and in the case of a continuing offence, to a fine not exceeding RM1000 (One Thousand Ringgit) for each day or part of a day during which the offence continues after conviction.

5.1.2 The Classification, Packaging and Labeling (CPL) Regulations 1997

The CPL regulation required proper packaging and labeling of chemicals by the supplier including the label giving risk phrases. The regulation also specifies the packaging requirement of chemicals. If chemicals are pack in a container, the container should be such that its contents cannot be escape. The material used for packaging and fastenings is appropriate for normal handling and cannot be spoiled by the chemical action.

As for Labeling of chemicals, essentially it must be firmly affixed. The dimension of label is specified in the regulations in Scheduled V. Labeling should include particulars such as Name of hazardous chemical; Name, address, telephone number of supplier; Danger symbol and indication of danger; and Nature of special risk and safety precautions. The label must be able to be read horizontally when package is set down in its normal positions or must be tagged when not practical to label hazardous chemical. Further details on CPL Regulation 2000 refer to the above mention regulations.

5.2 Environmental Quality Act, 1974 (Environmental Quality (Scheduled Wastes) Regulation 2005)

The regulation require waste generator to notify the generation of scheduled waste at the workplace and to disposed scheduled waste "on site" or "off site" at prescribed premises. Before disposal, waste generator must render scheduled

waste safe and store in proper container. "Scheduled wastes" means any waste falling within the categories of waste listed in the First Schedule (MDC Publishers Sdn. Bhd, 2006), Schedules wastes are categorize as shown in Table 2 (Azuddin, Hanum et al, 2005):

Table 2: First Schedule (Regulation 2)

SW 1 Metal and metal-bearing wastes
SW 2 Wastes containing principally inorganic constituents which may contain metals and organic materials
SW 3 Wastes containing principally organic constituents which may contain metals and inorganic materials
SW 4 Wastes which may contain either inorganic or organic constituents
SW 5 Other wastes
Remarks: For further details, please refer to First Schedule of Environmental Quality (Scheduled Wastes) Regulation 2005

Aspects that waste generators must be take cognizance of with regard to disposal of chemical waste as follows:

a. Regulation 4 - Disposal of scheduled wastes.
b. Regulation 5 - Treatment of scheduled wastes
c. Regulation 8 - Responsibility of waste generator
d. Regulation 9 - Storage of scheduled wastes
e. Regulation 10 - Labeling of scheduled wastes
f. Regulation 11 - Waste generator shall keep an inventory of scheduled wastes
g. Regulation 14 - Spill or accidental discharge

The waste generator can manage the generated waste "on site" or "off site" for treatment, disposal or recycling. "On-site treatment facility" means a facility, other than a scheduled wastes incinerator or a land treatment facility, located on a waste generator's site and that is used solely to deal with scheduled wastes produced on that site. The Contractors that conduct "On-Site Treatment" of Scheduled Waste are as shown at Table 3.

Table 3: On-Site Treatment Scheduled Waste Contractors in Malaysia

State & Contractor	Waste Group
Petronas Carigali Sdn Bhd, Miri Crude Oil Terminal, I	i. 'Sludge from effluent treatment System' (SW 311) ii. 'Crude Tank Bottom Sludges' (SW 310)
Labuan Crude Oil Terminal	i. Enapcemar from 'Crude Storage Tank' (SW 312) ii. Enapcemar from 'Effluent Treatment Plant' (SW 313)
Sabah Shell	iii.Enapcemar from 'Free Water Knock-Out Vessel' (SW 314)

Petroleum Co. Ltd.	iv. Enapcemar from 'Pigging' Operatin (SW 315) v. Enapcemar from 'Offshore Platform' (SW 316)

Source: www.doe.gov.my/

While "off site waste" are wastes that are managed at different site. Table 4 shows Contractors in Malaysia that conduct "Off Site Treatment" Schedule Waste.

Table 4: Off-Site Treatment, Scheduled Waste Contractors in Malaysia

State & Contractor	Waste Group
Kualiti Alam Sdn Bhd	All scheduled wastes except radioactive, clinical and explosive waste
Trienekens (Sarawak) Sdn. Bhd.	All scheduled wastes except radioactive and explosive waste

Source: www.doe.gov.my

6.0 CONCLUSION

In practically every Bioprocess Engineering workplace, where the work processes require transforming raw materials to products or by products, wastes are generated. The waste generated which falls under Schedule 1 of the Environmental Quality Act, 1974 (Environmental Quality (Scheduled Wastes) Regulation 2005) are considered hazardous**.** The likely hazards related with these chemicals are flammable, explosive or toxic properties etcetera. These hazards must be control so as to avoid industrial accidents and also occupational diseases at the workplace.

The employer and employees too ought to be aware of the relevant laws at the workplace base on the nature of the work. The laws which employer and employees must take cognizance of at the workplace are the "Occupational Safety and Health Act 1994 and Environmental Quality Act, 1974 (Environmental Quality (Scheduled Wastes) Regulation 2005). The adherence to these laws will avoid accidents and occupational diseases at the workplace.

7.0 RECOMMENDATIONS.

Based on the discussion aforesaid, to enhance awareness and improve the occupational safe and healthy at the workplace the following actions are recommended

a. Employers are to implement OSH Programs at the Workplace to enhance awareness and proficiency on safety and health at workplace amongst the employees.

b. Intensification of drive to propagate and instill awareness on the relevant laws at workplace especially chemical hazards through Special training courses for employees at workplace.

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