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Implanting of Safety Culture in Display Manufacturing Company in Korea through Employee's Safety Perception Survey: Case Study Focusing on Behavior-Based Safety

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Abstract: Accidents caused by unsafe behaviors account for most industrial accidents (88%). This case study focused on the accident rate caused by unsafe behavior in a specific Korean display manufacturing company and found a similar rate of accidents caused by unsafe behaviors about 85%. In order to prevent these accidents, the researchers surveyed the worker's safety perception level in 'company A' and found that workers often unconsciously behave unsafely while believing they are being safe. Based on the results of the survey, we introduce a Behavior-Based Safety (BBS) plan to improve unsafe behaviors that workers perceive to be the most worrisome. To apply BBS concepts, the researchers develop a Critical Behavior Inventory (CBI) by observing the behavior of workers and applying it to company A's workplace between 2015 and 2016. As a result, it was confirmed that accidents caused by unsafe behaviors decreased in company A. Therefore, it is necessary to establish a safety culture for accident prevention and this study confirms that BBS is an effective means of doing so.

Key words: Safety perception, Critical Behavior Inventory (CBI), Behavior-Based Safety (BBS), safety culture, display industry safety, establish

INTRODUCTION

The display manufacturing industry which produces Liquefied Crystal Displays (LCDs) and Organic Light-Emitting Diodes (OLEDs) has been growing rapidly in Korea. The LCDs and OLEDs manufacturing process is divided into a fabrication process and a module process in whichwide variety ofequipment are used such asheat ovens, autoclaves, conveyors and industrial robots and involves large quantities of chemicals, thus, there is always a potential risk of accidents. This is especially, true in the module process (Fig. 1) because a lot of works

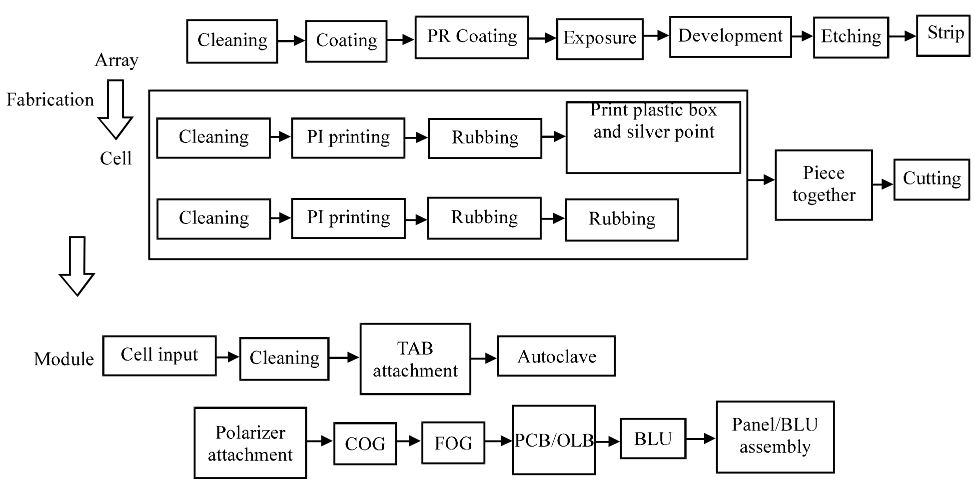

Fig. 1: LCD panel manufacturing process; COG: Chip on Glass; FOG: Film on Glass; PCB: Printed Circuit Board; OLB: Outer Lead Bonding and BLU: Back Light Unit

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in that process need to be performed manually, so that, it hard to achieve full automation while the fabrication process has been automated. Because of this, workers remain vulnerable to much kind of hazards during working.

Unsafe behavior is a major cause of workplace accidents. Heinrich (1959) found that about 88% of accidents occurring in all workplaces are caused by unsafe behavior. Our results confirm this, we studied all the accidents in a display manufacturing company during 2013 and found that about 85% were due to unsafe behavior. Because of the company's information security policy, the company's name is not disclosed and is referred to as "company A" throughout the study.

There have been various attempts to systematically explain the causes and mechanisms of accident occurrence in industrial fields. Heinrich (1959) argues that there are five domino causes to industrial accidents: with the exception of the social environment which is the first domino, the others personal characteristics, unsafe behavior, accidents and injuries are causedby human factors.

Based on the result of accident-cause investigation, we came to conclusion that that it is important to prevent unsafe behavior of workers in order to prevent research related accidents in workplace. Worker's behavior regarding safety is closely related with worker's safety perception and a company's safety culture (Awodele *et al*., 2014) which is as an important critical factor of safety (O'Toole, 2002). The idea of safety culture was introduced in 1986, after the Chernobyl nuclear disaster, to prevent accidents caused by unsafe conditions or human errors (Ostrom *et al*., 1993; Pidgeon, 1991). Since, that time, many global companies have become interested in establishing their own safety culture.

However, it is not always easy to define the concept of safety culture, nor does the definition provide a way to measure how safe a given environment is. Cox and Cox (1991) insisted that safety culture is the attitudes, beliefs, perceptions and values commonly owned by employees related to safety in the workplace and safety culture is a part of organizational culture which can be defined as "the way we do things around here" (Cooper, 2001).

At the Australian worksafety workshop, Beyond Lost Injuries, held in Sydney in May 1994, green emphasized that an important factor in the success of a positive approach to measuring safety performance will be the ability of an organization to go beyond an exclusive focus on indicators of employee behavior based on workplace safety culture (AGPS., 1994).

Until recently, Korean manufacturing companie's accident prevention-related activities including those of the display industry have focused on educating employees in safety, so that, they can determine job-related hazards through safety education, enhancing the reliability and superficiallyincreasing the safety level of machinery. In recent years, however, there has been a growing interest in safety culture in order to prevent accidents and reduce the potential risks associated with everyday work environments and behavior.

The ultimate goal of a safety culture is to create a safe atmosphere, to empower workers about the risks associated with their work environment and to take appropriate safety measures. Lefranc *et al*. (2012) argue that safety culture is composedof three main factors: organization, psychology and behavior. The organizational component is related to analysis of a company's business operations including policies and procedures, psychology is the attempt to analyze the attitudes and perceptions of both individuals and groups at the company and the behavioral component involves investigating worker's behaviors including whether workers wear personal protective equipment, follow operating procedures, etc. (Lefranc *et al*., 2012).

Safety culture is closely related to organizational culture where the beliefs and values about health and safety are commonly shared (Clarke, 1999). Based on the above-mentioned research results, we can say that people's behavior is directly affected by organizational culture. One way to investigate or measure the organization's safety culture is through employee's perception surveys which have been regarded as valuable methods to detect employee's attitudes toward management safety and health practices. Cooper (2000) suggested a framework for a safety culture survey which is composed of manager's commitment to safety, employee involvement individual behavior and policies and procedures. The objects of this research are: to survey the worker's safety and health perception in company A. Introducing the BBS program in company A. We find that removing unsafe behavior from the workplace is the most critical change in establishing a safety culture. Based on these results, we identify a Critical Behavior Inventory (CBI) for workers, apply this program for a certain period of time and analyze the results. Finding out the effect of BBS program and ultimately reducing accident within the company A.

MATERIALS AND METHODS

In order to conduct a survey for this study, a questionnaire was developed by referring NOSACQ-50

(EU-OSHA., 2011) because that tool is easy to find out weak point of worker's safety perception. This was done through an analysis of data collected from workers who work in the module process including parts assembling, rework, packing and inspection at company A.

Based on and safety perception survey results, we conducted investigations for unsafe behavior on field workers to seize the type, frequency and incidence of unsafe behavior. After that an ABC (Antecedent, Behavior and Consequence) analysis was carried out on unsafe behavior data collected on the basis of BBS techniques.

Using data gathered from field investigation CBI (Critical Behavior Inventory) were listed and CBI managing system was constructed in order to detect unsafe behavior continuously. After constructing the system we asked for workers observing unsafe behavior each other and input the findings to system. From 2013, we have operated BBS program to continuously monitor unsafe behavior and apply the improvement program. Finally, we analyzed the effect of this BBS program.

Safety perception survey: First, we conducted a survey to understand worker's perception of safety. The questionnaires were distributed to 1,200 workers who were randomly chosen from among the 2,150 who worked in the module processbut excluding office workers, 209 responded. The average age of the surveyed workers was 24.6 years (range: 19-38 years) and the total work experience was 5.6 years (range: 0-19 years). Most module workers are female which is reflected in the fact that 98% of respondents were women.

The survey consisted of 38 questions in 7 categories: safety and health policies, safety procedures, safety and health prevention activities, communication, risk management, safety behaviors and personal protection. The answers to the questionnaire consisted of a 5-point scale, from "strongly agree" (5) to "strongly disagree" (1). We analyzed the results through factor and correlation analysis using Minitab statistical software.

The questionnaires were designed to identify the level of safety both in management (safety and health policy, safety procedures, safety and health prevention, communication and risk management) and worker's personal performance (safety behavior and personal protection). We hypothesized that the safer a worker perceived a management area to be, the higher was the worker's safety performance level.

Critical Behavior Inventory (CBI): After conducting the survey, we listeda Critical Behavior Inventory (CBI) by observing the unsafe behavior of field workers. A CBI is a reliable tool to measure the safety level of workers from the view point of BBS. A CBI includes all important safety and health elements and accounts for both unsafe behavior and unsafe physical work environments.

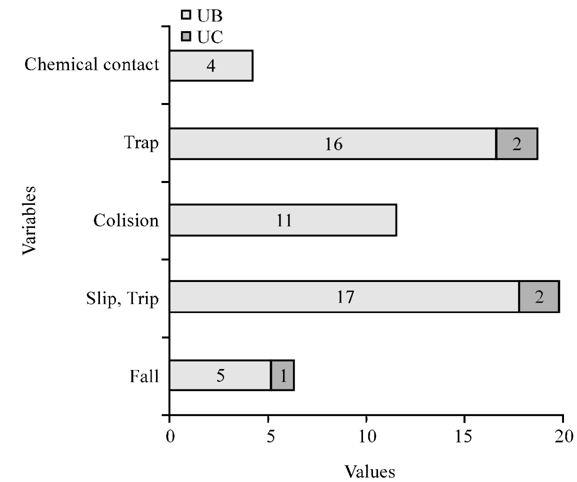

Fig. 2: Root cause analysis of accident occurred in 2013; UB: Unsafe Behavior, UC: Unsafe Condition

In this study, experienced workers in the module process line drew up a CBI. Prior to our data collection, we educated these workers about BBS theories and trained them in field observation. They then conducted observation and evaluation of workplace occurr encesusing a key action checklist. This on-site evaluation was conducted from May 14-June 14, 2013 and 25 experienced field workers participated.

We also analyzed 58 human accidents (including cases that were, so, minor they went unreported) that occurred in company A during 2013 and established the root causes from the viewpoint of unsafe behaviors (Fig. 2).

Combining the accident root cause analysis and field observation, we classified these into representative unsafe behaviors: our final analysis included 29 unsafe behaviors in six categories (Table 1).

We then conducted an ABC analysis on the most frequently observed unsafe behaviors. Antecedent, Behavior, Consequence (ABC) analysis is a process to identify the connections before and after unsafe behavior. This assumes that all behaviors have one or more antecedents, activators or prompts which initiate the behavior and one or more consequences that either encourage or discourage repetition of the behavior. ABC analysis is therefore a method of analyzing the antecedents leading to observed unsafe behaviors and analyzing the consequences thereof. A Behavior-Based

Table 1: Critical Behavior Inventory (CBI)

Items	Judgment criteria
Pathways	
Designation of working space	Clearly marked pathways around the working space
Condition of pathways	No obstacles left in aisle
	Floor is not slippery
	Moving cart is able to easily load/store goods in aisles
Organization around workshop	
Condition of work table	Work tables are well organized
Cleanliness of trash can	No unnecessary items left on workbench
Condition of workplace floor	The trash can does not overflow and is regularly emptied
	No unnecessary objects are on the floor around the work area
Fire and emergency equipment	
Arrangement of fire extinguisher or firefighting equipment	Fire extinguisher or equipment is in correct position
Electric panel management	Fire extinguisher and similar equipment is easily accessible
Condition of emergency equipment (i.e., eye/body shower)	No unnecessary obstacles are within 1 m of electric panel
	Emergency equipment, (i.e., eye/body showers) are easy to access and readily available
Chemical management	
Handling of chemicals	Chemicals are properly stored/handled according to safety standards
Information provided regarding possible hazards	Chemical substance names and warning labels are properly attached
	Material Safety Data Sheets (MSDS) are readily available
Behavior	
Wearing and management of Personnel Protective Equipment (PPE)	Proper PPE is selected and worn considering the hazard and risk factors (i.e., chemical-resistant respirators are worn for working with organic solvents)
Unsafe behavior	An appropriate quantity of PPE is maintained and managed
	Safety device function is not tampered with
	No one moves at an improper speed (i.e., rushing or running)
	No careless behavior during walking (i.e., chatting, looking around, not paying attention to what is ahead)
	Moving carts not overloaded or driven too fast
	No unsafe behavior during preventive maintenance
	Warning signs while facility is repaired
Ergonomics	
Secure working space	Workers have adequate work space
Appropriate working posture	No awkward posture or unreasonable behavior
Appropriate use of heavy machinery	When handling heavy objects, more than two people are involved, according to safety standards
Prevention of fatigue	Fatigue prevention mats or chairs are used for standing workers
	Workers use tools properly

Safety (BBS) analysis is a process through which work groups can identify, measure and change their behaviors. Therefore, conducting an ABC analysis is important in developing a BBS program. BBS is a proactive process that helps to bring about changes in worker's safe behavior levels before incidents happen. All incidents are preceded by some kind of behavior, for example, a worker falls off a ladder because she was overreaching or the ladder was not secured. Both of these are individual behaviors. BBS seeks to change the person's mindset, habits and behaviors, so that, these "at risk" behaviors will no longer be performed. As a result, the worker will no longer fall off the ladder.

RESULTS AND DISCUSSION

Safety awareness survey: We conducted a factor analysis in order to confirm the appropriateness of the data. Factor analysis of 38 items in 7 categories showed that the value of Cronbach's α was 0.908, larger than the generally used benchmark of 0.7. This means that the questionnaire was appropriately selected and carrying out a factor analysis for each item is valid.

The reliability of safety management (safety policy, safety procedures, prevention activities, communication and risk management) was 0.9026 and the reliability of safety performance (safety behavior and protection) was 0.646. Table 2 shows the results of the item analysis for the seven data areas. In addition, we analyzed the correlation coefficient between safety management level and safety performance and found that Pearson's correlation coefficient was 0.709 and Cronbach's α was 0.829 indicating a close relationship between safety management level and safety behavior.

We also analyzed the correlation with each factor and found that the correlations between safety procedures and safety behavior, safety policy and safety behavior and safety procedure and risk management were relatively low while correlations between prevention activity and communication, safety policy and prevention activities and risk management and communication were

Table 2: Results of factor analysis

Category	Loading	Cronbach's α
Safety policy	0.820	0.889
Safety procedures	0.756	0.899
Accident prevention activities	0.907	0.877
Safety communication	0.874	0.882
Hazard management	0.816	0.892
Safety behavior	0.684	0.906
Personal Protective Equipment (PPE)	0.755	0.899

Table 3: Correlation analysis among the seven categories

Variables	SPO	SP	PA	SC	HM	SB
SP	0.666					
PA	0.740	0.638				
SC	0.664	0.622	0.766			
HM	0.568	0.468	0.703	0.721		
SB	0.409	0.357	0.549	0.510	0.610	
PPE	0.529	0.503	0.658	0.586	0.506	0.489

SPO: Safety Policy, SP: Safety Procedures, PA: Accident Prevention Activities, SC: Safety Communication, HM: Hazard Management, SB: Safety Behavior, PPE: Personal Protective Equipment. ($p<0.01$)

relatively high. In order to raise awareness of safety behavior, it can be inferred that field-based improvement activities such as risk management and preventive activities should be carried out. The correlation coefficients for each area are shown in Table 3.

Our analysis of the seven areas of the questionnaire results shows that the number of workers wearing personal protective equipment and engaged in accident prevention activities was relatively high whereas the scores regarding risk management and safety behaviors were relatively low. This implies that company A is equipped with systematic safety policies and procedures and carries out accident prevention, so that, field workers can fully recognize them through repeated training and education. However, the workers have unconsciously engaged in unsafe behaviors because they did not recognize whether their behaviors were safe or unsafe and they did not have enough knowledge about what can create risk. That is due to the low level of safety culture. Table 4 shows the questionnaire scores for eachcategory. Based on the survey results, we determined that focusing on on-site risk management and worker's unsafe behavior would have the greatest impact on company A's safety awareness. We also found a need to introduce Behavior-Based Safety (BBS) to improve unsafe behavior.

Developing a CBI based on BBS: We determined the number of observations using a sampling equationwith a confidence level of 95% and tolerance of 3%. According to the following equation, we can obtain statistical significance when observing behaviors more than 203 times but in this study, we observed and validated 1,306 behaviors:

Table 4: Survey results for the seven categories

Category	Mean	SD
Safety policy	3.864	0.714
Safety procedures	3.801	0.763
Accident prevention activities	4.033	0.666
Safety communication	3.827	0.695
Hazard management	3.649	0.589
Safety behavior	3.716	0.561
Personal Protective Equipment (PPE)	4.018	0.701

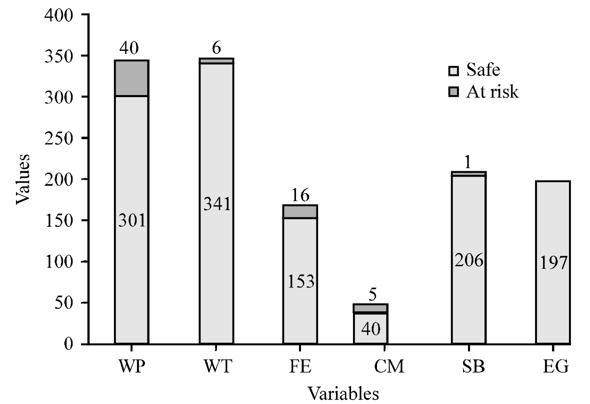

Fig. 3: Observation results of safe vs. at risk behaviors; WP: Workplace Path; WT: Worktable; FE: Firefighting Equipment; CM: Chemical Management; SB: Safety Behavior; EG: Ergonomics

$$N = \frac{Z_{\alpha/2}^2}{E^2} p(1-p) = \frac{1.96^2}{0.03^2} \times 0.05 \times 0.95 = 202.75$$

We observed 68 unsafe behaviors out of a total of 1,306 field observations. We then classified these 68 observed behaviors into 6 categories: workplace aisle, work bench, firefighting equipment, chemical management, safety behavior and ergonomics (Table 2). Figure 3 shows the number of unsafe behaviors observed in each area.

As shown in Fig. 3, the poor management of workplace pathways was the most frequently observed unsafe behavior. We recorded the following risky behaviors: no mark indicating work areas, obstacles left in passage ways and insufficient arrangements of carts and products. The second most common category of unsafe behavior was chemical management including the inadequate handling and storage of chemicals, lack of warning signs and lack of on-site and use of Material Safety Data Sheets (MSDS).

Based on the results of our observation, we selected the final list of unsafe behaviors to apply to company A's workplace and categorized them into rule-based behaviors, skill-based behaviors or knowledge-based behaviors for ABC analysis. This is shown in Table 5.

Table 5: Classification of unsafe behaviors

Behavior types	Unsafe behavior
Rule-based behavior	Leaving an object on pathway No mark indicating pathway and working space
Skill-based behavior	Awkward posture Overloaded cargo cart
Knowledge-based behavior	Cart moving too fast Inadequate handling and storage of chemicals

Table 6: ABC analysis of leaving objects on pathway

Antecedent (causes for unsafe behavior)	Behavior	Consequence (predictable result)
Step 1: Analysis of unsafe behavior		
Convenience Colleague's pressure Limited time Lack of training	Leaving objects on pathway	Disciplinary measures Increasing probability of accident
Step 2: Analysis of safe behavior		
Provide a parts rack Observation and suggestions to not leave objects in pathway No pressure regarding time limits	Removing objects from pathway	Friendly environment of compliance and encouragement Supervisor's positive feedback Enhanced safe working conditions Time saved time and work efficiency enhanced Pride in achievements Decreasing probability of accidents
Step 3: Implementing action plan		
Supervise/observe each other's leaving of objects on pathways. If someone finds a violation, report and record it. Provide periodic training in order to recognize the hazard of tipping over and collision		

Table 6 provides an example of ABC analysis for leaving an object on a pathway, the most commonly observed unsafe behavior.

The first step of ABC analysis determines the antecedents for an unsafe behavior or why people engage in that behavior. In Table 6, the main reasons for leaving something in the pathway were as follows: convenience, colleague's pressure, limited time and lack of training. Next, the possible consequences are determined:saving time, disciplinary action, convenience an increase in research efficiency and increasing the probability of an accident. When consideringthe antecedents and the possible consequences together, we determined that workers believe it to be more convenient to keep materials close at hand in the passageway and believe that there is no need to better organize the passage or point out this behavior when a colleague is engaging in it.

In the second step, we analyze the possible consequences of engaging in the opposite or safe behavior. In this case, the counter measures to the behavior in the first step are the leading factorsin the safe behavior. In other words, to be safe do not leave obstacles in the passageway, tell department heads about the state of passage ways, so that, safety behaviors can be implemented an example should be set by supervisors and companies should provide safety education on the importance of keeping passages clear.

In the third step, we draw up a concrete action plan according to the antecedents in step 2. In this case, we have set up measures to regularly supervise employees to organize pathways and run regular training courses. As in Table 6, we conducted an ABC analysis for the next most frequently observed unsafe behaviors: overloaded cargo carts and inadequate handling and storage of chemicals. For overloaded cargo carts, the second-most observed unsafe behavior, limited time, convenience, hurry to finish work quickly and trying to meet product process conditions turned out to be the causes of unsafe behavior. If a worker acts safely, the predictable results may be decreased accident probability, enhanced working conditions and so on. The counter measures were selected: periodic supervision, providing carts that cannot be overloaded and making workers report any violationsthey encounter.

In the same way for inadequate handling and storage of chemicals, the causes of unsafe behavior were identified as lack of education inappropriate designation of storage locations and lack of observation. The predictable results for the safe behavior turned out to be reduced likelihood of accidents and enhanced working conditions by preventing the diffusion of chemicals. Finally, the countermeasures are selected: rearranging the storage of chemicals, providing periodic education on the treatment of chemicals and increased workplace observation by managers. We then applied the action plan developed based on the ABC analysis causes and counter measures to the display manufacturing process in 2014 and constructed a computer system which was named "Behavior Tracking System (BTS)."

Figure 4 shows how we implemented a processto improve unsafe behavior (HAS., 2013). The workers had been educated in how to observe colleague's unsafe behavior. The observation procedures were defined as follows: if someone finds that a co-worker is behaving in an unsafe manner, evaluate whether the behavior is safe or not using the CBI checklist. If they conclude that the behavior is unsafe, they approach and notifythe worker of the violation. They then talk to each other about the reasons for behaving unsafely and input the observation

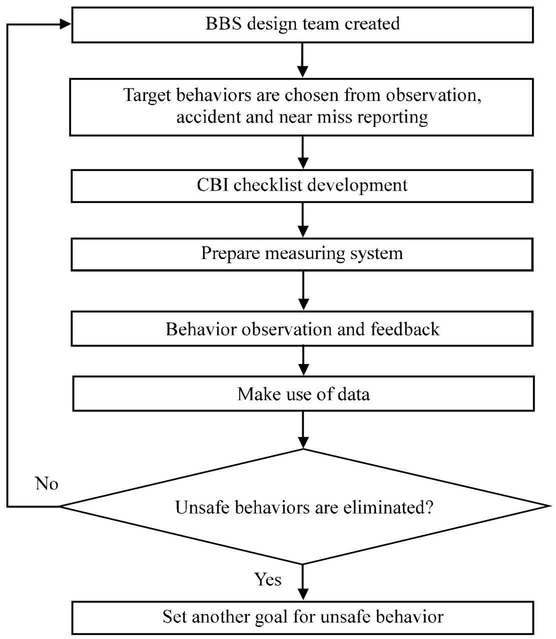

Fig. 4: Theimplementation process for Behavior Based Safety (BBS)

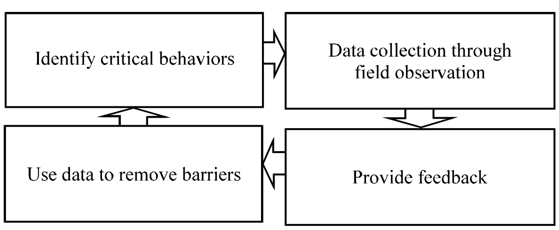

Fig. 5: Critical Behavior Inventory (CBI) development process

result to the BTS for feedback. After a manager checks the entered data, they request the violator take measures to prevent reoccurrence. In order to encourage the proper implementation of the observation program, we provide incentives to workers for every discovery of unsafe behavior. After applying the CBI for a certain period of time, its suitability was evaluated and it was revised if a different unsafe behavior was found. In addition, Fig. 5 illustrates how we established and applied a CBI development process and proposed the CBI as a criterion for encouraging improvement via. the mutual observation of unsafe behaviors in the workplace.

The BTS within the company network allows employees who observe unsafe behavior according to the CBI to report to each other. That system is still in use and the input data is periodically collected and analyzed in order to develop a new CBI. As a result, we confirmed that the number of accidents caused by unsafe behavior fell between 2013 and 2016 as shown in Fig. 6 and 7.

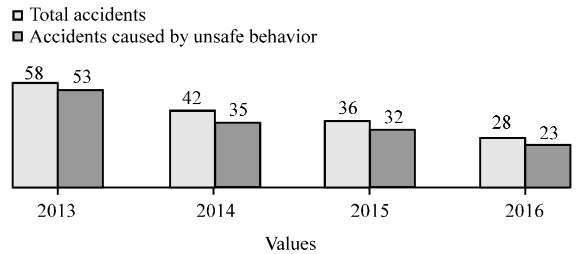

Fig. 6: Workplace accidents 2013-2016

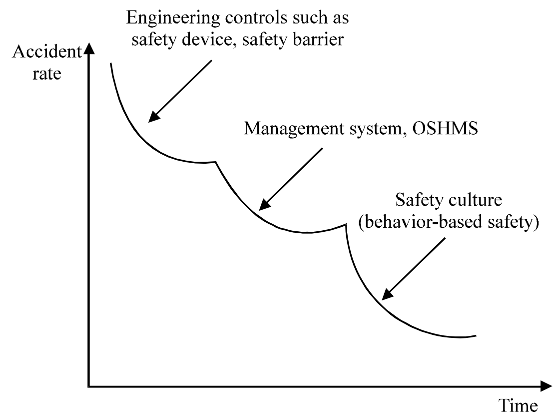

Fig. 7: Steps to prevent workplace accidents

In this study, we confirmed the level of safety perception at company A through questionnaires. The survey result showed that of seven given categories, the weakest was unsafe behavior and therefore was one of the main priorities in enhancing the safety culture of company A. We used the survey results to adapt and apply a Behavior-Based Safety (BBS) approach over a certain period and confirmed that it is an effective method to prevent accidents in the display manufacturing process.

There were several limitations when we conducted the survey and constructed the CBI used for BBS which has been adapted for enhancing safety culture. First, the employees did not display a high level of interest in the safety perception survey and only 209 answered the questionnaire, even though, we distributed it to 1,200 employees. As most of the people we targeted were shift workers, it was hard to collect survey data, so, we conducted the survey twice in order to collect enough data for statistical reliability. According to, Roscoe's simple rule of thumb, 10% or more of a target population should assure the reliability of a survey. The shift workers who were our survey targets mostly subject to act unsafely, the survey result can representatives were secured and could get statistical reliability of survey.

The most frequently observed unsafe behaviors in company A involved objects leftin passageways, overloaded hand carts, unsafe handling of chemicals and inadequate storage. In order to prevent accidents caused by unsafe behavior, voluntary and continuous employee participation is essential. Clean-up and workspace arrangement by all workers is the first step of safety management.

Unsafe behaviors can be improved through continuous mutual observation and feedback as described in this study. The approach to secure workplace safety and the prevention of accidents is shown in Fig. 7.

Safety and health management systems are often introduced to prevent accidents caused by technology, it is this stage that most management including CEOs, focus on. However, while it is possible to prevent the occurrence of workplace accidents by eliminating and improving unsafe conditions through engineering management, this study shows that approach is inherently limited. Instead, differences in individual inclinations mean that even if accident prevention activities are implemented by applying the safety and health management system, workers will still engage in unsafe behaviors. Therefore, it is necessary to create and enhance a safety culture in which all employees participate for the prevention of accidentsas well as unsafe behaviors.

Technical measures and safety and health management systems had already been introduced and applied at company A even before we introduced BBS. In this study, we developed a CBI as a method of behavior-based safety management which is the last step in safety management for company A and applied it across the company from 2014-2016. As a result, the number of accidents was significantly reduced.

CONCLUSION

Much of the module process in company A is now moving to Vietnam and workers who are not accustomed to module processes can be exposed to risks caused by unsafe behavior and conditions. If the behavior-based safety program identified in this study is applied to other display manufacturing processes in Vietnam and Korea, the industrial accidents caused by unsafe behavior can be reduced. In addition, a comparative study of the behavioral characteristics between Vietnam and Korea would be a good research topic.

REFERENCES

AGPS., 1994. Summary Paper in NOHSC: Positive Performance Indicators for OHS: Beyond Lost Time Injuries; Part 1-Issues. Australian Government Publishing Service (AGPS) Publications, Canberra, Australia,.

Awodele, O., T.D. Popoola, B.S. Ogbudu, A. Akinyede and A.H. Coker *et al*., 2014. Occupational hazards and safety measures amongst the paint factory workers in Lagos, Nigeria. Saf. Health Work, 5: 106-111.

Clarke, S., 1999. Perceptions of organizational safety: Implications for the development of safety culture. J. Organ. Behav., 20: 185-198.

Cooper, M.D., 2000. Towards a model of safety culture. Saf. Sci., 36: 111-136.

Cooper, M.D., 2001. Improving Safety Culture: A Practical Guide. Wiley, New Jersey, USA.,.

Cox, S. and T. Cox, 1991. The structure of employee attitudes to safety: A European example. Work Stress, 5: 93-106.

EU-OSHA., 2011. Occupational safety and health culture assessment: A review of main approaches and selected tools. European Agency for Safety and Health, Bilbao, Spain.

HAS., 2013. Behavior based safety guide. Health and Safety Authority, Dublin, Ireland.

Heinrich, H.W., 1959. Industrial Accident Prevention: A Scientific Approach. 4th Edn., McGraw-Hill, New York, USA., Pages: 480.

Lefranc, G., F. Guarnieri, J.M. Rallo, E. Garbolino and R. Textoris, 2012. Does the management of regulatory compliance and occupational risk have an impact on safety culture?. Proceedings of the 11th Joint Conference on Probabilistic Safety Assessment and Management and European Safety and Reliability Vol. 8, June 25-29, 2012, IAPSAM & ESRA, Helsinki, Finland, ISBN:978-162276436-5, pp: 6514-6523.

O'Toole, M., 2002. The relationship between employees perceptions of safety and organizational culture. J. Saf. Res., 33: 231-243.

Ostrom, L., C. Wilhelmsen and B. Kaplan, 1993. Assessing safety culture. Nucl. Saf., 34: 163-172.

Pidgeon, N.F., 1991. Safety culture and risk management in organizations. J. Cross Cult. Psychol., 22: 129-140.