International Journal of Research in Engineering, Science and Management
Volume-2, Issue-12, December-2019
www.ijresm.com | ISSN (Online): 2581-5792

Behaviour Based Safety in Workplace

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***Abstract*: Behaviour-based safety (BBS) is the "application of science of behaviour change to real world safety problems" or "A process that creates a safety partnership between management and employees that continually focuses people's attention and actions on theirs, and others on daily safety behaviour. Safety at work is the subject of continuous debates, studies and researches. Traditional safety programs put the responsibility of accident prevention and safety coordination on the shoulders of upper management in each company. An alternative currently being used in industry is Behaviour Based Safety (BBS) concept. A behaviour-based approach to industrial safety management has been advocated by many authors and has been found to effectively improve safety performance in different industrial settings and on different circumstance. Unsafe behaviour of people is the most important factor to cause accident. In this project phase-I the BBS approach was characterized and the examples of good practices in workplace are clearly explained**

***Keywords*: Safety culture; Behaviour Based Safety; Observation program.**

1. Introduction

The training market offers a wide variety of safety programs. Safety has become an important issue for companies. With workplace accident costs rising into the thousands of dollars, companies are now taking a closer look into safety. Safety incidents do not just cost the company medical bills and damaged equipment costs; they include insurance premium increases, production decreases, and loss of customers due to poor safety records. Behavior-based safety is one of the newest safety programs to be marketed. This safety program uses psychology and employee ownership to prevent safety incidents. Behavior-based safety sets up a program that uses a safety committee that is made up of employees. They use Behavior-based safety observations to determine the most prevalent at-risk Behaviors. The observations use negative and positive reinforcement to help modify employee Behaviors, supporting the Behaviors that are good and acknowledging those that place the employee at risk of having a safety incident. The employees are trained and then asked to do observations on other employees while they are working. These observations are then compiled into a database that allows the committee to make decisions on where more training needs to be utilized or employee awareness needs to be heightened

A. BBS History

The methods employed in BBS originate from techniques used by psychologists and have only been used in occupational safety applications for approximately last 30-years (Al Hemoud et al., 2006). Psychologists have identified a comprehensive Behavior change program as one that includes the following:

- Identification of target Behavior(s).
- Establishment of criteria in order to determine what consequences will accrue
- Apply to those Behaviors that have to be changed.
- Include the target audience as active participants in the process
- Implementing the program.
- Provide training to all participants that the program will focus.
- Collect data in order to track progress
- Provide feedback based on the data.
- Allow for adjustments to the program as and when necessary.
- Exercise a continued commitment to the program.

From a psychological standpoint, design safety engineers do not design with the mindset that all people vary based on Behavioral vectors such as: social norms, functional disorders, stress, etc. Psychologist believes that if these things were evaluated during the design of any process, then the potential for human error can be decreased (Peters, 2006). While the above is valid in retrospect, one can make an opposing argument in analyzing human error to conclude that during the design of safety-critical systems; the user having the “freedom to choose” can contribute to a human engaging in “at-risk” Behaviors’ that can lead to injuries (Pajan, 1997). Both the points of view (from the psychologist and safety perspectives) share a common interest in that being human error has not been researched enough at the design engineering level. Other psychological researchers believe that when it comes to eliminating/reducing human errors that result from “at-risk” Behavior; more than one technique should be administered. These include, but are not limited to (Anca, 2007):

- Training & Development
- Leadership/Management/Supervisors Inclusion
- Distraction Management
- Situational Awareness

While the core principles of BBS relate to psychological applications, its application in the workplace requires continuous maintenance/participation/support from all levels of employment as opposed to targeting specific groups of interest, similar to implementation of Behavior modification in the psychology field. BBS is most effective when applied at all levels of the organization (DePasquale et al., 1999).

2. Review of Literature

Safety management practices not only improve working conditions but also positively influence employees' attitudes and Behaviors with regard to safety, thereby reducing accidents in workplace. While safety knowledge and safety motivation are well-established predictors of safety participation, less is known about the impact of leadership styles on these relationships. The application of Behavior Based Safety (BBS) approach in construction industry is facing a severe challenge that safety performance may decline when BBS intervention is removed. Safety at work is the subject of continuous debates, studies and researches. Traditional safety programs put the responsibility of accident prevention and safety coordination on the shoulders of upper management in each company. An alternative currently being used in industry is Behavior Based Safety (BBS) concept. When employees perceive safety communication, safety systems and training to be positive, they seem to comply with safety rules and procedures than voluntarily participate in safety activities. Under low transformational leadership, safety motivation was not related to safety participation; under high passive leadership, safety knowledge was not related to safety participation.

3. Methodology

The guide that follows, is based on both the authors' theoretical and practical experience, and as such is concerned with outlining the principles and practices involved. Obviously, each organization is different but the approach is very flexible, and can be adapted to suit all types of organizations and situations.

A. Planning

As with most types of interventions, some planning is required. This usually entails deciding on the scope of the intervention, in terms of which departments etc. will be involved, and the necessary resources, as well as identifying the person, usually a senior manager or safety advisor, who will coordinate the overall effort.

B. Measuring current perceptions of the safety culture

Ideally, at the very beginning of this type of approach it is useful to measure employee's current thinking, in terms of safety, along various dimensions. This not only provides information as to currently held beliefs, but it aids in the development of the safety performance measures, so that they can be devised with maximum effect. It also provides senior management with information concerning the effects their current policies and practices are having on safety per se. Moreover, the results of the safety culture measure can be used as a baseline, by which the effects of the behaviour based approach on the plants safety culture can subsequently be assessed.

C. Management Briefings

During the planning stages, briefings must be held with line management as early as possible, to outline and explain the philosophy of utilizing goal-setting and feedback to improve safety performance. If line management does not 'buy in' to the process, problems may ensue. At the end of these briefings management will be asked to demonstrate their commitment to the successful implementation of the approach by fulfilling certain requests. These are [a] that they inform their subordinates that this type of intervention will be put into effect in the very near future and that their cooperation will be necessary. This aids in subsequent efforts, because the workforce are not in the dark as to what will be happening; [b] that they suggest appropriate personnel to be recruited as observers, or ask for volunteers; [c] that they allow all their subordinates to attend the subsequent goal-setting meetings; [d] that they allow observers to conduct one observation session during each working day. This does not usually take any more than 30 minutes at most; [e] that the managers themselves attend the goal-setting sessions to provide support to the observers; [f] that managers should praise subordinates who work safely; [g] that managers should regularly remind workers to try and reach the safety goals; [h] senior management should make a point of visiting each department (or workplace) on a weekly basis to discuss and make comments on the progress to date.

D. Recruiting Observers

Similarly, during the planning stages provision needs to be made to recruit employees to become safety observers. This is done normally on the basis of three criteria. First, the observers should be people who are known to be committed to safety. Second, each observer must be willing to undergo training, and continue to observe their colleagues safety performance for at least six months. Third, one observer should be obtained from each individual shift crew or department in order to ensure that the same observer will be in situ. If these criteria are not followed, and people are simply told that they will be observers, some initial problems can be expected, although these will not be insurmountable.

E. Interviews

Another aspect of planning is to ensure that a stratified sample of approximately 15 percent of the workforce will be made available for 30 minute interviews, to provide a check on the utility and practicality of the safety performance measures that will be developed, and gleaning further information that may be useful.

F. Training

Similarly, the planning stage will entail setting aside a days training for the observers, once the safety performance measures have been devised. If the plant or facility is large, it may be necessary to set aside sets of training days for groups of observers. As a rule of thumb, a ceiling of 25 observers should be set for each training group, simply because it becomes difficult to train more than this effectively at any one time.

G. Safety Performance Measures

After the planning stage, developing a reliable safety performance measure, for each department or type of trade, will be one of the first and main objectives. This will consist of identifying possible contributory factors to accident causation and sub-dividing these into observable behaviours or situations that are indicative of safe or unsafe events. Due to the many and varied production processes, many types of accidents can occur for many different reasons. Therefore, it is a good idea to analyze all the companies accident records for the previous two years. It is usually better to go back to the original accident reports, rather than computer summaries, unless the computer records are very comprehensive. Following a fixed sequence, the accident records should be sorted into three main categories. The first step is to sort the accident data by department, etc. The second step consists of identifying the different types of accident within each department, and then sorting these by the place of injury on the body. This step allows identification of both the main types of accident, and the types of task contributing to the causes of accidents. Third, the records should be classified on the basis of whether or not the individuals behaviour, or the situation contributed to the accident. A last final step, is to peruse the records to ascertain whether or not particular individuals are involved in more accidents than the norm, in relation to their peers, within the previous two-year period. If such individuals are identified, it is a good idea to try and recruit them as observers. Once the classification procedure is complete, the main focus of attention should be placed on the specific behavioral causes. In the west-country study, for example, forklift drivers often damaged their thumbs, due to the way they place their hands on a raised knob on the steering wheel; operatives often cut the back of their hands on circular knives when threading the film through slitting machines, simply because spare knives were left in the way; operatives in one department often cut themselves with razor blades when clearing up wet waste, simply because they would not dispose of razor blades in the appropriate receptacles provided for them; similarly, maintenance engineers often found themselves squirted in the eye with fluids, when undoing valves, because they were not wearing eye protection. The safe and unsafe behaviours gleaned from analyses of the accident records, are then subjected to verification, in terms of their utility and practicality, through in-depth, semi-structured interviews with a sample of approximately 15 percent of the workforce. This results in additional items being included that have not shown up in the accident records. On the basis of both the accident records and interviews (and the safety culture measure if applicable), departmental checklists of critical behaviours are constructed. This is achieved by stating the items in behaviorally specific terms, and where ambiguity may be a problem, giving a set of clear and explicit instructions. An example item is 'No spare knives may be left on the right hand side of bar, on slitting machines. A maximum of 3 spare male knives only, may remain on left hand side of the bar when not in use'. Thus, the items on the checklists are written as specifically as possible to allow consistency in scoring between observers, thereby increasing the reliability of the measure. In terms of similarity in accident causes, it may be possible to use the same critical behaviour checklists for all the different offices. Each departmental checklist should be further refined by the departmental managers and safety committees by providing feedback as to the appropriateness of each of the items, along with other suggestions. By following this process there is a buildup of employee ownership, which is vital for success.

H. Scoring the safety performance measure.

The scale used to rate the individual items that determine safety performance on the departmental checklists consists of three columns, the headings of which are Safe, Unsafe and Not Seen. Each item on the checklist is scored in the Safe column as either One, which represents all people behaving completely safe, or Zero which reflects the fact that some or all people are behaving unsafely. Conversely, the Unsafe column reflects the frequency of incidents of unsafe behaviours. This allows the proportion of safe to unsafe behaviours to be recorded. For each particular item, the unsafe column is scored by adding together all the instances of unsafe behaviour. The Not Seen column simply reflects the fact that during a particular observation session, people were not undertaking that particular activity. This allows these items to be discarded from the final percentage calculation. In summary, there are only two possible scores that can be recorded in the Safe column. These are either One or Zero. The Unsafe column can range from one to infinity. Thus, if a score of One is recorded in the Safe column, a zero must be scored in the corresponding Unsafe column. Conversely, if a score of Zero is recorded in the Safe column, then a score ranging from one to infinity will be recorded in the corresponding Unsafe column. The result of scoring safety performance in this way is that the scoring system is weighted heavily towards unsafe behaviour, which detects the slightest improvement in the frequency of safe behaviours. Therefore, any improvements in safety behaviour that are detected will be real improvements that correspond with reality on the shop floor. The formula for calculating the percentage of safe behaviour is based upon individual totals of both the Safe and Unsafe columns, and dividing the sum of these totals into the amount of safe behaviours recorded and multiplying by 100, i.e.

$$\%\text{safe behaviour} = \frac{\text{total safe}}{\text{total safe + total unsafe}} \text{ X } 100$$

I. Training

Each safety observer should undertook a days training in the basic theory and practice of the behavioural approach. The training content should include elements of goal-setting, behaviour modification, team decision-making, how to manage resistance from others, the provision of individual feedback, observational techniques and scoring of the departmental checklists. Similarly, part of the training must be devoted to practice observations within their respective departments, as they may lead to further refinements of the checklists. The observers should continue supervised practice observations for a further two weeks, within their respective departments, to ensure the observers are comfortable and conversant with their task. Any misunderstandings in scoring are usually identified during this period.

J. Establishing departmental baselines

Following the two-week practice period, a copy of each department checklist should be enlarged to A3 size and publicly displayed on health and safety notice boards in the appropriate department. This is done to make it explicit to the workforce which behaviours are being monitored by the observers. The observations in each department take on average, approximately 10-20 minutes to complete, and are undertaken every day, or on every shift, by the observer touring the department. In order to ensure that the pattern of observations is not predictable, they should be undertaken at different times, on different days. Completed departmental checklists are then posted in a departmental collection box for the computation of results. If VDU's are networked and available for use across all departments, it is possible for the raw results to be entered and computed, on a daily basis. A minimum of four weeks of data are subsequently collected from each department to provide a 'baseline' figure from which any improvements can be compared. Each week's figures are calculated and averaged to provide an overall index of each department's safety performance level. These averages are then posted on to specially prepared 3' X 4' departmental feedback charts, whereby the vertical axis would indicate the percentage of safety performance, and the horizontal axis would indicate time (eg the week numbers).

K. Establishing departmental goals

All personnel, including senior management, should attend their respective departments 'goal-setting' meetings. The meetings are usually conducted by the observers, but this may fall to the coordinator, or line management. In practice, it may be necessary to conduct these sessions with a series of smaller groups. Alternatively, it may be possible for the observers to go around their respective departments and talk to people individually, accompanied by the coordinator, or line manager, in order to minimise interruptions to the production process. The meetings should begin with an explanation of the purpose and the philosophy of the behavioural approach. Particular emphasis must be placed on the fact that no individual employee can be identified as a result of the observations, and therefore no disciplinary action will be taken against individuals who do not follow the procedures advocated on the checklists. A copy of the checklist must be given to all those present, to clarify the particular behaviours being monitored. The results of the baseline observations are then presented to the groups, in graphical form on the 3' X 4' feedback charts. Each individual group are asked to agree upon a goal that is 'difficult, but achievable' for improvements in safety, in relation to the appropriate baseline average (see Cooper, 1993). When consensus cannot be reached within a group, as is often the case, each individual suggested goal-level would be recorded. Subsequently, all the suggested figures are summed and averaged to provide a goal that the group can agree on. Once all the groups within each department have agreed a goal, the group goals are summed and averaged to provide the departmental goal. Although this may seem a long-winded way of going about establishing goal-levels, participation induces commitment to, and 'ownership' of, an improvement process. Previous research in the UK has demonstrated that assigned (delegated) goals de-motivate the workforce, with subsequent detrimental effects upon performance (Cooper et al., 1992). The respective departmental goal-levels are then entered as a solid line on each of the feedback charts. The employee's must also be informed that the results of subsequent observations will continue to be posted on the charts on a weekly basis. Following the goal-setting meetings the feedback charts are posted in the appropriate departments. Observations should continue at the same rate as that during the baseline period. The results of weekly observations are posted on the departmental feedback charts every week. Additionally, it is a good idea to provide information referring to the worst three-scoring items of the previous week, and post it next to that department's feedback chart, in order to make explicit to the workforce where to focus their attention the following week. During the remainder of the intervention period progress is monitored and assistance given to observers when necessary. 3.10 Continuous improvement

Because this approach adopts the philosophy of continuous improvement, it is usually a good idea, to begin planning the following interventions, about 8 weeks after the goal-setting sessions. The benefit of this is that within a relatively short period of time, the amount of employees who have been observers will reach a critical mass. This will help to drive down accident rates even more rapidly. Some would argue that previous observers should continue to observe ad infinitum. In practice, however, experience has shown that this is not really feasible at a formal level, because of the large amount of additional data that is generated which cannot be accommodated in a meaningful way on the feedback charts. Typically, however, experienced observers do continue to observe informally, and point out non-compliance to their peers. Moreover, they tend to provide a support resource for subsequent observers. It is impossible in an article of this size to fully explain all of the subtleties of this approach. However,

the intention is to provide safety professionals with a base level of knowledge from which to work, should they wish to implement this type of approach. This and the previous article on goal-setting can and should be used in conjunction with each other. Feedback and correspondence from readers concerning these articles is welcomed, particularly if the points raised lead to further refinements that aid in the improvement of this approach when applied to safety.

4. Conclusion

Based on the philosophy of safe production is the number one priority, well-designed and well-executed Behavioral safety processes fully engage both management and employees, within a mutually trusting and supportive atmosphere, to improve safety. A proven method, Behavioral safety is an effective way of positively impacting safety Behavior, and reducing or eliminating incidents. Focused on unwanted Behaviors with the potential to cause serious injuries and fatalities, Behavioral safety processes link the root causes of incidents to their precursor Behaviors; this includes Behaviors that have the potential to cause process safety incidents, as well as personal injury incidents. Organizations good at managing safety also tend to manage operations well – in other words, operational and safety excellence go hand-in-hand.

Appendix-I

QUESTIONNAIRE ON "A STUDY ON BEHAVIORAL BASED SAFETY MANAGEMENT

Your Name (Optional):
Department:
Designation:

Please answer all the questions.

I	Personal Information
1	Your Gender
	a) Male b) Female
2	Your Marital Status
	a) Unmarried b) Married
3	Number of your dependents
	a) Nil b) 1 to 2 c) 3 to 4 d) 5 or more
4	Whether your Spouse is also employed
	a) yes b) no c) Not applicable if single
5	Your Educational Qualification
	a) Below SSC b) SSC / Intermediate c) Degree d) Post Graduation & more
6	Your Age group
	a) Less than 30 years b) 31 – 40 years c) 41 – 50 years d) More than 50 years
7	How far is your residence from your work place?
	a) Below 5 Km b) 5-10 Kms c) 11-15 Kms (d) 15-20 Kms (e) above 20 Kms
8	Mode of transport to work place
	a) Cycle b) Motor Cycle c) Car d) Other bus travels
9	Your Present salary per month
	a) Upto 20,000 b) 21,000-40,000 c) 41,000-60,000 d) above 61,000
10	Your position in the organization
	a) Below Supervisory level b) Supervisory level / Front line officer c) Middle Management d) Head of section / Department / Zone
11	Your nature of job involves
	a) Mostly Desk job / office job b) Mostly site job / field work c) Both Desk job / office job and site job / field work
12	Your total work experience
	a) Less than 5 years b) 6 – 10 years c) 10 – 20 years d) More than 20 years
13	Your childhood is from
	a) Village / Panchayat b) Town / Taluk c) City / Corporation d) Metros

Complete the following by encircling the appropriate number of your response after each question.

1 - Strongly Agree
2 - Agree
3 - Neutral
4 – Disagree
5 - Strongly Disagree

II	**Safety Commitment**	
1	Our management visibly demonstrates an interest in the safety and health of their employees	**1 2 3 4 5**
2	The required PPEs (Personal Protective Equipments) like safety shoes, helmets, goggles, gloves, etc. for my job are always available	**1 2 3 4 5**
3	The health and safety training program offered by my organization meet my needs	**1 2 3 4 5**
4	The Safety audits / inspections of my section / department are conducted at regular intervals	**1 2 3 4 5**
5	The Safety audits / inspections of my section / department are conducted at regular intervals	**1 2 3 4 5**
6	Senior Managers seem interested in health and safety before an incident / accident happens	**1 2 3 4 5**
7	I am satisfied with the investigation and follow-up measures after incidents and accidents have taken place	**1 2 3 4 5**
III	**Safety Compliance**	
1	The safety Committee meetings are conducted effectively in my department	**1 2 3 4 5**
2	All workplace incidents / accidents and near misses in my department / section are reported	**1 2 3 4 5**
3	I am content with the Housekeeping / cleaning in my work area	**1 2 3 4 5**
4	I am comfortable with the work environment (noise, dust, heat and vibration) in my work place	**1 2 3 4 5**
5	I am satisfied with the facilities at our Occupational health and safety research center (OHSRC).	**1 2 3 4 5**
6	The permit-to-work / shut down system in my work area is followed earnestly	**1 2 3 4 5**

7	There is a SPOC (specific point of contact) system in my department for raising our safety issues.	1 2 3 4 5
8	The safety related issues raised in various audits / inspections in my work area are liquidated with all seriousness	1 2 3 4 5
IV	**Safety Awareness / Communication**	
1	The health and safety policy of my organization is clearly understood by me.	1 2 3 4 5
2	If I have a concern about health and safety, I know whom to contact	1 2 3 4 5
3	The Supervisors / Front line officers of my department / section discuss accidents with employees concerned	1 2 3 4 5
4	I use the safety committee team to get action on a safety complaint which concerned me.	1 2 3 4 5
5	All employees in my work area are provided information on type, cause and recommendations of all accidents in our company	1 2 3 4 5
6	I have been informed of all the potential hazards and safety precautions to be taken at our work place	1 2 3 4 5
7	New training is imparted, based on any accident to the employees of related and similar work area.	1 2 3 4 5
8	I have been informed about what to do in case of an emergency like fire and gas leakage etc. in my work area	1 2 3 4 5
9	I have been informed about what to do in case of an emergency like fire and gas leakage etc. in my work area	1 2 3 4 5
10	The visitors are permitted to enter inside our department only after giving necessary safety instructions to be followed	1 2 3 4 5
V	**Safety Behavior**	
1	In my department, Safety and health issues / hazards identified are corrected in a timely manner	1 2 3 4 5
2	Safety and Health is a high priority when I am performing my job responsibilities.	1 2 3 4 5
3	Rewards for safe behavior are a good way to increase safety awareness levels	1 2 3 4 5
4	A safety incentive program would cause employees to work more safely.	1 2 3 4 5
5	Penalties for safety violations would cause employees to work more safely	1 2 3 4 5
6	I feel that observing both the safe / unsafe behaviors of individuals and giving them feedback will improve the safety levels	1 2 3 4 5
VI	**Stress Recognition**	
1	I feel my department is flexible in adjusting work assignments according to employee safety considerations.	1 2 3 4 5
2	I trust my Supervisors / Managers to act on safety concerns	1 2 3 4 5
3	Sometimes, I work "under crisis / under pressure" when trying to do more work too quickly.	1 2 3 4 5
4	I am satisfied with my current work assignments	1 2 3 4 5
5	During the past, I had been injured or felt unwell as a result of the Work related stresses	1 2 3 4 5
6	I am able to take scheduled rest breaks and still complete my assigned work in time	1 2 3 4 5
7	Supervisors / managers are inclined to resolve our personal problems	1 2 3 4 5
8	The job expectations or targets are practicable at my workplace.	1 2 3 4 5
9	As per my knowledge, hurrying has been a factor in an incident / accident or near miss in some case	1 2 3 4 5
VII	**Teamwork**	
1	My immediate superior shows interest in the safety and health of the employees in my department / work area	1 2 3 4 5
2	My superior often observes my work practices for the purpose of protecting my safety and health.	1 2 3 4 5
3	If I saw another employee committing an unsafe practice, I would say something directly to him or her	1 2 3 4 5
4	Safe operating procedures (SOP's) for using equipment / machines are discussed with all concerned, reviewed and revised as necessary	1 2 3 4 5
5	I have opportunities to provide input into the health and safety program in my organization	1 2 3 4 5
7	In my department / section, we discuss ways to prevent errors / mistakes from happening again.	1 2 3 4 5
8	Staff / workers will freely speak up if they see something that may negatively affect health and safety at work	1 2 3 4 5

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