Behavior Based Safety approach to advance injury free culture

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Abstract—Behavior Based Safety (BBS) is an approach based on human behavior used to prevent workplace injuries, which is currently being used in many countries. As it is not restricted for particular field, it can be applied for any type of field to minimize the behavior related problems, BBS provides tools and methods that employees can use to take control over their own safety performance. In this thesis BBS intervention technique has been used to explain the consequences and create awareness among employees of different categories. This is also explains about the problems faced by the employees is wearing the personal protective equipments. Peer – to – peer intervention had with employees helped a lot to understand this problem from their point of view. Employees stated numerous reasons for not adhering PPE. Lack of comfort/fit, fogging, storage and scratching of the eyewear were suggested as the most important barriers for wearing personal protective equipments usage. Management concepts were implemented in order to create a safe environment by involving middle management peoples. Thus BBS was implemented in organization in various formats. Then incident rate was measured before and after implemented of BBS and the same was compared with each other. The comparison reveals that the incident rate after implementation has reduced considerably. Hence it is concluded that implementation has given fruitful result in the reduction of workplace injuries, promote injury free culture and enhance the proper usage of PPE.

Keywords— Behaviour based safety, Personal protective equipment, Workplace injuries & Awareness.

I. INTRODUCTION

Behavior Based Safety (BBS) is the "application of science of behavior change to real world problems". A process that creates a safety partnership between management and employees that continually focuses people's attentions and actions on theirs, and others, daily safety behavior.

Behavior is variously defined as:

- How a person conduct himself;
- The demeanor and manners of an individual;
- An absolute action of a person.

The case of human behavior is associated with attitude, personality, motivation and memory, together with those physical and mental characteristics which constitute a person and his environment.

II. OCCUPATIONAL PSYCHOLOGY

Occupational psychology is concerned with the behavior of people at work. It deals with areas such as the intelligence and aptitude require for work related task, essential tests for the selection and placement of people, training and supervision requirements, the important of communication and in other cases, the resolution of conflict involved employers and employees.

BBS "focuses on what people do, analyzes why they do it, and then applies a research-supported intervention strategy to improve what people do.

At its very core BBS is based on a larger scientific field called Organizational behavior management. In a safety management system based upon the hierarchy of hazard control, BBS may be applied to internalise hazard avoidance strategies or administrative controls (including use of PPE), but should not be used in preference to the implementation of reasonably practicable safety measures further up the hierarchy.

To be successful a BBS program must include all employees, from the CEO to the front line workers. Including but not limited to hourly, salary, union employees, contractors and sub-contractors. To achieve changes in behavior, a change in policy, procedures and/or systems most assuredly will also need some change. Those changes cannot be done without buy-in and support from all involved in making those decisions.

III. LITERATURE SURVEY

Rokeach (1968) defined ‘attitude’ as a learned orientation which focus towards the object and situation which provides a tendency to respond favorable or unfavorable to the object situation. Dominic cooper (1999), the well known exponent of behavior safety, defines the terms as the systematic application of psychological research on human behavior to the problem of safety in workplace. It is the person of involving employees in defining the way that they are most likely to be injured. Basically it is means of obtain increased in improvements in safety performances.
through the promotions of safe behaviors at all levels in the concerned workplace. The vital important factor is not replacement for more traditional proactive and reactive approaches for the accident prevention activities. This approach is directly focused on improving self awareness, improving the safety culture and encouraging the contribution factor among the workers and also developing the involvement in the safety aspects. This is also concerned with establishing and promoting the right safety culture within the organization based in higher management and its commitments. In the safety research the application if behavioral science for solving the safety problems incorperated and community skills. Indeed most of his 250 researches are evaluating the behavior change intervention to improve the safety quality.

McSween et al., (1995) revealed that the behavioral approach to injury control has a number of advantages to the management and they can approach the people in the natural setting where they problems occurred in such particular works area. Although there was proven evidence that both specific and global behavioral based safety feedback, as such the present study compared the impact of giving specific versus global feedback regarding certain self related behaviors.

Geller et al., (2004) stated that BBS method can be incorporated in many areas like occupational safety, ergonomics, human error prevention, incident analysis, hazard identification and preventive corrective actions. The BBS based observation and feedback must be viewed as one of the systematic ways to prevent injury in the building premises. This category of programs developed by behavioral scientists and it incorporates basic principles and procedures from BBS.

Myers et al., (2010) stated that the success of the BBS intervention program and the durability of behavior change over time. The intervention took place in an oil refinery in which plant managers had expressed a clear interest in reducing injuries and improving safety culture.

- All the employees were informed of the intervention, the rationale behind the intervention and the goals of the interventions therefore employees implicit identify the risk and need of training and associated risk.

- A design team was created with 10 employees who volunteered to take part of area. The design team was trained for 3 days.

- The design team trained all the employees on BBS for using observation to measure of safe behavior.

- Employees are requested to complete at least two peer observations per month using check list that listed relevant safe behaviors. The design reviewed the observation report frequently.

- Employees received monthly feedback as both verbal and visual. Rewards were delivered in the form of meals are small celebrations if the team met their targets.

- Finally at all Workplace reduced the incident rate from an average of 4 per year prior to the BBS program. Additionally, over the years, participation in the program remained above 60% indicating a high level of employee engagement in safety.

Unsafe behavior takes many forms from simple failure to wear or use personal protective equipment to intentional actions, such as removal of machine guarding not following safety precautions or the defending of a safety mechanism. They are many reasons why people behave unsafely. It may be that they were taught a particular unsafe method of work at the start employment and see it now as standard working practice.

They may lack of skills or knowledge to undertake a task safety, as with certain manual handling operations, they may fail to make a load secure due to demand on time, or operate equipment, such as a lift truck, without authority to get the job finished.

The BBS is going to work efficiently; there must be formally established systems and operating procedures. These techniques are used for safety analysis and risk assessments are useful tools for identifying the potential hazards and precautionary activities for employees. For implementing the BBS has number of stages as follows:

- Identify and specifying the procedures and systems.

- Explaining to employees, the key aspects of system works and getting them to complete the task according to the established system.

- Provide adequate training to the new employees and educate the standard operating procedures.

- The supervisors and others are well known about the system and correct operating procedures.

- Regular monitor and observations should be done by the safety officer or the safety managers.

**IV. BEHAVIOR BASED SAFETY TRAINING**

The commencement of BBS training program is essential that people at all levels receive the appropriate raining. Such a program incorporates a number of elements.

- Raising the safety awareness: This is the one the principle objectives of the training program me. Poster campaigns, targeting both safe working practices and the cause of accidents and ill health, should be used to raise awareness.

- Coaching: Line managers, supervisors should receive the frequent coaching and that coaching should be documented by the self operating procedure.
Reviewing the consequences of unsafe behavior:

Regular feedback sessions are necessary whereby accidents arising from unsafe behavior are reviewed with the reference to the direct and indirect cases of those accidents. By the way no doubt that people learn from the others mistakes.

Once the program has been established and it is necessary to monitor frequently. Similarly in the case of observers, they may lose heart if they see no action being taken following their observation.

BBS is not based on assumptions, personal feeling, and/or common knowledge. To be successful, the BBS program used must be based on scientific knowledge. The following figure [1] show how implemented the BBS.

<table>
<thead>
<tr>
<th>Behavior based safety model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observed workers</strong></td>
</tr>
<tr>
<td>Receive periodically safety training</td>
</tr>
<tr>
<td><strong>Observers (Management Commitment)</strong></td>
</tr>
<tr>
<td><strong>BBS facilitator</strong></td>
</tr>
<tr>
<td>Training observers</td>
</tr>
<tr>
<td><strong>Management Representative</strong></td>
</tr>
<tr>
<td><strong>Steering Committee</strong></td>
</tr>
<tr>
<td>Best practice and previous recommend</td>
</tr>
<tr>
<td><strong>Top Management</strong></td>
</tr>
</tbody>
</table>

Figure 1: Behavior based safety model
Behavior-based safety supplements other elements of an organization’s safety process by supporting safety practices and providing data that helps the organization prioritize and address conditions and design factors that contribute to unsafe acts. By using this BBS is system we can reduce the accident and improve the safety culture as desired.

V. METHODOLOGY

The core of BBS is to perform field observation, analysis and communication based on the unsafe behavior, which would help analyze the unsafe behavior and achieve the prevention of accident and eliminating the occurrence of unsafe behaviors.

The four main procedures of behavior based safety management theory is

- Identify critical actions
- Collect action data
- Provide dual communication
- Eliminating the hindrance for safety behavior.

Steps to identify critical behaviours:

Look at incident trends to determine which processes carry the greatest risk for incidents. Conduct a hazard evaluation of the facility to determine the areas that have the greatest risk for an incident. Look at tasks that have the potential for serious injury or death. An example would be a confined space entry operation into a vessel or any other STP or ETP tanks that contains a toxic chemical or toxic gases.

Once the critical behaviors have been identified, ensure that effective engineering and/or administrative controls have been implemented. Eliminating the hazard should be the first priority.

After the behaviours have been identified, break down each step in the process. The steps should be detailed enough so that independent observers evaluating the same employee will get the same results. For example, one of the items on the checklist is personal protective equipment (PPE). Be specific about what PPE is required.

Observation checklists used to provide direct, measurable information on employees’ work practices. The observer uses the checklist to document employees performing their routine task. The observer records safe and unsafe behaviors on the checklist.

This information will be used to provide feedback and measure progress toward goals. The observation was obtained from various departments and different operations in manufacturing units which will be conducted in weekly as four sessions.

Table 1: Behavior based observation check list

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Observation</th>
<th>Safe</th>
<th>Unsafe</th>
<th>N/A</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PERSONAL PROTECTIVE EQUIPMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Helmet, goggle, boots, glasses, harness)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.</td>
<td>Is necessary PPE being worn?</td>
<td>Y</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1.2.</td>
<td>Is PPE adequate for the job?</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.</td>
<td>Is PPE being worn properly?</td>
<td>-</td>
<td>N</td>
<td></td>
<td>Not wearing properly</td>
</tr>
<tr>
<td>1.4.</td>
<td>Is PPE in good condition?</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PROTECTIVE DEFENSES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Barricade, tape, Tie-off, warning signs, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5.</td>
<td>2.1 Is isolation adequate?</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6.</td>
<td>2.2 Is warning adequate?</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7.</td>
<td>2.3 Are defenses secured?</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>POSITIONS/ACTIONS OF PEOPLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Use of what if approach to foresee the unexpected)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1.</td>
<td>Striking against or being struck by</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2.</td>
<td>Falling at the same level or to a different level</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3.</td>
<td>Caught with temperature extremes</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.4.</td>
<td>Contact with electric current</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TOOLS (File,Grinder,Stringer,Wrench etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.1 Are the tools right for the job? Y
4.2 Are the tools being used properly? N Right tools are not used
4.3 Are the tools in safe condition? N Condition to be improved

5 EQUIPMENT (Crane, bobcat etc)
5.1 Is the equipment right for the job? Y
5.2 Is the equipment being used correctly? Y
5.3 Is the equipment in safe condition? Y

6 5S Condition
6.1 Is the 5S condition standard adequate? N Condition to be improved
6.2 Is the 5S condition standard understood? Y
6.3 Is the 5S condition standard followed? Y

7 PROCEDURES (Planning, Permits, SOP, JSA)
Are the procedures followed and adequate? Y

Y=Yes, N= No

Rule adherence %
Adherence % month of Oct $^{14}$ = 43.5
(Followed / Total) X 100 = % Adherence
(136 / 142 X 100 = 95.7 % Adherence
Adherence % month of Jan $^{15} = 95.7$

<table>
<thead>
<tr>
<th>Week</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>60</td>
<td>53</td>
<td>77</td>
<td>75</td>
<td>80</td>
<td>88</td>
</tr>
<tr>
<td>0</td>
<td>42</td>
<td>35</td>
<td>66</td>
<td>72</td>
<td>70</td>
<td>78</td>
</tr>
<tr>
<td>0</td>
<td>20</td>
<td>21</td>
<td>34</td>
<td>40</td>
<td>60</td>
<td>72</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>10</td>
<td>27</td>
<td>52</td>
<td>60</td>
<td>75</td>
</tr>
</tbody>
</table>

Fig 3: BBS observation result

The above BBS based checklist observation was conducted in various locations and operations. From the obtained result with the help of continuous training regarding the BBS the safety culture and the behavior based approach to be improved massive and the industry can reach the zero accident.

VI. RESULT

BBS was utilized in many areas which is monitored frequently the behavior is the one of key factor in safety performance. However the behavior based safety is not developed in our country therefore still it was in beginning stage by following the BBS management in safety, the moral and safety culture will be developed.

Fig 4: Overall performance in BBS implementation.

BBS implemented all areas such as Production, maintenance area, Quality checking area, storage and material movement, washing area and fuel storage. The salient improvement is noted and the behavior was improved. In work places with troublesome rates of unsafe performance, behavioral safety programs properly implemented it produce significant improvement in safe performance and financial cost are sharply reduced.

VII. CONCLUSION

Result of the BBS experimental analysis carried out in cement industry there was a significant improvement developed in safety activities among the workers and managements. It created good relationship between them. 90% of accident and near misses were reduced.
due to reduction of unsafe act and conditions. The industry which is implementing the above mentioned behavioral activities will meet the healthy and also can achieve a safety environmental for employees and country

REFERENCE


