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THE EFFECTIVENESS OF HEALTH AND SAFETY PROCESSES IN THE WASTE AND RECYCLE INDUSTRY: THE UK AS A CASE STUDY

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ABSTRACT

Waste management remains a pivotal consideration in any society that is interested in sustainable development, an appreciation of this reality therefore prompted an investigation into the Waste and Recycle industry with respect to the effectiveness of the established safety processes within the industry. The relationship between leadership and the effectiveness of safety processes was also investigated.

In this paper, a bold methodology was explored in the analysis of the established accident trends within the industry by under stating the dependence of the effectiveness of any process on the elements of Process Safety Management (PSM) rather than a simple exploration of processes. This paper subsequently established that increased trends in subcontracting would lead to a weakness in all 14 elements of Process Safety Management (PSM) thus compromising any safety process in place while increased legal compliance will strengthen any safety process since the elements of PSM are also strengthened. This paper also attempted to ensure completeness in considering the influence on leadership on the effectiveness of safety processes.

Indeed this investigation propelled critical thinking in proposing a different approach in the analysis of safety processes within the Waste and Recycle industry establishing a possible methodology in future investigation into the effectiveness of any safety process within any industry without compromising practicability.

Keywords— Process Safety Management (PSM), sustainable development, Waste and Recycle industry

I. INTRODUCTION

A comprehensive approach to health and safety in the work place constitutes a major aspect in organisational operations more so as it directly affects Human capital sustainability, health and safety practises are inseparable from contemporary business practice (Chapman 2012).

The need for a critical consideration health and safety practises of Waste Management and Recycling becomes obvious when we appreciate the significant proportion of human capital utilized in the industry with waste management being the largest employer of municipal labour and transport in developing countries (Bartone, Bernstein and Wright 1990). This human capital component when exposed to waste is exposed to health and physical injury. Some of these health-associated risks arise due to airborne dust, bio aerosol, chemicals used or liberated in specific operations, heavy metals and/or carcinogens liberated in recycling, infectious agents, high temperatures and heat related illness (The Royal Society for the Prevention of Accidents 2013)

This report will attempt to explore the effectiveness, strengths and weakness of the safety processes with respect to Waste Management and Recycling , focusing on non-hazardous waste (such as household or municipal waste) as well as investigate the influence leadership has on the effectiveness of workplace processes in continuously reducing workplace accidents. In identifying the weakness and strengths of safety processes, Process Safety Management underlying principles are utilized.

II. WASTE MANAGEMENT AND RECYCLING

The EU Waste Framework Directive defines waste as any substance or object, which the holder discards or intends to discard, the industry motivates the improvement of the waste converting into resource systems while reducing the waste destined for disposal. The industry ultimately aims at alleviating the impacts to the environment catalysing the development of the economy and quality our habitat(McCull 2013). The industry is concerned with the production , management and disposal of waste and is

sometimes described with reference to the waste hierarchy concept which categorises five distinct phases of Waste Management in order of importance based on environmental gains of each phase (Bernan 2008). Figure 1 clearly shows the waste management hierarchy

Figure 1: Waste Management Hierarchy (United States Environmental protection Agency 2013)

It is logical to state that the consideration of the major stages of Waste Management and Recycling will aid in the application of Process Safety Management (PSM) principles to the entire process.

The consideration of the typical flow chat in Figure2 will show that that the entire process consists of five major elements:

- Waste generation and storage,
- Waste collection,
- Waste disposal
- Waste transfer and transport,
- Waste processing and recovery

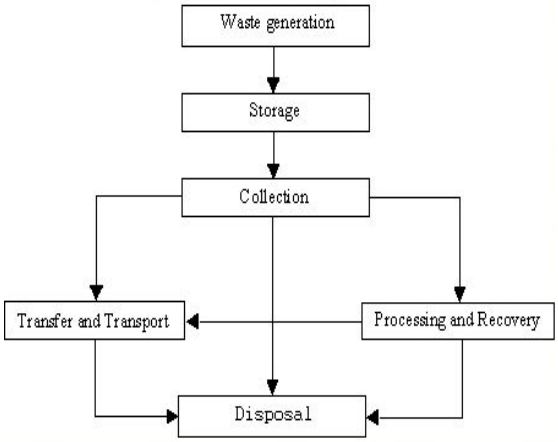

Figure 2: Flow chart shows the interrelationship between the functional elements in Solid Waste Management (Indian Institute of Science 2013)

In general, in applying safety processes within any industry irrespective of the existing flowchart, it is most effective to explore elimination of the risk before the utilisation of engineering controls, then warnings before considering training and the use of personal protective equipments (United Steel Workers 2009).

III. THE PROCESS SAFETY MANAGEMENT

This paper will attempt to consider the subject matter from a different dimension via the application of the elements of Process Safety Management rather than simply considering weakness in risk assessment processes.

Hardy (2013) considered process safety management as characterized by 14 major elements, which are employed in the utilisation of management principles, and systems to identify, understand, and control of process hazards by proactively identifying hazards and risks while taking appropriate actions to reduce those risks.

A simple Process Safety model is shown in Figure 3, it is clear from the model that equal significance is given to the elements and the overall sustainability of the model is a function of the Management's level of leadership and commitment.

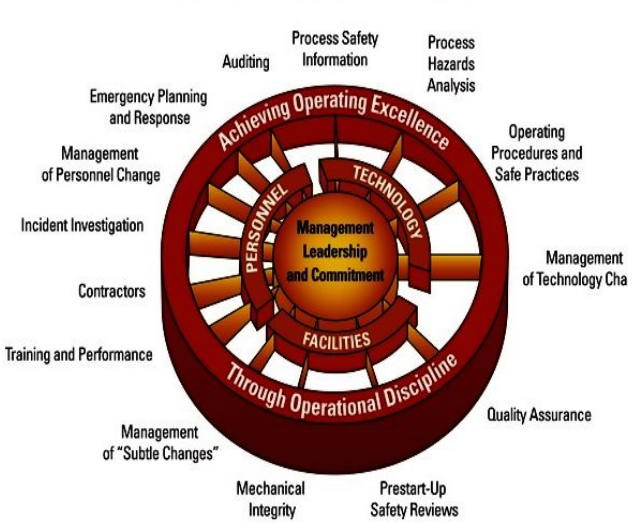

Figure 3: A simple Process Safety model (Dupont 2013)

It becomes clear that the application of the principles of Process Safety Management to the waste management and recycle industry will assist in identifying loopholes in the entire safety process.

Elements	**Notes**
Employee Participation	Involves consultation with employees to ensure that there is a full understanding of hazards and risks in the process
Process Safety Information (PSI)	Involves compiling the technical information on the process and equipment prior to conducting a Process Hazard Analysis (PHA)
Process Hazard Analysis (PHA)	Usually conducted by a team Knowledgeable in process operations, including at least one employee who has experience and knowledge on the system
Operating Procedures	operating procedures that provide instructions should be clearly stated and should be readily accessible to employees
Training/ performance	Each employee must be fully trained on both the process and the operating procedures
Contractor Safety	Contractors who work with and around hazardous chemicals must possess the skills and knowledge to perform those tasks without compromising safety
Pre-Start up Safety Review (PSSR)	There should be a review of start up operations since accidents can occur during start-up, especially during a new process.
Incident Investigation	This involves a careful analysis of an incident to ascertain the root cause
Mechanical Integrity	An organisation must establish and implement identified procedures for maintaining equipments
Hot Work Program	Employers must issue a hot work permit for hot work operations, that are conducted on or near a covered process such as welding operations
Management of Change (MOC)	Changes must be thoroughly evaluated to assure that safety is maintained

Emergency Planning and Response	Organisations must plan for an emergency and be prepared to respond. At a minimum, employers must develop an emergency action plan that includes evacuation and shelter-in-place instructions and training in the use of personal protective equipment
Compliance Audits	Compliance audits provide a means for assuring that the procedures and practices in the PSM Standard are adhered to. These compliance audits are conducted at least every three years
Trade Secrets	Organisations must make critical safety information available even if trade secrets are included although confidentiality agreements to assure that the information is not disclosed

Table 1: Elements of Process Safety Management (PSM) (Leidos 2013)

IV. RISK ASSESSMENT AND PROCESS SAFETY MANAGEMENT

The significance of risk assessment as a tool in maintaining and ensuring efficient Process Safety Management cannot be overlooked. The relationship is made clearer when we appreciate that Risk Assessment assists in risk identification while helping to evaluate overall process safety while Process Safety Management attempts to provide layers of protection against accidents (Centre for Chemical Process Safety 2012).

Cooper, F. D. et al. considered Risk Assessment as the overall use of Risk Analysis and Risk Evaluation in other to help develop agreed priorities for the identified risks. Rise Analysis is the systematic use of the available information to determine how often specified events will occur and the magnitude of their consequences while risk Evaluation is the process of comparing the estimated risk against risk criteria to determine the significance of the risk. Consequently risk analysis, risk evaluation, risk control and risk assessment are considered as sub-constituents of the entire Risk Management process (Rausand 2011)

HSE (2006) subsequently identified the five steps of risk assessment a consideration of these steps with respect to the Waste and recycling industry is shown in Table 2

Steps identified	**Notes**
Identify the hazards	Hazards such as infectious diseases or hazards due to sharp edges
Decide who might be harmed and how	Determining if it is the waste collectors or equipment operators that could be harmed and how , such as exposure to air borne pathogens or wrong use of equipments)
Evaluate the risks and decide on precautions	By utilizing a Risk Matrix the severity of the risks identified will be determined and precautions such as the use of personal protection equipment decided upon
Record your findings and implement them	Base on the evaluations, precautions are selected and implemented
Review your assessment and update if necessary	Assessments are made , control measures effected, process updated

Table 2: Major steps utilised in risk assessment

V. ACCIDENTS IN THE WASTE MANAGEMENT AND RECYCLE INDUSTRY CONSIDERING THE UNITED KINGDOM AS A CASE STUDY

A consideration of the statistics in Britain indicates that although the industry accounts for only about 0.6% of the employees in Britain it is still responsible for 2.8% of reported injuries to employees (11% fatalities,

2.6% major and 2.8% of over seven day injuries) which is significantly high (HSE. 2013a)

To aid the analysis of available data HSE (2013b) categorised the industry based on core activities within the industry. The core activities are:

- Waste collection, treatment and disposal activities; materials recovery (coded SIC 38)
- Wholesale of waste and scrap, including collecting, sorting, separating, stripping of used goods such as cars in order to obtain reusable parts (coded as SIC 46.77)

These categorisations as presented by HSE will be explored via considering the elements of PSM in an attempt to determine what the factors will lead to weakness to the elements and subsequently weakness in any safety process in place.

VI. AN OVERVIEW OF THE INDUSTRY BASED ON CORE ACTIVITIES

An attempt will be made in investigating the variations observed in the rates of reported accidents according to fatalities, major and over seven/ three day as illustrated in Figures 4, Figure 5 and Figure 6

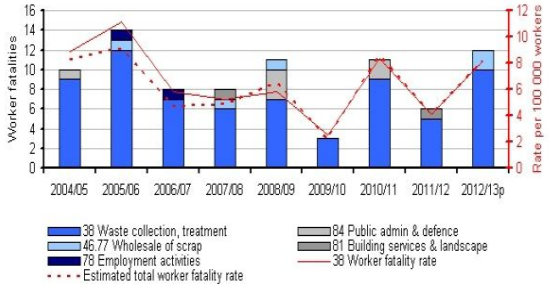

Figure 4: Worker fatal injuries and rates of fatal injury in waste and recycling (RIDDOR) (HSE 2013c, pp7)

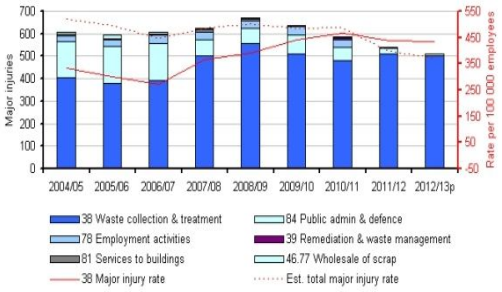

Figure 5: Number and rate of major injury to employees in waste and recycling (RIDDOR) (HSE 2013d , pp 8)

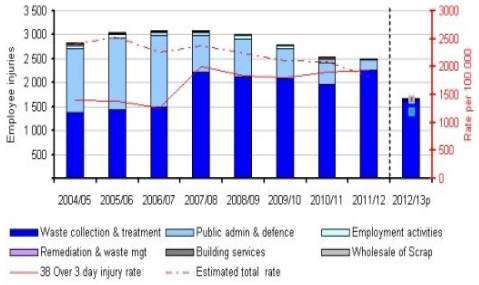

Figure 6: Over three day and over seven day injuries and rates of injury to employees in waste and recycling (RIDDOR) (HSE 2013e, pp 9)

Figure 4 is characterised by year to year changes in the over all estimated worker fatality rate, thus it is clear that there was no overall trend.

However, considering Figure 4, Figure 5 and Figure 6 it is clear that a majority all accidents occurs during the waste collection and treatment with an increase with slight various for Figure 5 and Figure 6 till 2012/2013 for the years under investigation. According to HSE.2013f this situation is a direct consequence of an increase in the number of accidents coded under this activity the over the years. The application of the elements of process safety management principles provides an alternative explanation for the predominance of fatalities, minor injuries and over three day and seven day injuries due to the waste collection and treatment activity.

It is possible that the predominance is due to an increase in subcontracting to smaller Waste Management Service providers and waste collectors (Jalil 2010). Gochfeld and Mohr (2007) subsequently established that this increase in subcontracting makes it increasingly difficult to protect the workers within the

sector a situation that may compromise the entire process safety management due to arising weaknesses in the standard elements of safety management as illustrated in Table3

Possible accidents during waste collection and treatment	Safety process weakness based on the elements of Process Safety Management
Road Accidents	Mechanical integrity : Poor maintenance of vehicles Training: Poor Training on the proper driving protocol
Trips, Slips and Falls	Process Hazard Analysis (PHA) : Poor analysis of the hazards
Lacerations and Needle sticks	Process Safety Information (PSI) : there is no information on the need for Personal Protection Equipment (PPE) at all times Process Hazard Analysis (PHA) : Poor analysis of the hazards inherent such as exposure to sharp edges
Muscular stress while lifting, carrying and putting down objects	Training: Poor Training on the proper ways of load lifting
Contact with moving machinery	Training: Poor Training on the proper ways of handling machinery Operating procedures : poorly transmitted operating procedures that provide clear instructions on how to machine should be operated
Injuries due to exposure to extremes of temperature, UV exposure during waste treatment	Employers must issue a hot work permit for hot work operations, that are conducted on or near a covered process such as welding operations Process Safety Information (PSI); on the need to wear Personal Protection Equipment (PPE) as well as operational awareness

Table 3: Possible weakness in the process safety management that may arise due to subcontracting

In addition, it is also possible that the observed decrease in accidents due to waste collection and treatment activities observed in Figure 5 and Figure 6 in 2012/2013 may be a direct consequence of the new European Union's approach, which considers waste reduction as a key factor in Waste Management (European Commission 2013). It is therefore logical to state that if there is a reduction in the waste collected and treated less opportunities for accidents and injuries will exist.

A consideration of Figure 5 reveals a notable trend in the second core aspect of the sector previously identified the wholesale of scrap (coded as SIC 46.77). It is observed that there is an overall decrease in the predominance of accidents due to wholesale of scrap related activities within the years under investigation. HSE.2013g considered this trend to be due to the changes in the coding system and also the fact that wholesalers are also involved with collecting, sorting or breaking up scrap which are activities usually coded within waste collection, treatment and disposal (coded SIC 38).

It is also possible that the observed trend is due to some UK recycling targets set out in the Waste Strategy of 2000. It is interesting to note that some of the targets set a deadline date for implementation for 2006 while a net decrease in the proportion of accidents due to wholesale of scrap observed in 2007, a year after the implementation targets (Hawkins and Shaw 2004). Thus, it is safe to assume a correlation between the legislation and the established trend. Indeed a logical correlation may be established between the strengthening of the elements of PSM due to improved compliance to legislation leading to a 'stronger' safety process within the industry.

Some notable legislation includes:

- The 2002/95 Restrictions of Hazardous Substances Directive
- The 2002/96 Waste Electrical and Electronic Equipment Directive
- The 2002/53 End of Life Vehicle Directive
- The 99/31 Landfill Directive

This introduction of laws from the year 2000 subsequently led to increments in the cases successfully persecuted with defaulters of the laws considered to have committed a 'Waste Crime'. Apart from this general waste related legislation, certain worker specific laws with special emphasis placed on the European Standards Personal Protective equipment standard, which was amended and strengthened leading to improvements in the Process Safety Management (European Commission 2013). Figure 7 shows the trend in the cases prosecuted.

The decrease in the prosecutions may be because of possible improvements in adherence with legal requirements leading to an overall safer industry; it is safe to state that this may also have contributed to the observed reduction in wholesale of scrap related injuries observed in Figure 5.

The reduction in 'Waste Crime' prosecution observed by a significantly negative slope from year 2011/2012 may also be significant factor to consider in accounting for the sharp decrease in the waste collection and treatment accidents observed in Figure 6.

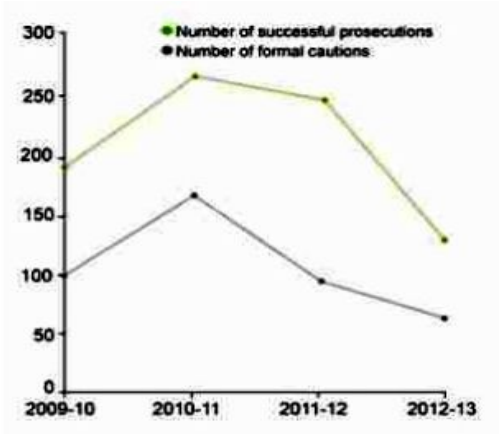

Figure 7: Trends in waste crime prosecutions (Holder 2013)

Thus having examined the core activities of the Waste Management and Recycle industry it is clear that the weakness in the Waste collection, treatment activities (coded SIC 38) may be a direct consequence of the increase in subcontracting as established earlier, a situation that will lead to an overall weakness in all the elements of Process Safety Management (PSM). This scenario is a likely cause of the net increments in accidents observed in Figure 5 and Figure 6 until 2012/2013 rather than simply changes in coding emphasised by HSE. While improvements observed from 2012/2013 in Figure 6 may be a consequence of improved adherence to legal requirements, a situation mirrored in activities associated with wholesale of scrap where the significance of legal adherence in determining the trend is a possibility.

VII. ROLE OF LEADERSHIP IN SUCCESSFUL IMPLEMENTATION OF SAFETY PROCESS

The role of effective leadership in the successful implementation of any safety process cannot be over emphasised indeed it has been shown that effective communication between the employees and supervisors have also will significantly affect specific employee behaviours with particular reference to the overall safety performance (Michael et. al. 2006). This assertion was aptly supported by Cohen (1977) when he emphasised the role of safety conscious leaders in promoting occupational safety within organisations subsequently leading to improved safety records.

The influence of leader on the organisational safety is illustrated in the model of micro-macro organisational factors hypothetically influencing the propensity of workgroups to take safety initiatives shown in Figure 8

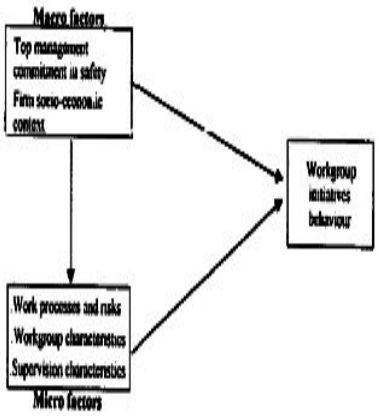

Figure 8: Model of micro-macro organisational factors hypothetically influencing the propensity of workgroups to take safety initiatives (Simard and Marchand 1995, pp 115)

A consideration of Figure 8 will show the overall dependence of workgroups behaviour with respect to safety activities on macro and micro factors with the leadership element illustrated as Top management commitment to safety and Supervision characteristics clearly identified.

VIII. HOW LEADERSHIP INFLUENCES SAFETY PROCESSES

In general, seven major leadership theories are obtained from literature as identified by Shu (2013):

- Transactional theories; focus on benefits obtainable
- Transformational theories; focuses on change and intrinsic value
- Behavioural theories; emphasis is placed on what leaders do rather than their traits
- Situational Theories; considers leader as fluid depending on the prevailing situation
- Contingency Theories; a modification of situational theory dependent on identifying variables that determine a situation
- Trait; based on the assumption that a leader must possess characteristic traits or qualities
- Great-man; based on the assumption that leaders are born not made

However, in considering the influence leadership on the effectiveness of the application of any safety process the transformational-transactional leadership theory will be explored since it is the most general in application and has been used in the study of leaders in different sectors (Bass and Bass 2009). A transformational leader is that leader that offers a purpose that far beyond the achievement of short-term goals with emphasis placed on the satisfaction of higher order intrinsic needs a behaviour that contrasts sharply with the transactional leader who is concerned with short-term resource exchange and satisfaction (Judge and Piccolo 2004).

An investigation of the influence of a leader exhibiting either transformational or transactional behaviour is therefore summarised in Table 4.

Having established a direct correlation between leadership and workgroup behaviours with particular emphasis the effectiveness of any safety process it is clear that the level effectiveness and clarity of leadership in any organisation will have far reaching consequences for the safety practise in that organisation.

Leadership level	Transactional behaviours	Transformational behaviours
Supervisors	Transactional behaviours can influence safety by monitoring, auditing and reinforcing workers' safe behaviours via mandatory participation in workforce safety activities (May also influence transformational behaviour)	Transformational behaviours can influence safety by supporting safety initiatives through an active encouragement of involvement in safety initiatives

Middle managers	Transactional behaviours can influence safety by being involved in safety initiatives (May also influence transformational behaviour)	Transformational behaviours can influence safety by ensuring that safety is emphasised beyond the need for productivity, while ensuring that a decentralised style is adopted in communicating the organisation's vision of safety to supervisors
Senior managers	Transactional behaviours can influence safety by complying with regulatory requirements while ensuring that resources are provided for a comprehensive safety programme	Transformational behaviours can influence safety by exhibiting an undisputed commitment to safety while promoting participatory styles in supervisors and middle managers

Table 4: Influence of leader on safety behaviour (Flin and Yule 2004)

IX. ETHICS IN LEADERSHIP

Ethics refers to the tool that is utilised in the examination of the rational justification of moral judgments made. It defines the elements considered essential to human well-being while proposes principles utilised as the basis of ethical culture in other words it refers to all , standards, rules, agreements and values adopted by people in conducting their lives (Washington Ethical Society 2013, Treasury Board of Canada Secretariat 2005). Thus, the prevailing ethical code of an organisation will govern the leader's behaviour and decisions with regard to all policies, which also includes the safety related policies (Mendonca and Kanungo 2006).

Having established the role and influence of leadership in the effectiveness of safety processes it is clear that the extent of completeness in the application any safety process will be a direct determinant of the moral basis of the leaders judgements, thus;

(Ethics + Leadership) = f (Effectiveness of any safety process)

X. CONCLUSION

This report was expected to explore the conflicting values and issues of safety processes while investigating the influence of leadership and supervision in relation to ensuring effective workplace safety. The investigation was done via the extensive consideration of the distinct aspects of the safety process:

The effectiveness of the safety process

- The waste and Recycle industry was considered with respect to the core activities identified to determine the effectiveness of safety practises by utilising the Process Safety Management principles

The weaknesses of the safety process

- Increase in subcontracting within the sector was identified as a possible reason for the increase in accidents during the waste collection and treatment activity leading to weakness in all the elements of the Process Safety Management

The strengths of the process

- This was explored by analysis of the trend observed during the whole sale of scrap with increase in legal compliance identified as a possible reason for a decrease in the accidents during that activity. This increase in legal compliance will lead to a strengthening of the elements of Process Safety Management ultimately strengthening any safety process in place

The critical significance of leadership and supervision to successful implementation of any safety processes

was also explored by considering the transformational-transactional leadership theory in an attempt to establish a correlation between leadership and successful safety process implementation, with the overall dependence on ethics also identified

XI. ACKNOWLEDGMENT

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XII. REFERENCES

1. *Bartone,C., Bernstein, J.D. and Wright, F.W.1990 .Investments in the solid waste management : Opportunities for Environmental Improvement. Washinton: World Bank Publications*
2. *Bass, B. M and Bass, R. 2009. The Bass Handbook of Leadership: Theory, Research, and Managerial Applications.4th ed. New York: Free press.*
3. *Bernan .2008. Waste Reduction : 6th report of session 2007-08, Vol. 2: Evidence. Westminster: The Stationery Office*
4. *Centre for Chemical Process Safety .2012.Guidelines for Engineering Design for Process Safety.2nd ed. New Jersey .Wiley.*
5. *Chapman, R.J. 2012. Simple Tools and Techniques for Enterprise Risk Management.2nd ed. West Sussex: John Wiley and Sons*
6. *Cohen, A. 1977. Factors in successful occupational safety programs .Journal of Safety Research. 9 (1): pp.168–178.*
7. *Cooper, F. D. Et al. 2005. Project Risk management guidelines Managing risk in Large Projects and complex procurements . West sussex :John Wiley and sons*
8. *Daniel Shu. 2013.The leader : five leader types: The Personality Approach Leader (PAL).Paris: L'Harmattan*
9. *Dupont.2013. DuPont Process Safety Management Program Methods. [online image]. Available from:http://www.dupont.com/products-and-services/consulting-services-process-technologies/operation-risk-management-consulting/uses-and-applications/risk-management-consulting.html [Accessed 8 December 2013].*
10. *European Commission. 2013. Waste. [Online] Available from: http://ec.europa.eu/environment/waste/ [Accessed 30 December 2013*
11. *European Commission.2013. Personal protective equipment. [Online] .Available from: http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/personal-protective-equipment/index en.htm [Accessed 30 December 2013]*
12. *Flin, R. and Yule, S. 2004. Leadership for safety: industrial experience. Qual Saf Health Care. 13(2): pp. 45-51*
13. *Gochfeld, M. and Mohr, S. 2007. Protecting Contract Workers: Case Study of the US Department of Energy's Nuclear and Chemical Waste Management. American Journal of Public Health. 97(9): pp.1607-1613.*
14. *Hardy, T.L. 2013. Elements of Process Safety Management: Case Studies [online]. The system safetyskeptic.Availablefrom:http://systemsafetyskeptic.com/yahoo_site_admin/assets/docs/Elements_of_PSM_Terry_Hardy.51145540.pdf [Accessed 8 December 2013].*
15. *Hawkins, R. G. P. and Shaw, H. S. 2004. The Practical Guide to Waste Management Law. London: Thomas Telford)*
16. *Holder,M.2013. Waste crime prosecutions fall in 2012/13.[Online image] Available from: http://www.letsrecycle.com/news/latest-news/waste-management/waste-crime-prosecutions-fall-in-2012-13 [Accessed 30 December 2013]*
17. *HSE.2006. Five steps to risk assessment. [online].Available from: http:// www.hse.gov.uk /pubns/indg163.pdf [Accessed 8 December 2013].*
18. *HSE.2013a. Waste and Recycling. [Online] Available from: http:// www.hse.gov.uk /statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 October 2013].*
19. *HSE.2013b. Waste and Recycling. [Online] Available from: http://www.hse.gov.uk /statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 October 2013].*

HSE.2013c. Waste and Recycling. [Onlineimage] Available from: http://www.hse.gov.uk/ statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 October 2013].

20. HSE.2013d. Waste and Recycling. [Onlineimage] Available from: http://www.hse.gov.uk/ statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 October 2013]

21. HSE.2013e. Waste and Recycling. [Onlineimage] Available from: http://www.hse.gov.uk/ statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 October 2013]

22. HSE.2013f. Waste and Recycling.[Online] Available from: http://www.hse.gov.uk/ statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 December 2013]

23. HSE.2013g. Waste and Recycling.[Online] Available from: http://www.hse.gov.uk/ statistics/industry/waste-recycling/waste-recycling.pdf [Accessed 30 December 2013]

24. Indian Institute of Science.2013. Functional elements in Solid Waste Management. [online image].Available from: http://ces.iisc.ernet.in/energy/SWMTR/content1.html [Accessed 15 November 2013].

25. Jalil, A. 2010 Sustainable Development in Malaysia: A Case Study on Household Waste Management. Journal of Sustainable Development. 3(3): pp.91-102

26. Judge, T.A and Piccolo, R.F. 2004. Transformational and Transactional Leadership: A Meta-Analytic Test of Their Relative Validity. Journal of Applied Psychology. 89(5): pp. 755-768

27. Leidos. 2013. Elements of Process Safety Management.[online].Available from: http://www.leidos.com/environment/psm/elements. [Accessed 7 November 2013].

28. McCull, N. 2013. The Importance of Recycling and Waste Management. [online].Available from: http://nicholasmccull2.blogspot.co.uk/2013/01/the-importance-of-recycling-and-waste.html[Accessed 18 October 2013].

29. Mendonca, M. and Kanungo, R. N.2006. Ethical Leadership. New York: Mc Graw-Hill

30. Michael, J.H. et. Al. 2006. Production supervisor impacts on subordinates' safety outcomes: An investigation of leader-member exchange and safety communication. Journal of Safety Research . 37(1): pp. 469 -477

31. Rausand M. 2011.Risk Assessment: Theory, Methods, and Applications. New jersey: John wiley and sons

32. Simard, M. and Marchand, A. 1995. A multilevel analysis of organisational factors related to the taking of safety initiatives by work groups .Safety Science. 21(1): pp. 13-129

33. The Royal Society for the Prevention of Accidents.2013.Waste and Recycling Industry Safety Solutions.[online].Available from: http://www.rospa.com/occupationalsafety/sector/waste-recycling. aspx [Accessed 15 October 2013].

34. Treasury Board of Canada Secretariat .2005. What is ethics? [Online]. http://www.tbs-sct.gc.ca/gui/eth-eng.asp [Accessed 10 January 2014]

35. United States Environmental protection Agency.2013. Solid Waste Management Hierarchy.[online image].Available from :http://www.epa.gov/osw/nonhaz/municipal/hierarchy.htm [Accessed 15 October 2013].

36. United Steel Workers. 2009. Blame the Worker Health and Safety Programs. [online]. Available from: http://www.usw.org/resources/hse/page?type=hse_publications&id=0002 [Accessed 4 November 2013]

37. Washington Ethical Society.2013. What does "ethics" mean? [Online]. Available from: http://www.ethicalsociety.org/article/19/about-wes/ethical-culture-our-religious-heritage/faqs-about-ethical-culture/what-does-ethics-mean[Accessed 30 November 2013]