



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 5, May 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

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Behavior Based Safety in Manufacturing Industry

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ABSTRACT: This paper is intended to be helpful in understanding and applying the concept and process of safety of behavior for safety professionals who are concerned with correcting unsafe behaviors to reduce accidents and promoting safe behaviors to develop an injury-free culture in their organizations. Behavior Based Safety (BBS) emphasizes that employees must take responsibility for their safe and unsafe behavior. If they behave insecure, they are not punished, but repeatedly asked to correct them and when they behave safely, they are encouraged. Both unsafe and safe behavior are counted and displayed. BBS also discusses the unsafe conditions that influence unsafe behavior. BBS is a data-driven decision-making process. BBS believes that what is measured gets done and every employee can improve organizational security. Employees are the basic source of expertise on behavior change (observe and correct). BBS begins with briefing sessions for all work areas and departments. BBS is teamwork; It's company-wide and people-oriented. The purpose of BBS is not to enforce safety rules, force change, gossip about others, and report to the boss. The aim is to identify safe and endangered behavior, identify possible injuries, communicate the risk and find safer solutions. An implementation team or BBS steering committee monitors its progress. In essence, BBS is not a management-driven security tool. It is a person-centered approach with management support.

KEYWORDS: Behavior Based Safety, data-driven decision-making process, management-driven security tool, person-centered approach.

I. INTRODUCTION

A behavior-based safety approach promotes interventions that are people-focused and often incorporate one-to-one or group observations of employees performing routine work tasks, setting goals carefully and giving timely feedback on safety-related behavior, coaching and mentoring. The initiatives have a proactive focus, encouraging individuals and their work groups to consider the potential for incident involvement, (accidents) and to assess their own behavior as safe run safe always, no matter what. Behavior-based safety is a process that reveals to management the overall safety of a workplace. Established as a way to increase control and manageability in industrial settings, BBS strives to focus workers' attention on their own and their peers' daily safety behavior. BBS mandates that management and employees alike consistently focus attention and action on their own daily behavior to keep facilities safe.

When BBS goes as planned, employees are more engaged in their safety, and more willing to take responsibility for their safety-related behavior. They're also able to hold their peers accountable when unsafe practices occur. The result is a workforce that is acutely aware of safety protocols and is actively working to stay safe.

BBS's conception was vice president of BST, INC. Dissatisfied with the lack of progress and ingenuity in industrial safety concepts, Spigener's intention was for BBS to become another component in his organization's safety program.

Spigener wanted to increase the effectiveness of safety programs. Since most safety concepts and strategies focus on engineering and administrative controls, Spigener thought these controls were forgetting a crucial factor in workplace accidents: people. Sure, machines can shut themselves down when a sensor goes off, but no machine can monitor the reckless habits of workers. Administrative controls like signs, floor markings, and labels only work when teams are being mindful of rules. Without people being accountable for safety, safety problems would always plague the workplace. This was the way BBS approached the problem of safety. With the help of the science of behavioral change,



Spigener created system-focused BBS, which seeks to find, then reduce or eliminate exposures that lead to accidents and injury by improving the systems that make up a facility's operations.

1.1 Behavior and Accident Prevention Model

The Bureau of Labor Statistics (BLS) reported that there were approximately 2.8 million non-fatal occupational injuries and 4,609 occupational deaths in 2017 (BLS, 2018). In 1931, H. Heinrich carried out extensive research into a database that is used by the insurance industry. As a result, he concluded that approximately 90% of security incidents are due to "unsafe acts" (Al Hemoudetal., 2006). If further research shows that this number is accurate, the number of work accidents that occur each year could be drastically reduced if the human element of error is eliminated.

In prevention, maintenance and injury investigations, the interaction between humans, machines and the environment is often the crucial tool that safety experts use when evaluating safety-related programs. Incorporating BBS into the work environment provides an opportunity to reduce injuries as the human contribution to the incident is reduced. In any human / machine / environment interaction, there is always the potential for injury and the likelihood of injury due to human error may be lower.

1.2 Behavior Approach - Mindset & Risks

With the behavior-based approach to continuously improving safety, many more people take responsibility or safety and keep an eye on the ball every day and every shift. The workshop staff take turns to act in such a way that observers within their own work group continuously measure the safety performance. A checklist is used, which is updated regularly to take account of changes that may occur in the work environment.

Many companies are striving to improve safety performance in the workplace through both task and hardware approaches. In the past, these tended to focus on the physical design and how it relates to employee performance. That is why engineers and ergonomists have dominated the security arena. More recently, sociologists and psychologists have been added trying to explain involvement in accidents and poor safety performance in terms of attitudes, safety climate and / or organizational culture. The first of these approaches involves trying to change employee attitudes and reducing accidents through advertising campaigns, safety training, or disciplinary action. It can be recognized as the "traditional" approach to improving safety performance. Other approaches tend to use the workplace survey method (ie interview and questionnaire techniques) for problem diagnosis.

Therefore, the challenge of continuously improving security performance remains a key activity for many companies. In fact, managers and safety directors responsible for improving safety performance have asked us for help because they believe they have reached some kind of plateau. They felt unable to further reduce the number of accidents by traditional means. A growing body of evidence suggests that shifting the focus from traditional approaches to a behavior-based approach to improving safety can further improve safety performance in the workplace and reduce the number and severity of occupational accidents.

Any popular, widespread concept is quite criticized, but BBS is more polarized than other health and safety philosophies. Many safety managers and experts spoke out against it because they weren't worth the cost, didn't do what they advertised, and didn't even meet basic expectations, while others criticized BBS for blaming employees for accidents, injuries and other safety deficiencies. Because of this, BBS is often misinterpreted by operations that rely on the wrong philosophy that people do stupid things and that is why accidents happen.

In one facility, collisions kept occurring outside the door that led to the break room. Security managers couldn't figure out why people kept colliding. They implemented a number of BBS strategies, and yet accidents kept happening. One incident was so bad that a worker suffered a broken wrist. It wasn't until the safety manager went to the Gemba and found that the main cause of the problem was surprising: the accidents happened just before lunch and the reason people rushed to the break room because there weren't enough seats there. If you didn't hurry, you would have to eat your lunch standing up. This was a problem that BBS was unable to resolve.

For Spigener, this is a huge misunderstanding of what BBS is made for. This concept was not designed as a comprehensive solution for the safety programs of industrial plants. Instead, it is a complementary tool.

There are three factors that influence personal safety choices: the ability to recognize and assess hazards, the motivation to be safe, and the ability to focus while safely doing the current task.

Behavior Based Safety is a program designed to influence the actions of employees towards safer results, ideally by preventing an accident or injury before it occurs. Implementing a behavior-based safety program is the most comprehensive way for companies to promote safety, eliminate hazards and prevent injuries. When implemented correctly, a behavior-based safety program can offer positive rewards for changing unsafe behavior, reducing work-related injuries, minimizing lost production, and improving work morale - essential ingredients in creating a strong one.

II. RELATED WORKS

1. Behavior based intervention for occupational safety – case study

Debra L. Truitt (2016) conducted the study to know the association between training experience and attitudes on perceived job proficiency among 237 employees. There spondents were from three different states namely Maryland, Delaware and Arizona. Findings show that half of the employees are showing positive result remaining of them showing negative result towards T&D program, which develops their job proficiency. For example, to a forklift operator you might say, “Thank you for driving slowly around that corner and using your horn to warn others.” Avoid generalizations such as, “Thanks for driving the forklift carefully.” Deliver feedback on performance immediately after the behavior or as soon after the behavior as possible.

2. Behavior Based Safety Among Workers And Management Level Towards A Better Safety Culture In Construction Industry

Shah Rollah et al., (2014) Human behavior is a major contributor of construction accidents; nearly 80% of the accidents/incidents occur due to unsafe behaviors. The presence of good safety behavior does reflect good safety compliance. Safety issue cannot betackle effectively without interference of employers with a particular pattern of behaviors as important criteria needed to change employee’s behaviors. If properly applied an effective next step towards creating a truly proactive safety culture, where loss prevention is a core value. It assumes that majority of work related accidents are caused by workers at-risk behaviors which can be reduced through behavior modification. An exploratory cross-sectional employees’ perception survey was used in conducting the study, using questionnaire / interactions administered on randomly selected employees of the two construction companies involved in the construction / maintenance project. The results indicated that the implementation of behavior-based safety program in the construction project to a large extent reduced workers at-risk behaviors and accident rate. Also different levels of management influence safety practices within organizations in a different ways. Thus, the primary objective to change behaviors in work among workers and management in the construction project.

3. Proactive Behavior-Based Safety Management for Work Area Safety improvement

Ting Huang (2019) Construction is one of the most hazardous industries due to its dynamic, temporary, and decentralized nature. The Hong Kong Commissioner for Labor identifies worker behavior as the root cause of construction accidents. Behavior-based safety (BBS) is one effective approach in managing employee safety issues. However, there is little research on the application of BBS in the construction industry. This research proposes an extension of the BBS approach, proactive behavior-based safety (PBBS), to improve construction safety. PBBS integrates the theory of BBS with the technology of Proactive Construction Management System (PCMS). The innovations of PBBS are: (1) automatically monitoring location-based behaviors; (2) quantitatively measuring safety performance; (3) investigating potential causes of unsafe behaviors; and (4) improving the efficiency of safety management. A pilot study of a Hong Kong construction site practicing PBBS was conducted. The experiment results showed that PBBS performed well on construction accident prevention and the Safety Index (SI) of the two project teams, with increased improvements by 36.07% and 44.70% respectively. It is concluded that PBBS is effective and adaptable to construction industry.

4. The Implementation and Evaluation of Behavior Based Safety Intervention at Sishen Iron Oremine:

S. Rothmann (2017) World-wide it is estimated that workers suffer 250 million accidents every year, with 330 000 fatalities. In South aca, the fatality rate is 426 per annum. Sishen mine also experienced safety problems, namely a high injury rate, an average of one fatality perineum, and 85% of injuries being caused by risk behavior. Furthermore, the safety culture at the mine was moderate. A proper safety management system requires continual attention to three domains, namely the environment (equipment, tools and housekeeping), the person, and behavior. Sashes mine previously concentrated on the domains of environment and person, and virtually ignored safety behavior. To correct this, Sishen mine adapted a behavior based safety intervention programmed. The aims of this research were to determine drivers that motivate safety and risk behavior, to identify critical factors for the successful implementation of

such a programme, and to determine if the safety culture and performance were affected by the implementation of a behavior based safety intervention program

III. PROPOSED SYSTEM

In the proposed system, BBS is a data-driven decision-making process. BBS believes that what is measured gets done and every employee can improve organizational security. Employees are the basic source of expertise on behavior change (observe and correct) BBS begins with briefing sessions for all work areas and departments. BBS is teamwork; It's company-wide and people-driven. The purpose of BBS is not to enforce safety rules, force change, gossip about others, and report to the boss. The aim is to identify safe and endangered behavior, identify possible injuries, communicate the risk and find safer solutions. An implementation team or BBS steering committee monitors its progress. In essence, BBS is not a management-driven security tool. It's a people-centric approach with management support.

IV. METHODOLOGY

4.1 Developing observation procedure

Observation and feedback are the most important components of the BBS process. Observation provides the data that makes this process uniquely effective.

Following steps are followed after forming the checklist:

- Who will conduct the observations?
- The frequency of the observations
- Observation procedures
- Who will provide feedback and when

Observations are conducted by design team and supervisors trained to do so. The observer will watch the employee work, and use the checklist to record the number of safe and unsafe acts the employee performs. Observations are conducted for 10-15 minutes daily and are noted in the checklist.

4.2 Data analysis

Data collected by each observer is analyzed for finding the unsafe and safe acts performed by the employees. This is used to evaluate the improvement in the participants (employees) daily and weekly basis by calculating the safety index (SI). Based on this feedback is provided.

$$SI=100[N2/ (N1+N2)] \%$$

N2: observed times of safety behaviour;

N1: observed times of unsafe behaviour; N1+N2: total times of observed behaviour.

4.3 Developing feedback procedure

Frequent feedback is essential in maintaining any safe behaviour. Provide positive feedback for safe behaviours and non-threatening, instructive feedback on how to correct unsafe behaviours.

Following steps are considered before giving feedback:

- Who will provide feedback?
- How often feedback be given?
- How feedback is given?

Feedback is provided on daily basis and weekly basis. Daily feedbacks are provided verbally to each participants individually mentioning the safe and unsafe behaviours they performed. Feedbacks are also displayed publically in notice boards on weekly basis showing the change in safety index of the entire group (Participants), which shows change in behaviour among the group. Daily feedbacks are provided by the observer itself after the work. Stimuli leading to unsafe behaviours are identified and training sessions are provided to the group in every week to correct the unsafe behaviours they performed.

4.4 Measuring success

Success of the study is measured by calculating the Safety Index on weekly basis for the group. A baseline of 70% is set which is used to evaluate the improvement. A participant performing tasks with higher percentage of safe behaviour or Safety Index than the baseline shows the improvement in the group. Change in the Safety Index during the 8 week study time shows the effectiveness of the BBS among the workers.



Various approaches have had reasonable success in reducing unsafe behaviours in the workplace. Some involve penalties; others involve surveillance; others involve guidance, codes and procedures to follow; others still are supportive and training- oriented. Some initiatives come from the employer, from the social partner organizations, from state regulatory bodies, and some worthwhile initiatives come from individual employees’ own insights, ideas, training and development activities around health and safety.

V. EXPERIMENTAL RESULTS

The goal of behavior-based safety is to change the behavior of employees from “at risk” behaviors to “safe” behaviors. They use what is called the ABC model to change human behavior. Most of today’s behavioral safeties efforts are based on this theory that says all behaviors are a result of antecedents and consequences. Various approaches have had reasonable success in reducing unsafe behaviors’ in the workplace. Some involve penalties; others involve surveillance; others involve guidance, codes and procedures to follow; others still are supportive and training - oriented. Some initiatives come from the employer, from the social partner organizations, from state regulatory bodies, and some worthwhile initiatives come from individual employees’ own insights, ideas, training and development activities around health and safety.

FORKLIFT
To check the Break , ON /OFF working condition , Horn and streeing condition
Speed limit inside shop 5KM/hr and outside shop 8 to 10KM/hr
Driver wear ID card and reflecting jacket
From axle shop entrance to road point is gradient, so forklift is moved in reverse condition. Forward condition due to gravity, possible of axle falling.
With axle two still ages and at empty three still ages.
If any issues in vehicle not allow driving. And informed to supervisor immediatly

VI. CONCLUSION

The concept and process of BBS can is aimed at safety professionals and anyone concerned about correcting unsafe behaviors to reduce accidents and promoting safe behaviors to develop an injury-free culture in their organizations. Behavior-based safety training and implementation help improve the company's safety culture. By increasing the quality and frequency of security feedback in the organization, barriers between employees within and between organizational levels are reduced. Improving safety communication (both correcting and rewarding feedback) through BBS leads to a more open, positive and trustworthy safety culture as well as improved safety performance. BBS is a process that enables companies to achieve a higher level of safety excellence by proactively reacting to statistically valid leading indicators, building ownership, trust and unity across the team, and developing empowerment opportunities related to employee safety.

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