

LEVEL OF AWARENESS ON BEHAVIOUR-BASED SAFETY (BBS) IN MANUFACTURING INDUSTRY TOWARDS REDUCING WORKPLACE INCIDENTS

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ABSTRACT

Improving safety performance by applying Behaviour-Based Safety (BBS) into safety risk control has been adopted in major industry. This approach to prevent incident has a number of advantages. The aim of this paper is to identify the BBS awareness level among workers in manufacturing industry. The methodology of this paper is through quantitative research based on 53 respondents of registered Safety and Health Officers (SHO). The general finding shows that the knowledge level among respondents are higher than understanding and practices level. BBS covers elements of human, behaviour and environment factors. Human factor is influenced by knowledge and understanding of the workers while behaviour factors are influenced by culture and practises in a daily life. Environment refers to equipment, machinery, housekeeping, weather and temperature changes, and engineering. This study can become the reference model for future implementation in other organisation and as a guidance for better safety management.

Keywords: BBS, behaviour, safety performance, risk control

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1.0 INTRODUCTION

Safety regulation is a kind of social regulations on the aspects of workplace and environment safety and it is used to prevent the probability of accidents and reduce damage of accidents. In the field of occupational safety and health, Malaysia is now moving away from the traditional approach whereby it is believed that all occupational hazards can be controlled through detailed regulations. On 25th February 1994, Occupational Safety and Health Act 1994 (OSHA) came into force providing protection on safety and health for work activities in all economic sectors including public services and statutory authorities, except those subjected to Merchant Shipping Ordinance and the armed forces. Under Section 15 (1) and (2) Occupational Safety and Health Act 1994, employers have a duty to ensure, as far as practicable, that employees are not exposed to any hazard at the workplace (OSHA, 1994).

The Occupational Safety and Health Act 1994 (OSHA) has been enacted in 1994. The objectives of the act are to secure the safety, health and welfare of person at work, to protect person (other than person at work) at a place of work against hazard, to promote the occupational environment adaptable to the person's physiological and psychological needs and to provide the means towards a legislative system based on regulations and industry codes of practice in combination with the provisions of the act. The philosophy of the act is the responsibilities to ensure safety and health at the workplace lies with those who create the risk and with those who work with the risk. In respect to the above philosophy, manufacture industries are expected to comply with the provision of the act such as general duty of employer and employee, the requirement of safety officer regulations, the requirements of safety and health committee and responsibilities for reporting of accident and dangerous occurrences (OSHA, 1994).

Accident among employees carries serious implication such as fatality and disability which incurred cost. For example, compensation expenses paid by SOCSO for the year 2012 due to an accident is about RM 2 billion. Occupational accident statistic for the year 2013 showed the number of accident is increasing as reported by DOSH but the accident rate reduce from 3.3 per 1000 workers to 2.8 per 1000 workers. Manufacturing industry contributed to the highest number of accident involving about 1655 victims. Major industries are defined as companies in the manufacturing sector with full-time employees exceeding 200 or annual sales turnover exceeding RM 50 million (DOSHS, 2013).

Effective workers working in safe environments help to improve productivity and innovation among businesses, leading to economic growth and higher wages. Good workplace safety and health is an investment for a good business. It helps business through better productivity and reliability and better staff engagement. It is a business that drive economic growth and build a more successful economy. Implementing BBS is a cost effective approach and previous study suggest Return On Investment (ROI) of 281% resulting from reductions in incidents, insurance premiums and workers compensation (D. Cooper, 2010).

2.0 LITERATURE REVIEW

Behavioural-based Safety or BBS is a process and approach to improve safety and health performance at the workplaces through observation and feedback to the Human (employer/employee) to change their behaviour (Geller, 1994). This program is based on research conducted by Heinrich(1931). He concluded that 80% to 90% from the accidents and injuries at the workplaces are caused by unsafe acts. At risk work behaviour become the main problem contributing to the accident at the workplaces (Geller,1999). BBS is an effective method in

reducing accident at the workplace (Purdue, 2000). Most of the major industries introduce and implement BBS to overcome this problem.

Occupational safety and health practice vary among nations with different approaches to legislation, regulation, enforcement, and incentives for compliance. In United Kingdom (UK), there is the Health and Safety at Work Act 1974 (HASAWA), in United States (US) there is Occupational Safety and Health Act 1970, in Malaysia there is Occupational Safety and Health Act 1994 and in South Africa there is Occupational Health and Safety Act 1993. Different countries take different approaches in ensuring occupational safety and health, areas of OSH requirement as well as in their focus. This is one of the reason why the implementation of BBS is optional and depended on the owner or director of the company.

In Malaysia, safety performance contributed by BBS (Kathirgamanathan. T & Wong T.K , 2005). Most of the industries which applied the BBS in Malaysia usually have another branch or parent company in other countries which have already implemented BBS and trying to adopt the system in this country. Most of the organisations in Malaysia despite not practising BBS system completely but they do practise prevention method involving behaviour. The number of organisation in Malaysia with BBS implementation cannot be obtained since the implementation of the system is voluntary and no parties controlling the implementation of the systems.

Human, become the main factor contributing to BBS. Human refers to the individuals who have knowledge, experience, ability, motivation and personality. Human factor are influenced by many situation such as safety training received, workload and level of understanding (Geller 1994). Behaviour refers to compliance, coaching, recognition, communication and action. Behaviour factors mostly influenced by culture and practices that are used in daily life (Geller, 1994). Behaviour is simply anything someone does or says. Psychologically, behaviours are actions or reactions of persons or things in response to external or internal stimuli. Environment refers to equipment, machinery, housekeeping, weather and temperature changes, and engineering (Geller, 1994).

A management perspective on occupational risk prevention is reflected in the company's focus on safety management systems. It becomes the responsibility of employer to make appropriate arrangements for the establishment of an OSH management system. BBS not only involves procedure and discipline but also a commitment from the top management to improve safety at the workplace (Liu, Mei, & Shen, 2010; Depasquale, J. P., & Geller, E. S. (1999).

'Implementation' can be defined as a course of action taken to put into use an idea, decision, procedure or program (Klein & Sorra, 1996). Then, the immediate outcome of interest is initial use or early use of this new idea. OSH implementation that is measured here would be implementations that are following at least the minimum requirements outlined by the Occupational Safety and Health Act (OSHA, 1994). This activity is an organizational level construct as implementation OSH must be interdependent and coordinated among the many functional, departments, work shifts and locations. It is organization wide initiatives and not individual basis.

Implementation of OSH measured in this study covers aspects such as assessing organization's OSH policy availability, employer's safety leadership attitude, provision and offerings of safety training by trained safety personnel's, documentation provision either manually or electronically, emergency preparedness and response arrangements, the appointment or the availability of a safety officer and risk assessment record and provision of the conducive environment to develop work safety at the workplace and also the medical surveillances aspect Gilkey et. al. (2003).

Management commitment is defined as the management's involvement and engagement in actions towards achieving a goal (Cooper, 2006). Ashill, Carruthers and Krisjanous (2006) found that management commitment is manifested through various ways such as having safety

education and training, giving rewards, and empowerment of employees to make decisions. Investment in safety education and training will allow employees to gain the necessary safety knowledge and help them to work safely. Furthermore, giving rewards to employees that report unsafe behaviours of co-workers during working is also an important aspect of OSH successful implementation.

On the other hand, management commitment can also be viewed from their commitment in penalizing employees who do not follow safety measures such as the use of personal protective equipment. The former was stressing on a two way communication between employees and managers to facilitate the effective implementation of OSH.

In general, occupational accidents occur either due to a lack of knowledge or training, lack of management, lack of means to carry out the task safely, or alternatively, due to an error of judgment, carelessness, apathy or downright recklessness (Toole, T.M., 2002).

According to Vredenburg G.A (2002), safety training can reduce number of accidents. Safety training includes pre-service training, transfer post training, regular training, and special training aiming at new techniques and other training. The purpose of safety training is to improve staffs' operation skill, dangerous identification ability, and safety consciousness in order to make staffs attach importance to production safety, and have the ability to operate safely.

The role of feedback concerning employees' performance is critical because behaviours resulting in industrial accidents are not typically new occurrences. Their causes are deeply rooted in past minor incidents, where damage was insignificant and workers and bystanders were not injured (Kletz, 1993). Regular feedback on performance can be communicated to employees through posted charts and a review of behavioural data in safety meetings (Roughton, 1993).

Consistent and forthright communication is an essential characteristic of any strong organization. Good communication leads to trust, which is a fundamental element of strength. In order for organizations to foster a climate where employees are alert to hazards, they must have an appreciation of the employees' and organizations' tendency to conceal and distort significant available information (Pidgeon, 1991). In order to influence safety practices, feedback must be provided to the employees who are capable of using it. It needs to be given to those working at the point in the process where their behaviour can effectively influence outcomes. People cannot behave in a safety-conscious manner unless they have the authority to change their own actions to improve their work conditions. It is illogical to ask employees to be careful if they do not have the power or discretion to avoid hazards (Turner, 1991).

3.0 METHODOLOGY

A quantitative research method has been used in this study. The chosen sample was Safety & Health Officer (SHO) registered with Department of Occupational Safety and Health (DOSH). There are 2007 registered and active SHO which covers all industries (DOSH, 2013). 53 respondents from manufacturing have given the feedback. The sample of this study is only focused on major manufacturing industry.

Questionnaire was developed in 2 parts; demography and Behaviour Based Safety. The objective of the demography part is to identify worker's socio demography factors. The demography part includes name of the respondent, company name, position, state, industry classification, manufacturing classification, annual sales turnover, number of workers, gender, age, education background, number of work experience, types of hazard at their workplaces and accident record. The ranking of BBS factor also included in the demography part.

In second part it covers Behaviour-Based Safety (BBS). The objective of the BBS part is to identify the BBS factors comprising human, behaviour and environment. In addition, part of the BBS

identifies the level of knowledge, understanding and practices also included. 5 point Likert scale was used in the questionnaire.

Table 1: Likert scale

Score	Knowledge Level	Understanding Level	Practice Level
1	Poor	Poor	Poor
2	Intermediate	Intermediate	Intermediate
3	Moderate	Moderate	Moderate
4	Good	Good	Good
5	Strong	Strong	Strong

There are 11 components in human factor, 8 components in behaviour factor and 6 components in environment factor were developed in the questionnaire.

Data collection which covers online and offline questionnaire were used. Online questionnaire was used as a fast and easy approach to be used by respondent. In addition, respondents may easily answer the question at any time either on a computer, laptop or smart phone. However, the use of an online questionnaire also has some disadvantages. Among the disadvantages are registered SHO did not answer the questionnaires given, SHO did not open and read their e-mail, and sometimes email cannot be delivered due to a full inbox status. Some of these disadvantages cause the number of respondents who answered this questionnaire through online were not encouraging.

All data received was analyzed using latest version of Statistical Package for Social Science (SPSS). Analysis of the data comprises of 2 parts:

1. Demography

The data comprising the demographic information of the respondents was analyzed using descriptive statistics and presented using frequency distribution and percentages.

2. Frequency of awareness level

In order to interpret the level of awareness among the respondents, a 3-level scale based on the mean score was used. (Ashari & Mahmood, 2013)

Table 2: Mean score

No	Mean Value	Rating
1	3.68 – 5.00	High (H)
2	2.34 – 3.67	Moderate (M)
3	1.00 – 2.33	Low (L)

4.0 RESULT

4.1 Demography

Table 3 : Characteristic of respondent

<u>Characteristic</u>	<u>N</u>	<u>%</u>	<u>Characteristic</u>	<u>N</u>	<u>%</u>
<u>Gender</u>			<u>Manufacturing Classification</u>		
Male	49	92	Chemical	11	21
Female	4	8	Metal	4	7
<u>Age</u>			Wood	4	8
25-29 years old	3	6	Others	34	64
30-34 years old	11	21	<u>Number of Workers**</u>		
35-39 years old	9	17	5-74 workers	2	4
40-44 years old	10	19	75-200 workers	6	11
45-49 years old	7	13	Above 200 workers	44	85
50-54 years old	10	19	<u>Sales Turn Over**</u>		
55-59 years old	2	4	<300k	1	2
Above 60 years old	1	2	300k-15m	5	9
<u>State</u>			15m-50m	17	33
Johor	8	15	>50m	29	56
Melaka	4	8	<u>Education</u>		
Negeri Sembilan	7	13	PMR	1	2
Perak	1	2	SPM	6	11
Kedah	8	15	Skill Certificate	2	4
Pulau Pinang	5	9	Diploma	15	28
Sarawak	4	8	Degree and above	28	53
Selangor	12	23	Others	1	2
Pahang	3	6	<u>Work Experience**</u>		
Terengganu	1	2	> 11 years	18	37
<u>Position</u>			6-10 years	8	16
Lower level	2	4	3-5 years	7	14
Middle level	41	77	0-2 years	16	33
Upper level	10	19	-	-	-

*N = 53

**Missing data

4.2 Reliability and Authenticity Analysis

Table 4 : Overall respondent reliability and authenticity analysis

Cronbach's Alpha	No. Of Item
0.854	3

Table 2 shows the reliability value to overall factor which is high, 0.854. It shows overall understanding of the respondent is consistent and overall error rate is at the lowest level.

Table 5: Reliability and Authenticity Analysis for Each Factor

Variables	Cronbach's Alpha	No. Of Item
Human	0.953	33
Behaviour	0.969	24
Environment	0.956	18

Based on the above table, reliability value for each factor is high which the value is within 0.9 to 1.0. All the factors provided were easily understood by the respondents supported by Nunnely(1978).

4.3 Awareness Level

Table 6 : Awareness Level for Behaviour

No	Component	Knowledge Level	Understanding Level	Practice Level	Awareness Level
1	Compliance to legal requirement	4.15 (H)	4.04 (H)	3.94 (H)	High
2	Report unsafe act without reward	4.00 (H)	3.81 (H)	3.51 (M)	Moderate - High
3	Communication	4.00 (H)	3.85 (H)	3.66 (M)	Moderate - High
4	Report unsafe condition without act	3.96 (H)	3.77 (H)	3.51 (M)	Moderate - High
5	Reprimand to the colleagues	3.94 (H)	3.72 (H)	3.45 (M)	Moderate - High
6	Sufficient rest to prevent fatigue	3.89 (H)	3.70 (H)	3.40 (M)	Moderate - High
7	Coaching colleagues	3.83 (H)	3.74 (H)	3.45 (M)	Moderate - High
8	Report unsafe act without reward	3.36 (M)	3.34 (M)	3.00 (M)	Moderate

From the analysis conducted, the findings show that workers have high level of awareness for the compliance to legal requirement component (See Table 6). Workers have moderate-high level of awareness for the other components. It's mean that, workers have high level awareness to comply with the legal aspects compared with other components. The mean value for level of knowledge is higher than level of understanding and practice. It is clearly stated that workers have high knowledge and understanding in the component under behaviour factors, but less practice all that they were understood and known. It indicates that the behaviour needs to have an intervention to ensure awareness level are at a better level.

Table 7 Awareness Level for Human

No	Component	Knowledge Level	Understanding Level	Practice Level	Awareness Level
1	Establish safety & health policy	4.26 (H)	4.08 (H)	3.98 (H)	High
2	Establish safety & health committee	4.25 (H)	4.08 (H)	3.94 (H)	High
3	Ensure workers fit to work	4.21 (H)	4.15 (H)	3.92 (H)	High
4	Compliance to employer's instruction	4.19 (H)	3.91 (H)	3.68 (H)	High
5	Ensure the workers competent to do the task	4.15 (H)	4.06 (H)	3.91 (H)	High
6	Provide OSH training	4.04 (H)	3.89 (H)	3.68 (H)	High
7	Implement safe work procedure	4.02 (H)	3.87 (H)	3.62 (M)	Moderate - High
8	Involvement in OSH activities	4.00 (H)	3.87 (H)	3.75 (H)	High

9	Develop OSH objectives	4.00 (H)	3.80 (H)	3.40 (M)	Moderate - High
10	Ensure the skill of the workers	3.96 (H)	3.83 (H)	3.62 (M)	Moderate - High
11	Hazard Identification	3.92 (H)	3.83 (H)	3.57 (M)	Moderate - High

According to Table 7, workers have high level of awareness for establishing safety & health policy, establishing safety & health committee, ensuring workers fit to work, compliance to employer's instruction, ensuring the workers competent, providing OSH training and involvement in OSH activities. At the meanwhile, implementing safe work procedure, developing OSH objectives, ensuring the skill of the workers and hazard identification are at moderate level. 4 out of 11 components are at moderate-high level.

High mean value for the components 1 and 2 clearly shows that the major industry actually has a high level of adherence to the law. The reason for this is that the component 1 establishing safety and health committee and component 2 establishing safety and health committee are the requirement in the legislation. OSHA 1994 states any organisation with more than 5 workers need to establish safety and health policy and the organisation with more than 40 workers need to establish safety and health committee. The demography result in Table 3 clearly shows 100% of the respondents were from the company with more than 5 workers and 96% respondents have more than 75 workers which is more than the minimum number required.

Workers have high level of knowledge and understanding to the human factors components but less practised what is understood and known. For a better awareness level among workers, behaviour needs to have an intervention.

Table 8 Awareness Level for Environment

No	Component	Knowledge Level	Understanding Level	Practice Level	Awareness Level
1	High Noise level	4.12 (H)	3.98 (H)	3.68 (H)	High
2	Dusty environment	4.02 (H)	3.88 (H)	3.69 (H)	High
3	Housekeeping at workplace	4.02 (H)	3.92 (H)	3.64 (M)	Moderate - High
4	Weather changes	3.94 (H)	3.89 (H)	3.79 (H)	High
5	Sufficient lighting	3.94 (H)	3.96 (H)	3.75 (H)	High
6	Appropriate Temperature	3.79 (H)	3.81 (H)	3.53 (M)	Moderate - High

According to Table 8 above, knowledge level for noise, dusty environment, weather changes and sufficient lighting is at high level. Moderate-high level recorded for housekeeping at the workplace and appropriate temperature. Workers have high level of knowledge and understanding to the human factors components. The workers' have knowledge on hazard associated to the environment but less practised what is understood and known.

5.0 RECOMMENDATION

Knowledge level among the workers at major industry are higher than understanding and practice level based on analysis on the level of awareness in this paper.

The workers have high knowledge and understanding level in behaviour factor components, but less practised what is understood and known. This indicates behaviour need an intervention to ensure awareness level at a better level. Meanwhile the workers have knowledge associated to reporting an unsafe act and unsafe condition as well as reward, but in practical, workers are not given an attention to the practice. Therefore, in accordance with the hierarchy of hazard control, administrative control is the best control measures to improve awareness level among workers. Administrative control measures that can be taken are as follows:-

I. Awareness Level for workers Behaviour

Report unsafe act without reward: Implement supervision to the workers and enforcement of safety rules by the supervisor. Supervisor also can encourage safe behaviour, keep inform the workers of safety rules and keep them motivated.

Communication: Communication can be improved either by verbal or non verbal. Verbal communication improvement can be achieved by ensuring effectiveness of safety and health committee. Non verbal communication involves labelling of chemicals, signage, notice boards and email to the workers.

Report unsafe condition without reward: Implement supervision to the workers and enforcement of safety rules by the supervisor. Supervisor also can encourage safe behaviour, keep inform the workers of safety rules and keep them motivated.

Reprimand to the colleagues: Implement coaching and give feedback to the workers. Feedback can either in advise or praise relating the behaviour shown. Workers also can remind colleagues about taking safety precaution and give motivation to change the way they usually do their job to a safer method.

Sufficient rest to prevent fatigue: Allocation of workbench, floor mat, and suitable shoes to prevent fatigue. Provide refresh training to keep them remind on the consequences of fatigue.

Coaching colleagues: Implement coaching and give feedback to the workers. Feedback can either in advise or praise relating the behaviour shown. Workers also can remind colleagues about taking safety precaution and give motivation to change the way they usually do their job to a safer method.

Report unsafe act with reward: Implement supervision to the workers and enforcement of safety rules by the supervisor. Supervisor also can encourage safe behaviour, keep inform the workers of safety rules and keep them motivated. Give reward or incentives to the workers.

II). Awareness Level for Human

Implement safe work procedure: Establish SOP and consistently comply to Standard Operating Procedure (SOP) and supervisor can coach the workers. Give feedback or praise for the behaviour shown.

Develop OSH objectives: Ensure effective OSH objectives, review and revise the objectives. Give instruction to the workers to involve in the implementation of OSH objectives.

Ensure the skill of the workers: Ensure effective OSH objectives, review and revise the objectives. Give instruction to the workers to involve in the implementation of OSH objectives.

Hazard Identification: Review HIRARC procedure, involvement all division in HIRARC process. Give HIRARC training to the workers. Reward may be given for hazard identification. In accordance with the responsibilities of the employer as stated in Section 15 (2) OSHA 1994, employers need to provide and maintain plant and safe system of work, provide arrangement for operation and handling as well as provide information, instruction, training and supervision to the workers. Therefore, the measures taken to improve the level of awareness is necessary.

III). Awareness Level for Workplace Environment

Housekeeping at workplace: Training and 5S housekeeping system

Appropriate Temperature: Conduct related training to the task

Environment factor cause indirectly by human also one the BBS factor. Workers need to know the unsafe condition, the effect of it and how to control the condition. By conducting related training, the workers will get the idea on the hazard they are exposed at.

6.0 CONCLUSION

Level of knowledge, understanding and practices are still at moderate level. Views from the SHO about the level of knowledge, understanding, and practical level reflect of their work environment. Therefore, it is important to increase the level of knowledge and level of understanding among employees to ensure that workers can exercise their way to safe work practices. Accident reduction can be achieved by increasing the level of practice. Alteration and modification are needed to change behaviour of the workers in ensuring behavioural safety success. Implementation of a behaviour based safety intervention is a major exercise and it involves the application of important change principles. The key features of the BBS implementation is the commitment, focus, purpose and execution.

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