

Evaluation on Process Hazards Awareness in Handling Scheduled Wastes at a Urea Manufacturing Company

Nurul Nazleen Suhairi,^a Suryani Kamarudin,^{a,*}

^aSafety Engineering Interest Group (SEIG), Department of Chemical and Environmental Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

*Corresponding author: suryani@upm.edu.my

ABSTRACT: Toxic and hazardous wastes are defined in a schedule under the Environmental Quality (Scheduled Wastes) regulation 2005. Company A is a waste generator, thus, obliged to the regulation. Although awareness training has been conducted periodically, there are still recurring non-compliances. This research is to determine the process hazards awareness level of technical personnel in handling scheduled wastes for Company A via conducting a survey and detailed analysis on audit findings and training requirements. Target group of the study is Company A's technical executives. Sixty respondents (86%) completed the survey. The results shown that all respondents fully understand the characteristics of scheduled wastes on site. Misunderstandings were found in relation to method to reduce scheduled wastes, interpretation of pictogram for scheduled wastes and role and responsibilities of scheduled wastes handling and management. Five factors were identified as the main contributor towards the recurring non-compliances. Proposed interventions were executed and from weekly audit, no non-compliances observed after implementation for four consecutive months. It can be concluded that the proposed interventions are effective and confirmed that the study conducted has increased staff awareness on scheduled wastes hazards and risks.

Keywords: Non-Compliance at Workplace, Process Hazards Awareness, Scheduled Waste Awareness, Scheduled Waste Management, Training Requirements

All rights reserved.

1.0 INTRODUCTION

Scheduled wastes means any material falling within the categories of wastes listed in the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005 (Department of Environment, 2005). The criteria for scheduled wastes include metal and metal bearing wastes, wastes containing principally inorganic constituents which may contain metals, wastes containing principally organic constituents which may contain metals and inorganic materials, wastes which may contain either inorganic or organic constituents and any residues from treatment or recovery of scheduled wastes. There are 77 categories of scheduled wastes listed under the First Schedule of the Regulations (Department of Environment, 2005).

The toxic elements in scheduled wastes may be released to human and subsequently into the environment in three ways. Firstly, due to improper disposal of scheduled wastes, where scheduled wastes is normally disposed with municipal solid wastes and ends in non-hazardous landfill or is incinerated, and some are just dumped indiscriminately. Secondly, toxic substances are released into the environment through improper dismantling and precious material recovery processes, which release toxic substances into the air, soil and water; while the less precious (but highly hazardous materials) are disposed of in an unsafe manner. Thirdly, in relation to challenges faced in tracking down unlicensed or illegal scheduled

wastes recycling and material recovery activities. Due to the lack of appropriate methods and substructures, the workers and labourers working are fronting serious work related and health risks.

Having said that, many organizations face challenges to make the compliance programs pertaining to scheduled waste management sustainable. In a manufacturing company, regulatory compliance is among the key focus areas especially when it comes to health, safety and environment issues. Geddes (2017) claims that an organization that can mesh and implement compliance and integrity based ethics will have a strategic advantage over other businesses in the same industry. "Compliance needs integrity and integrity needs compliance" (Geddes, 2017). There are serious implications following a non-compliance including prosecution, exorbitant penalty cost or damage to reputation and brand. Yet, many organizations face challenges to make the compliance programs sustainable.

However, it is important to realize that an organization can technically has all the elements of a compliance program in other words the policies, the procedures and the training; but not actually has an effective culture of compliance. This is because full compliance is dependent upon the core ethical culture of the organization itself. According to the 2005 National Business Ethics Survey which found that employees in organizations with a weak ethical culture reported observing much higher levels of misconduct than employees in organizations with strong ethical cultures (70% compared to 30%) (Ethics Resource Center, 2005).

Furthermore, in measuring the effectiveness of a program, Richards (2007) suggested that the organization needs to think about measurements that include not just output, but that also include outcomes. In which, the organization not just measure the number of new surveillance reports, new training programs, new guidance provided to an organization's employees, but that organization also seek to measure the reduction or elimination of violations. In addition to that, Richards (2007) also suggested that there are five obstacles and pitfalls in improving an organization's culture of compliance which include lack of real management support, valuing risk-taking over all else, employees who do not understand the value or purpose of compliance obligations, lack of resources, and lack of constancy.

Richards (2007) suggested that education may help to emphasize that compliance is not about stifling risk-taking or profit-making, but about helping to ensure that risks are taken within the organization's tolerance for risk, and it may help to remind people that the organization and its franchise are bigger and more important than any one individual producer. He claimed that if the organization's employees do not affirmatively buy in to the value and the purpose of compliance, the compliance program would not be effective. Organizations that grab their employees' attention with real world examples of compliance issues by using videos, questions and answers, and other techniques seem to have a better chance at getting employees to understand and thereby to value compliance efforts. And, organizations that explain the underlying reasons for the compliance policies, and why they are good for the organization, do even better. Compliance education may be once a year, or may involve a big push in one area such as when new rules come out and then employees may never hear about the issue again. This is a common phenomenon in which we assume that if we tell people something important once, they will know it forever. Richard (2007) contends that this is just not true and in fact, repetition is key. For those provisions that rely entirely on behavioral compliance, there is a need to be very, very constant in delivering the message.

Apart from that, KPMG Risk Consulting (KPMG International Cooperative, 2016) also argued that compliance accountability starts with a strong culture of risk awareness with tone at the top, and reaches across the three lines of defence. The three lines of defence include business that is responsible for the design and execution of controls, compliance that oversees and implements the program to advise, challenge and assess compliance, and internal audit that provides the independent assurance of the first and second lines (KPMG International Cooperative, 2016). Apart from that, Cox (2007) also mentioned that leadership by example, good communication, and ongoing ethics education and training are all vital in setting up an ethical culture of an organization thus contribute towards overall culture of compliance.

Also, according to United States of America Department of Justice (2019) another hallmark of a well-designed compliance program is appropriately tailored training and communications. Prosecutors should assess the steps taken by the company to ensure that policies and procedures have been integrated into the organization, including through periodic training and certification for all directors, officers, relevant employees, and, where appropriate, agents and business partners. Prosecutors should also assess whether the company has relayed information in a manner tailored to the

audience's size, sophistication, or subject matter expertise. Some companies, for instance, give employees practical advice or case studies to address real-life scenarios, and/or guidance on how to obtain ethics advice on a case-by-case basis as needs arise. Prosecutors should also assess whether the training adequately covers prior compliance incidents and how the company measures the effectiveness of its training curriculum (United States of America Department of Justice, 2019).

As an organization that manufactures urea, Company A is part of the wastes life cycle as the wastes generator and thus, subjected to the scheduled wastes management regulation altogether. Even though scheduled wastes handling and management awareness training has been conducted periodically, there are still recurring non-compliances pertaining to scheduled wastes management at Company A such as unsealed wastes plastic bags kept next to equipment laydown area, insufficient cover causing rain water filled up wastes secondary containment, scheduled wastes and non-scheduled wastes are stored together, damaged bund wall which act as a wastes secondary containment and uncontrolled vegetation growth which caused blocked drainage leading to water accumulation. It is realized that there is a lack of understanding from technical personnel in the Company A on the process hazards of scheduled waste which leads to the recurring of non-compliances. The major problems on this issue is although many methods of awareness had been introduced and conducted in Company A, but non-compliances towards scheduled wastes handling and management practices still recurring. The other issue is that the top management of Company A does not directly address the compliance issues at site and need the justification to assess whether appropriate authority and accountability exists at all levels for compliance. It was strongly believed that by enhancement of measuring and promoting awareness attitudes of people on scheduled waste management could overcome any event or incident related to that issue. The quantitative survey conducted will gauge understanding on scheduled wastes hazards and its impact to health, safety and environment (SHE), investigate factors of non-compliances and propose recommendations to enhance scheduled wastes management program in Company A. This method will reduce the knowledge gap off all employee levels in Company A.

Although, compliance issues are a top concern for the Board and management committee of Company A, driving a growing cultural shift within the organization to view compliance risk management as an integral strategic investment is still a challenge by itself. Most of the time, the management failed to raise the real issues at site and ended up spending resources on secondary factors which does not directly address the compliance issues at site. In this case, the board needs to establish a strong tone at the top that demonstrates and communicates compliance as an investment. In addition to that, the management committee of Company A also needs to assess whether appropriate authority and accountability exists at all levels for compliance. There is a need for the management committee of Company A to receive regular and meaningful reports to understand the state of compliance at site in order to establish the right compliance culture. Thus, it is crucial to gauge the understanding of Company A's personnel at executive level on process hazards related to scheduled wastes handling and management in order to avoid non-compliances and prevent accidents from happening.

2.0 OBJECTIVE

The objective of this study is to determine the process hazards awareness level of technical personnel in handling scheduled wastes for Company A via conducting a thorough quantitative survey on process hazards awareness of technical personnel in handling scheduled wastes for Company A. The key objectives of this evaluation is to gauge understanding from technical personnel of Company A on scheduled wastes hazards and its impact to health, safety and environment, investigate the factors that contributed to recurring non-compliances towards scheduled wastes handling and management practices, and propose recommendations to enhance scheduled wastes management program in Company A and execute timely implementation to prevent recurring non-compliances.

The results obtain from the survey is crucial to improve current compliance programs at Company A. This research will cover technical executives from four departments namely Health, Safety and Environment (HSE) Department, Technical Services Department (TES), Maintenance Department and Productions Department with a total population of seventy (70) personnel. The scope covered in this study are the demography of the technical executives, the awareness and understanding on scheduled wastes hazards and its impact to health, safety and environment. The important point analysed is the main factors contributed to recurring non-compliances towards scheduled wastes handling and management practices

by taking periodic audit findings and employees training requirement as an input. Finally, intervention measures were proposed in order to tackle the recurring non-compliances followed by implementation at site. For closing the loop, periodic audit was enhanced to weekly in order to ensure constant review and updates of compliant status at site and subsequently, drive adoption of compliant practices as part of the organizational culture.

The study is foreseen to increase awareness on Process Safety especially on scheduled wastes hazards and its impact towards health, safety and environment among technical executives in Company A. From literature review conducted, many literature covers only electrical and electronic waste management while very limited sources discuss in detail about industrial waste from manufacturing company. Thus, the manufacturing company often falls into a huge gap of identifying ideas and intervention plan to address compliance issues pertaining to scheduled waste management at site.

Hence, the output of this research will help personnel in the manufacturing industries, especially those in health, safety and environment capability to establish the focus area for them to troubleshoot on the main factors of recurring non-compliances towards scheduled wastes handling and management practices at their site. Personnel in the manufacturing industry fraternity may adopt the evaluation approach of using quantitative survey, periodic audit findings and employees training requirement as an input to gauge on the factors that contribute to non-compliance at site. Finally, intervention measures that were proposed in this research can be duplicated with some customization tailor made to specific company's framework in order to tackle the recurring non-compliances at site.

3.0 METHOD

The target group of the study was technical executives working in Company A from namely Health, Safety and Environment (HSE), Technical Services (TES), Productions and Maintenance Department. The choice was mainly due to the fact that the personnel from these departments were major scheduled wastes generators in which they contributed to 90% of the total amount of scheduled wastes generated overall. According to the 'Pareto Principle of 80-20 rule' by Dunford et al. (2014), by targeting to this group of people, it is expected that most of the issues related to recurring non-compliances that happened will be addressed. Overall, this study was using a plan, do, check and act (PDCA) cycle approach.

Simple random technique was used in sampling for technical executives in Company A which were segregated to respective departments (Health, Safety and Environment, Technical Services, Maintenance and Production Department) for ease of establishing intervention plan. When conducting probability sampling, it is important to use the appropriate sample size. For a total population of 70 pax, with confidence level of 95% and margin of error of 5%, the sample needed is 59 pax (Paul et al., 2019).

The study starts with establishment of safe handling of chemical and scheduled wastes procedure and overall yearly plan as part of Company A's environmental management plan, followed by conducting safe handling of chemicals and scheduled wastes management training to all relevant personnel.

During the execution of the plan, periodic audits were conducted to gauge on the effectiveness of current plan and to identify further opportunities for improvement. Three types of site audit conducted which include tier 1 audit on scheduled wastes management conducted weekly, Management Health, Safety and Environment (MHSE) audit conducted monthly and Mandatory Control Framework (MCF) audit conducted quarterly.

Following inputs from the weekly, monthly and quarterly audits conducted, a questionnaire was issued out prior to Company A's turnaround which was scheduled between October until December 2018. This survey questionnaire objective is to gauge the understanding on scheduled wastes handling and management of technical executives working in Company A in terms of real practice and available procedures at site.

The findings from the survey questionnaire were then analyzed in order to become an input for Company A's intervention plan. The intervention plans identified were executed as part of Company A's Strategies and Initiatives for the

turnaround. Throughout the turnaround duration, site audit was intensified to weekly in order to assess the effectiveness of the intervention plan proposed. The feedbacks acquired from all audits, survey and questionnaire were being consolidated to further improve Company A's environmental management plan and overall scheduled wastes management program.

4.0 RESULTS AND DISCUSSION

From the survey conducted, four root causes were found to be related to the recurring non-compliances at site for Company A which include inadequate coverage of scheduled wastes handling and management training to all Company A's personnel, misunderstandings on the method to reduce scheduled wastes at site, misinterpretation of scheduled wastes pictogram on the waste collection area and unclear of the specific individual roles and responsibilities of scheduled wastes handling and management.

Six intervention plans were proposed and executed in order to tackle the root causes highlighted above include update and enhance the safe handling of chemicals and scheduled wastes management training pack to include specific individual role and responsibilities of safe handling of chemicals and scheduled wastes at site, replace scheduled wastes pictograms with actual scheduled wastes pictures at site, increase audit frequency from monthly to weekly, establish '*Collect and Redeem Program*' campaign, nominate focal person from each department and establish scheduled wastes minimization at source plan which identifies process operations that generated most scheduled wastes from the total inventory and subsequently conduct process parameters adjustments and lastly include scheduled wastes handling and management training as part of compulsory training requirement for all technical staff.

As part of the proposed intervention plan above, a scheduled wastes management Information to Public (ITP) session was conducted for all staff of Company A. A total of 389 personnel attended the session which covers 85% of total population of Company A's staffs inclusive of Executives and Non-Executives. Those who did not attend the session are identified from shift groups in which they are subjected to a more formal and structured training modules pertaining to safe handling of chemicals and scheduled wastes. Overall, the coverage of the session and structured training have reached 100% of the total Company A's staff population. Feedback form was issued out to gauge the understanding of Company A's staff on safe handling of chemical and scheduled wastes procedure and practices after the session.

From the feedback forms gathered, 97% agreed that the session has achieved its objective of increase awareness on safe handling of chemicals and scheduled wastes, iterating scheduled wastes hazards and risks as part of scheduled wastes handling and management program. 99% of the respondents agreed that scheduled wastes handling and management safety hazards and requirements have been effectively communicated and 97% of total population agreed that they understand clearly hazards related to safe handling of chemicals and scheduled wastes. Likewise, 98% agreed that proactive steps that need to be taken for safe handling of chemicals and scheduled wastes during scheduled wastes handling and management have been clearly explained and 95% of the total population said that all information that has been shared is clear and easily understood. Program effectiveness score has also increased from an average score of only 3.34 which is equivalent to 67% to an average score 3.43 which is equivalent to 86%.

In accordance to the root cause of inadequate coverage of training, Charles (2005) claimed that a culture of compliance is evidenced by people working toward common and understood goals, with clear and consistent communication, efficient monitoring and reporting, and decisive action to investigate anomalies and take corrective action as needed. The survey results support this statement by showing significant correlation between an increase in process hazards awareness (from 67% to 86%) and reduction of non-compliance cases (from five cases every month to zero cases within the duration of four months). Apart from that, the survey results also support the presumptions from Charles (2005) that culture of compliance is evidenced by people working toward common and understood goals where it was observed there was an abrupt reduction in number of non-compliances at site when common goals has been established and expectations are clearly communicated across. By changing the scheduled wastes pictogram into real pictures, the respondents can directly relate on the hazards and risk of mishandling scheduled wastes to their health and safety and thus work together to fully comply to the requirements stipulated in the Company A's work procedure.

Apart from that, Richards (2007) claimed that if the organization's employees do not affirmatively buy in to the value and the purpose of compliance, the compliance program would not be effective. From the survey, the buy in of personnel in Company A was enhanced by reiterating the roles and responsibilities related to scheduled waste handling and management via enhancing relevant training materials for all personnel that involve in scheduled waste handling. Apart from that, the training pack was also enhanced by using real pictures of scheduled wastes at site instead of pictograms. The hazards and impact of scheduled wastes to personnel health was highlighted precisely in the training pack to nurture culture of compliance. This is to create common understanding towards the importance of compliance when it comes to scheduled wastes handling and management in Company A. As a result, Company A establishes a common goal which leads to outstanding results of zero non-compliance for five consecutive months after all intervention plans executed.

Also, Richards (2007) suggested that the organization needs to think about measurements that include not just output, but that also include outcomes. In which, the organization not just measure the number of new surveillance reports, new training programs, new guidance provided to an organization's employees, but that organization also seek to measure the reduction or elimination of violations. In this study, this was achieved by improving the frequency and effectiveness of periodic audit from monthly to weekly in order to measure the reduction or elimination of violations once the intervention plan has been executed. By having a weekly audit on scheduled wastes handling and management with no further non-compliances observed in the month from October 2018 until February 2019, this can confirm that an increase in site surveillance frequency may improve hazards awareness of relevant personnel.

In short, this can conclude that the survey with its intervention plan execution has positively improved the scheduled waste handling and management awareness for all personnel in Company A. However, in order for this improvement to sustain, the training to all relevant personnel of Company A has to be repeated periodically for it to become an embedded safety culture in each and every one of Company A personnel. Employees in organizations with a strong ethical culture were more likely to report the misconduct than those in weak-culture organizations (79% compared to 48%) according to Ethics Resource Center (2005). This will over time reduce and eliminates the misconduct or non-compliances altogether.

In addition to that, Richards (2007) also suggested that there are five obstacles and pitfalls in improving an organization's culture of compliance which include lack of real management support, valuing risk-taking over all else, employees who do not understand the value or purpose of compliance obligations, lack of resources, and lack of constancy. It is crucial for Company A to follow through the implementation of the proposed intervention plan with continuous improvement initiatives so that the intervention program remains relevant and zero non-compliances can be sustained.

5.0 CONCLUSION

In summary, the survey conducted in Company A on evaluating the process hazards awareness of handling scheduled wastes have reached the targeted audience with 95% confidence level. The root causes for non-compliances identified and the intervention plans proposed were executed in October and November 2018. Based on the observations from periodic scheduled wastes audit which frequency has been revised from monthly to weekly, there is no non-compliances observed with regards to scheduled wastes handling and management from the month of October 2018 until February 2019. Therefore, it can be concluded that the proposed intervention plan has reached its objective and targeted audience. This confirms that the "Evaluation on Process Hazards Awareness in Handling Scheduled Wastes at a Urea Manufacturing Company" has increased staff awareness on scheduled wastes hazards and risks on health, safety and environment and at the same time has reduced and minimized incidents and non-compliances at workplace for Company A.

Recommendations are to extend this evaluation study to contractors of Company A's so as to get a correct impression of the actual implementation at site on safe handling of chemicals and scheduled wastes. Correspondingly, the intervention plans that has been executed need to continue so as to have a sustainable implementation and safety performance at site. Some limitations of the study include limited coverage of the population samples which target only to technical executives of Company A. Thus, the study will be confined to the Process Safety culture of the particular company of study and might not be applicable to the public at large. Further customization is needed if the similar quantitative evaluation is to be conducted to a different group of people.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the Ministry of Education of Malaysia and Universiti Putra Malaysia for the support given in this study. Special gratitude's to the management committee and fellow colleagues of Company A in sharing the knowledge and active participation in the surveys.

REFERENCES

- Charles, H. (2005). *Building a Culture of Compliance*. Retrieved June 21, 2019, from <http://www.ibs-us.com>
- Cox, C. (2007, September). Doing the Right Thing; Christopher Cox, Chairman of the SEC, sets the tone in a Q and A on ethics. *Speaker Magazine*.
- Department of Environment. (2005). *Environmental Quality (Scheduled Wastes) Regulations 2005*. Malaysia: Department of Environment.
- Dunford, R., Su, Q., Tamang, E. & Wintour, A. (2014). The Pareto Principle. *The Plymouth Student Scientist*, pp. 140 - 148.
- Ethics Resource Center. (2005). Retrieved 21 June, 2019, from <https://i-sight.com/resources/ethics-resource-centre/>
- Geddes, B. (2017). Integrity or Compliance Based Ethics: Which Is Better for Today's Business? *Open Journal of Business and Management*, 05(03), 420-429. doi: 10.4236/ojbm.2017.53036
- KPMG International Cooperative. (2019). *Boardroom Questions: A Sustainable Approach to Compliance and Culture*. KPMG Risk Consulting. Retrieved June 21, 2019, from <https://home.kpmg/content/dam/kpmg/be/pdf/boardroomquestions/boardroom-questions-a-sustainable-approach-to-compliance-and-culture.pdf>
- Paul, C., Patt, M., & Karla, B. (2019). *The Research Advisors: Research Methodology, Study Design & Statistical Analysis*. Retrieved June 21, 2019, from <https://www.research-advisors.com/>
- Richards, L. (2007). Speech by SEC Staff: Working Towards a Culture of Compliance: Some Obstacles in the Path. Speech, Washington D.C.
- United States of America Department of Justice Criminal Division. (2019). *Evaluation of Corporate Compliance Program Guidance Document*. United States of America.