iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VII **Month of publication:** July 2020

DOI: http://doi.org/10.22214/ijraset.2020.7010

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VII July 2020- Available at www.ijraset.com

Improving the Safety Culture in the Organization by Implementing Behaviour Based Safety (BBS)

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Abstract: ***Construction has long been considered dangerous work. In addition, the construction industry is under constant scrutiny for quality of work. Combining safety and quality management principles and methods capitalizes on the similarities between these two management concepts to create a single 'synergistic' management system for improving both safety and quality. Behavioural Based Safety (BBS) processes focus on individual behaviours in the workplace that are at the very root of a high percentage of work-related injuries. Once the critical behaviours have been identified, the BBS process involves an observer/coach using positive behaviour modification techniques to change employee behaviours. As the percentage of observed safe behaviours increases, the injury rate should decrease. It is important to incorporate ergonomics into a BBS process because a high percentage of the total work-related injuries in many organizations are due to "ergonomic-related" issues. Also, a high percentage of ergonomic solutions rely heavily on employee behavioural choices. This paper covers various techniques in BBS process.***

Keywords: Implementing Behaviour Based safety in construction industry

I. INTRODUCTION

The Behaviour Based Safety aims to change human behaviour. Most of behavioural safety efforts are based on this theory that says all behaviour-based safety is to change the behaviour of employees "at risk" and "safe" behaviours. We need to use ABC model to get a result of antecedents and consequences. The below steps will explain in detail about the efforts. Negative consequences which are immediate and certain discourage unsafe behaviours. The goal for management is to set up a system to control the antecedents and consequences so workers will increase their safe behaviours. The theory being that by setting up a system of well-planned antecedents and consequences you can control the unsafe behaviours of employees thus accidents and injuries will be reduced

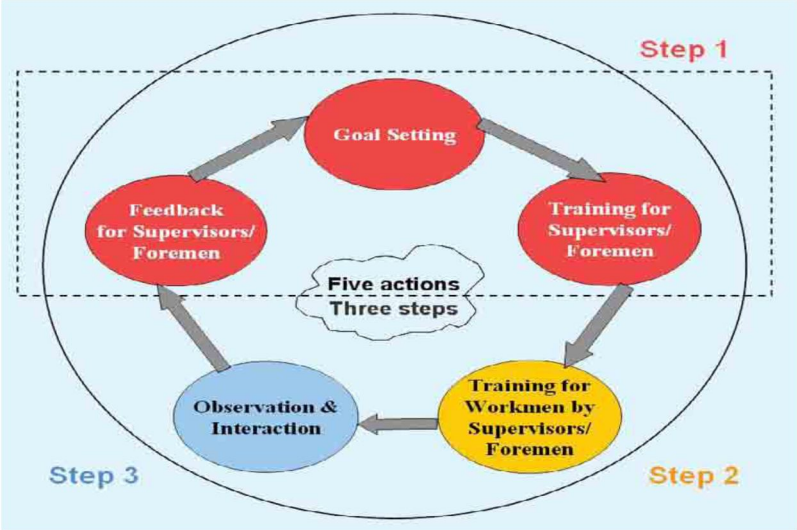

Fig: BBS Intervention Cycle

1) Step 1: Observation results and causes of unsafe behaviours communicated to supervisors.
2) Step 2: Train the trainers (supervisors) on methods to promote safe behaviour.
3) Step 3: Discuss and set new goals for next observation cycle.

Furthermore, the behaviourists believe that consequences are the driving force to changing people's behaviour. The tools of positive and negative reinforcement are what is needed to make people behave in the prescribed manner. Consequences are those events that occur because of behaviour. Positive reinforcement rewards a person for behaving in a certain way. Negative reinforcement provides unwanted or unpleasant consequences. The theory is punishment decreases the probability a behaviour will be repeated. Some behaviourist believe that negative reinforcement prompts only a minimal level of compliance. However, positive reinforcement encourages employees to exceed the minimum.

The ABC's of Behaviour Based Safety system

1) *Antecedents:* According to Thomas Krause, antecedents are pre-existing sensory or intellectual input that trigger behaviours and influence decision-making.

a) Tell us what to do to receive a consequence

b) Can be tangible/concrete or intangible/abstract

c) Only as powerful as the consequences that support them

2) *Behaviour:* According to E. Scott Geller, behaviour refers to *acts* or *actions* by individuals that can be *observed* by others. In other words, behaviour is what a person does or says, as opposed to what he or she thinks, feels, or believes.

a) A dead man can't do it

b) Must be observable, measurable

c) Anytime, anywhere, any body

3) *Consequence:* According to Aubrey Daniels, a consequence is simply what happens to the performer because of the behaviour. A consequence can be:

a) Positive or negative. Does the consequence help or hurt from the performer's point of view?

b) Immediate or future. When will the consequence occur?

c) Certain or uncertain. What's the probability that the performer will experience the consequence?

II. METHODLOGY

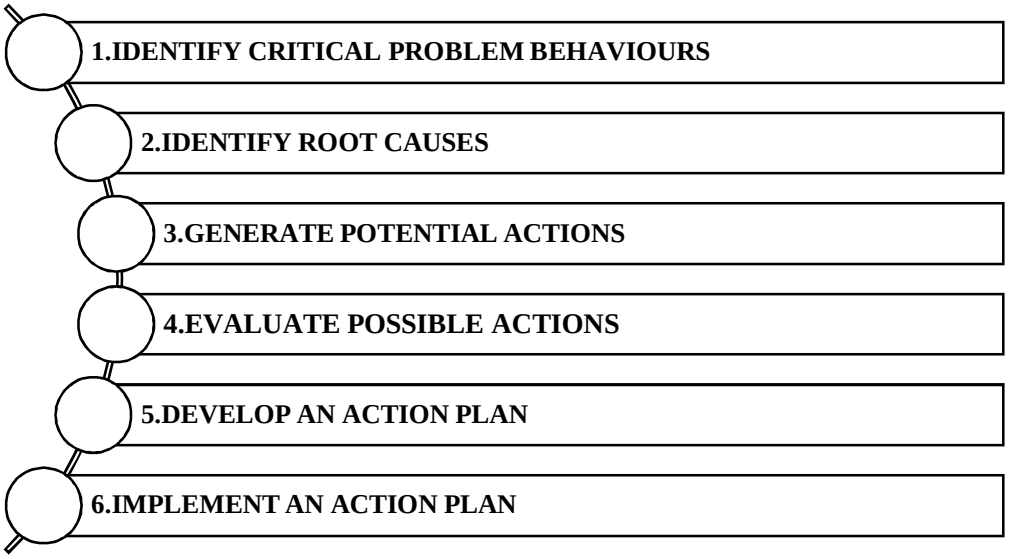

FIG: Methodology

A. Identify the Behaviours Critical to Obtaining Required Safety Performance

All workers regardless of their employer, trade or tasks they perform will perform behaviours which are the observable actions of people. A behaviour can also be observed as having been performed by observing the result of the behaviour. E.g. the required behaviour is: Complete a field level risk assessment. It is unlikely that an observer will observe the worker completing the field level risk assessment, but by looking at the field level risk assessment card the observer can confirm the behaviour has been satisfactorily performed.

In this step the behaviours that the workers need to perform to achieve the desired safety performance e.g. zero injuries, are identified. Behaviours expected of workers, supervisors and management should be identified. There can be several sources of possible required behaviours:

1) Learning experience reports,
2) Incident investigations,
3) Individuals who actually perform the work,
4) First aid/ injury records and details (i.e. part of body injured, action causing injury), incident and inspection trends.

Representatives of all segments of the workforce should be involved in identifying behaviours: experienced workers, supervisors, new workers, management. Involving workers in choosing the behaviours helps to get them involved and get their buy-in to the process.

Behaviours should be described as specifically as possible. Behaviour descriptions should meet the following criteria:

a) *Measurable* - can be measured.
b) *Active* - something the worker has to do.
c) *Reliable* - The behaviour is repeatable the same each time and at least two people should be able to see the behaviour and measure it the same way.
d) *Controllable* - the action is the control of the worker performing it.
e) *Observable* - can be observed, seen happening.
f) *Specific* - described so that the worker doing it knows exactly what to do.

In BBS "workers" includes all levels in an organization foreman, general foremen, superintendents, project managers, managers, CEOs. Everyone should expect to have behaviours
defined for them that will help bring about injury elimination. A critical behaviour for a manager might be:

i) Start every meeting with a safety topic or reference.
ii) Complete all observations as part of BBS implementation When visiting a job site perform one observation accompanied by another worker.
iii) No one is exempt from participating in BBS.

Some examples of behaviours are:

- ✓ Wear hearing protection when required through posted signs, work
- ✓ permit, field level risk assessment Attach fall prevention harness to a secure anchor point.
- ✓ Complete a field level risk assessment before starting a task
- ✓ Wear a seat belt while driving a motor vehicle
- ✓ Check hand tools for defects before use
- ✓ Intervene with co-workers to provide coaching/ correction when they
- ✓ perform an "at risk" behavior

B. Communicate the Behaviours and How They Are Performed Correctly to All Employees

All workers need to know what the required behaviours are and most important, how the required behaviours are performed safely. E.g. wear fall protection harness when working at height. A person can wear a fall protection harness safely or in an "at risk "way. If it is not snug fitted properly to the workers body, the cross strap is too high etc., then the worker is not wearing the harness safely.

In this step the required behaviours and how to do them safely is communicated clearly to all workers. It is important to the success of a BBS process that all participants receive a clear, easily understood, communication. Weekly/monthly safety meetings provide a good forum for this to happen.

C. Observe the Work Force and Record Safe/Unsafe Behaviours

In this step workers who have received the proper training in how to:

1) Perform observations and
2) Interact with the workers observed to provide feedback/correction/coaching
3) Go out into the workplace to observe the workers. Individuals providing this training should have a good understanding of the ABC Behaviour model and the BBS process.

Observations should be planned when possible. There are a variety of different factors to be considered when performing an observation. These include:

- Consider observing work where the higher risk hazards, or the
- Experience of the workers may be a factor;
- avoid interfering with the work activities;
- do observations in two-person teams;
- complete the observation report away from the work area;
- Examine the work area for access/egress, housekeeping.
- When planning observations here are some of the worker groups that can be observed:
  - ✓ new employees
  - ✓ younger employees
  - ✓ people under pressure/stress (mind on task)
  - ✓ new sub-contractors
  - ✓ people rushing/running.

A possible set of steps to perform a complete observation / interaction are:

- Observe the workers for 30 - 60 seconds as you approach them, introduce yourself to the workers. When doing this the observer should not distract the workers at a critical moment (e.g. cutting, lifting, using ladders etc). Wait until the interruption can occur when there will be no risk posed to the workers
- Explain what you are doing and that you will observe them for a bit longer,
- Observe them for some additional time
- Stop workers,
- Feedback what you have observed in a positive manner with awareness of the self-esteem of the workers that have been observed,
- Provide positive reinforcement for all those behaviours that were performed in a safe manner
- When at risk behaviours are observed ask for feedback from the workers to help understand why the at risk behaviours are being performed, and provide coaching/ correction so that the required safe behaviour is obtained
- Thank the workers for their assistance,
- Encourage them to continue to work safely.

It is most important that all observed behaviours that are immediately dangerous to life, health or the environment are stopped as soon as they are observed. In this situation the observer does not follow the observation steps. The priority is to stop the dangerous behaviour. The observer should discuss the problem with the workers. If the workers do not accept the observer's action and challenge the observer aggressively the observer should not confront the worker. The observer should stop the discussion and deal with the problem by talking to a foreman or supervisor.

D. Collect and Record Observation Data

In this step the results of the observations are collected from the observation forms and recorded in a data collection/analysis system. This can be manual or electronic. An electronic system is the better option because it can also provide an ability to analyse the observation results.

E. Summarize and Analyse Observation Data

In this step the observation results recorded in Step 4.0 are summarized and analysed. Observation data should be summarized into a format that will be simple to interpret and enable extraction of behavior performance data. During the analysis it is important to review the observation data for quality and consistency. Problems with either can lead to invalid data. The frequency at which the data is summarized and analysed is at the choice of the work group. Some suggested summaries are:

1) Overall % Acceptable for all behaviours
2) % Acceptable for each separate behaviour
3) Observation comments
4) Trend Chart - Overall % acceptable for all behaviours plotted

5) over time
6) Trend chart - % acceptable for each behaviour plotted over time
7) Observation and Intervention activity data - observations
8) performed for each behaviour

Charts showing correlation between behaviours and incidents When the data is summarized, an analysis of behaviours that are not being done at risk can be done. An ABC analysis technique can be used to do this. The analysis will typically result in suggestions for changes to: Antecedents or Consequences of the behaviour. Changes in conditions are sometimes the outcome. E.g. buy a wider range of glove sizes.

F. Communicate Observation Data and Analysis Results to All Employees

In this step the results of the observations, the summarized data, the data analysis and any changes to Antecedents, Consequences or Conditions are communicated to the employees. It is essential that this communication happen. It ensures that the workers are kept informed of the results of the observations and changes that may be happening. This should encourage their continued participation.
Communication to the work group can act as an antecedent in the ABC model. What is not known cannot be corrected. It is expected that the simple act of communicating the information will prompt the work group to proactively correct their unsafe behaviours.
The communication method should be the one most suited to the audience. Notices on bulletin boards, story boards or at meetings are all suitable alternatives. A prominent bulletin board can be very effective because it is always visible and thus gives continuous feedback on the behaviours.

G. Provide Recognition or Celebrate When Safe Behavior Improvements Occur

In this step the appropriate recognition of the workers or celebrations happen when the desired, or improvements in, behaviour performance occurs. Often this is not done, and the workers may get the impression that no-one cares that the behaviours are being done safely. This step is very important to provide the positive reinforcement to the workers for performing the behaviour safely.
Recognition and celebration happen when the behaviours are being done safely. Often the % acceptable behaviour reaches 95% plus scores. When this happens, it may be appropriate to change the behaviours that are critical to obtaining required safety performance.

H. Change Behaviours to Be Observed or Change Activators or Change Consequences as Appropriate

In this step any changes to Antecedents to, or Consequences of, the behaviour resulting from the ABC analysis are made. Changes in conditions resulting from the analysis are also made in this step. E.g. buy a wider range of glove sizes. The changes should be properly recorded in all relevant BBS documentation
To help with problem solving the following can be considered:
1) Improvement opportunities can be identified through observation, intervention and root cause trends
2) Positive intervention techniques present the best opportunity for improvement
3) Use knowledge and experience of others to assist
4) Management system failures can typically account for 85% of unacceptable behaviours

Improvement strategies can include:
a) Consider impact on existing safety program
b) Obtain necessary support and resources
c) May require changes to behaviour based training
d) Monitor implementation and evaluate impact on behaviours

III. IMPLEMENTATION OF BEHAVIOUR BASED SAFETY

BBS is a proactive safety approach focusing on motivating individuals to work safely and correct fellow workers' at-risk behaviours that may lead to an injury. Its ultimate aim is to condition the target group's way of thinking and reinforcing positive safety beliefs, values and attitude which will then influence their behaviour and building a good safety culture. BBS starts with baseline observation where workers behaviours were observed without any intervention based on an established checklist of critical behaviours.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VII July 2020- Available at www.ijraset.com

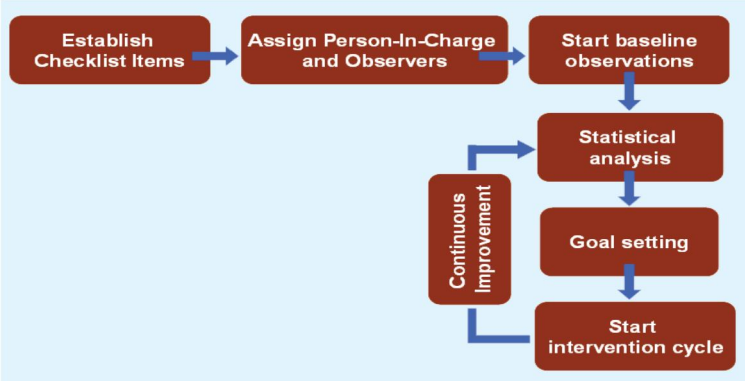

Fig : BBS Implementation Procedure

All aspects of BBS may not work in every organization. There is plenty of resistance to programs that promise big benefits but only result in more paperwork, less progress and a mountain of wasted time for safety teams. Although it's no magicbullet for injury prevention, there is data to prove that as observations go up, injuries go down. The question is: "Will it work foryour company?" The promises of BBS results are not empty ones, but your company must be ready. However, like any other prevention program, the conditions need to be right. Management support, effective management systems and company culture are keys to determining whether a company is ready for a transition to BBS. Since implementation of these processes can be costly, how can one tell whether a company is ready for it?
There are five conditions that dramatically increase the likelihood of success

A. Safety Leadership
Leadership must be active, visible and genuine in their commitment to injury and illness prevention. It is helpful for senior management to articulate a clear and inspiring vision that injury-free performance is the only acceptable goal. However, caution is needed here. These “vision messages” can be interpreted as “don’t report injures” as a method to achieving a goal. The organization must view safety as a core organizational priority equal to research, operations, productivity and quality.

B. Established Integrated Safety Management System
In order for BBS to be effective, an integrated safety management system needs to be in place. This includes minimum compliance, accident investigation, self-assessments, safety and health training program and record keeping systems. More advanced systems enhancements like observation, coaching, safety involvement teams, job safety analysis, accountability, and safety by objectives all rely on the basics being in place.

C. Employee Empowerment and Participation in Safety
Employee empowerment and involvement enhance safety innovation, ownership and results. Labour/management cooperation serves as a catalyst for success. Without employee participation and involvement BBS won’t get off the ground. Another critical facet of involvement is buy-in. Behavioural systems are much more effective in organizations that work hard at winning buy-in from the line to the executive office before they are introduced.

D. Organization’s Safety Culture
A positive social climate of trust, openness and respect for individuals is an intangible of organizational life that dramatically affects worker performance. With a more negative organizational style involvement is low, complaining replaces problem solving and coaching seems like scolding. In companies low on trust, BBS is resisted because it symbolizes another way to oppress the worker.

E. Measurement and Accountability
What gets measured gets done. Clearly defined responsibilities at every level of the organization the start points for top performance. When performance evaluations include safe and at-risk behaviours, strategies can be developed to focus on real threats to worker safety.

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IV. BEHAVIOR BASED SAFETY OBSERVATIONIN CONSTRUCTION ORGANIZATION

The data of regular plant observation visits by BBS mentors and observers indicated that on an average, the safe behaviour's observed were 65%, at-risk behaviours were 35%, andcorrection of at-risk behaviours were 70%. It was found that after corrections, the safe behaviours increased from 65% to 90% which indicated that the mentors and observers not only learned the BBS concepts; they also practically applied and tested the efficacy of BBS implementation.The trained mentors and observers prepared a roadmap and action plan along with responsible person and target date to achieve each action as below to implement the BBS approach for all employees and workmen in the organization. The Plant Head, Safety Head as well as all HODs discussed the above action plan in greater detail and then ensured to implement in their respective workplaces. The Plant Head stated that I failed to address the behavioural aspects of safety earlier but now I will do it as per roadmap prepared. The trained observers from another business unit of the plant (where BBS is implemented) expressed that the company should not only look at the number of observation cards filled in, we shall go on making corrections of unsafe behaviours,but may not fill cards. For example, during the shutdown of plant, the operators made hundreds of corrections of unsafe behaviours but did not fill-in cards due to lack of time. At the same time, 50% of observers were found to be passive as they made only a few observations in the previous months. There is need to train more observers to create an improved safety culture. However, the HODs emphasized the importance of filling-in observation cards for generation of behavioural trends.

A. Hazard Identification Checklist

Sl.no	Type of hazard	Behavioural correction
1	Working at Height	Compulsory pep talks before start of work - Use of certified ladders, scaffolds, platforms. - Use of safety harness, safety net - Maintaining 3-point contact while climbing and getting down - Supervision - Use of mechanized elevated platform for the work - Check for overhead live cables at the height of work - Ensuring no-violation of work permit
2	Electrical Shock	Use of certified tools and tackles - Ensure proper shutdown and LOTO compliance - Provide proper earthing - Avoid wet surfaces - Avoid loose cable joints - Caution boards at required places - Do not bypass Safety interlocks - Authorization details on panel rooms - Proper nomenclature of feeders - Use of RCCB - Not exceeding no. of joints than specified in SOP
3	Dust	- Dust suppression using water sprays, humidifier, fog gun etc. - Use of Dust masks and PPE - Proper maintenance of de-dusting systems - Enforcing limitation to speed limit of vehicles in plant
4	Fall of Material/Object from Height	-Use of safety helmet by the people - Use of certified lifting tools and tackles like slings, Chain pulley blocks, D-shackles etc. - Barricading of area with tape - Working at 2 levels (one above the other) not to be allowed, may be allowed with precautions like blanking. - Pre-lifting plans - Proper housekeeping - Check for Toe guards and hand rails - Materials not to be thrown - Use of safety net wherever required

5	Vehicle Movement	Identify the pathways for transit - One way/2 way - Ensuring adherence to speed limits - Ensure no overtaking/overloading of vehicles - Ensure the driver does not climb over the vehicle while loading/unloading - Ensure proper parking methods - Should not cook/rest below the vehicle - Spotter and loaders should wear fluorescent jackets - Random alcohol test - Ensure vehicle is not moving with lifted body - No mobile usage while driving - Looking through the rear-view mirror and co-ordination with the spotter - Ensuring queue discipline - Ensure reverse horn - Check for awareness of motor vehicle act by the drivers (PUC, Valid DL etc.)
6	Noise	Use of ear plugs/mufflers - Periodic measurement of noise levels - Providing acoustic/silencer at generating source - Providing Signage's
7	Poor Illumination	Ensuring Periodic measurement of lux levels - Ensure adequate illumination before start of work - Improve illumination with additional lights - Keep emergency lights handy
8	Explosion	Following SOP and work permit - Ensure Purging of gas line before work on gas lines - Ensure periodic testing of pressure vessels and gas lines - Keep manholes/relief valves/inspection covers open and take shutdown while working on gas lines - Ensure use of flashback arrestors on both sides-Torch and cylinder side - Dissemination of Knowledge of assembly points - Proper storage of flammable substances - No smoking in gas prone areas - Awareness of Material safety data sheet - use of Flameproof light fittings/Cables in LPG yard/battery charging rooms/petroleum storage - No storage of gas cylinders in direct sunlight
9	Poor Housekeeping	Ensure 5S is in place
10	Ergonomics	Educate and create awareness among people
11	Entanglement	Following SOP - Proper housekeeping - Avoiding shortcuts - Proper guarding/barricading of moving parts of equipment - No loose clothing, Jewellery - Alertness - Avoiding intoxication such as alcohol/drugs - Proper rest between work hours in shifts

B. Linking BBS With Hazard Identification

It is observed that the safety systems, documents, procedures are in place but are lacking in reflecting safe behaviours. Hence the need is felt to relate an important safety system like hazard identification with BBS. In this pursuit, the eighteen types of hazards were identified as below and for each hazard, a set of behavioural corrections were also identified which should be ensured by the BBS observers and the BBS mentors must discuss them during BBS monthly steering team meeting. It is very important to identify and control environmental hazards to create zero harm culture.

C. Certain Issues In BBS Implementation

During BBS implementation, some problems were often cited at workplaces as follows:

1) My manager is not giving time for observation, he is over-loading me with work
2) My manager is first concerned with production, then safety
3) During emergency situations, we don't follow SOP
4) Managers are focusing on plant production, not concerned about unsafe conditions
5) People often overlook unsafe behaviours thinking that it is small, not critical.

All implementations of BBS would have some ups and downs in its progress (Kaila, 2014). Sometimes employees are unclear about the subtle difference between safe and unsafe behaviours. In a focused-group interview, a team of observers and implementers expressed that we take accidents in a punishment route and warning which BBS is not. The main causes identified for the slowness in developing BBS culture are the lack of regular internal reviews, poor leadership by HODs, lack of motivation for inactive observers to become active, managers not being convinced or confident of BBS approach or its outcomes, line managers feel that safety is the responsibility/function of safety department, importance to production not safety, lack of an open mind towards peer to-peer correction, and people feel that it is an extra task so the attendance in BBS meeting is very less. The concept of BBS is not drilled down into the hearts of people. An observer said, "The way we have gone about BBS process is too formal, it's a drama like the observer would inform an observe that he would observe him while he was doing his job". The safety officers stated that during the plant shutdown, about 1200 deviations were corrected by the safety department which means the BBS observers were not doing their observation and corrections of unsafe behaviours. All this caused loss of interest in BBS project implementation. Any organization planning to launch BBS must look into these practical aspects. It is important to underline that all observers who are contributing to risk-reduction must be appreciated and recognized regularly following a distributed reward approach like ICICI payback system, not that one best observer of the month is rewarded, and others don't receive any admiration. Observers also need to know how they are performing in BBS implementation. As one of the observers said, "If observations are happening fast, feedback should also be fast by way of interactive meetings between implementers' team and observers". A plant head in India expressed that we have failed to learn from our accidents. The second major reason is the lack of value for human life. And the third is the leadership focus on production-not-safety and cost considerations of safety.

V. IMPROVEMENTS IN BSS APPROACH

Besides implementation problems, the trained observers listed many best learning experiences of BBS approach as below:

A. It's a correction of unsafe behaviour and value for human life.
B. It promotes being an active observer: never neglect, correct, correct and correct unsafe behaviour.
C. Unsafe behaviours that have potential for accidents areallowed with knowledge of employees and BBS is anelimination of root cause of accidents.
D. It is a development of additional manpower for EHS team, it's a line function.
E. It is an art of safe living, and a humanistic approach, safety for self and others.
F. It's a fundamental concept that everybody has right to go back home safely.
G. It's more than a safety regulation and an alert, alert, alert approach.
H. It's an easiest way to adopt for sending workers injury free back home.
I. In order to create safe culture, each trained observer must review one work-permit a day and at least interact with one contract workman a day.
J. The number of observers has also increased every month.
K. The number of unsafe conditions and unsafe behaviours has drastically gone down.
L. BBS implementation has been recommended to other locations of the company with an introduction of BBS in one location.
M. The management commitment for safety has gone up due to involvement.
N. Safety has become a real line function due to BBS approach.
O. The incident reporting is not there from locations where BBS is implemented.
P. There is a significant decline in near-miss and injuries.
Q. There is an increased reporting of unsafe behaviours.

VI. RESULT AND DISCUSSION

The success of BBS is truly considered only when the safety department has handed it over to the line management. Safety department should initially involve in coordinating its activities but gradually pass on behavioural safety ownership to the line function. Behavioural safety is being applied successfully worldwide instead of command-and control approach to occupational safety. BBS is an art of communication and correction of unsafe behaviour at work is the responsibility of one and all to develop zero harm and safe environment. If an unsafe behaviour exists at one place, be aware that the same unsafe behaviour is also prevailing at other locations as it is a reflection of safety culture which requires global or horizontal prevention. For example, if a work-permit or SOP violation is noticed in one unit, it needs to be identified and corrected at other units of the company as well in order to develop safe culture. Safety first is only a slogan in Indian companies; it does not appear in practice. In realty, its production first, and safety is put to back stage for cost reasons. BBS is much more than enforcement, it is deeper. BBS is yoga for safety. We shall ask each contractor to appoint safety mentor and the company BBS mentor would train them. Safety is an integral part of all our functions, but even after having all the safety systems in place we are unable to achieve injury free culture. The managers in the present study viewed the success of BBS with critical perceptions.

VII. CONCLUSION

Behaviour based safety is a process that provides organizations an opportunity to raise the level of safety excellence by promoting proactive responding to leading indicators that are statistically valid, building ownership, trust, and unity across the team, and developing empowerment opportunities which relate to employee safety. A properly designed Behaviour based safety process will involve workers from every level. Proper communication between the workers and the managerial staff may improve the BBS at work place. An observer can observe all the improvement process and working environment continuously and get the feedback from the workers about the improvements in the BBS process. By making continues improvement in the behaviour of works may lead to a good behaviour-based system.

VIII. ACKNOWLEDGMENT

The satisfaction that the one gets on completion of a task cannot be fully enjoyed without mentioning the people who made it possible. I am very much grateful to the almighty, who helped us all the way and who moulded me into what I am today. I am remaining indebted to my parents who have sacrificed many things for my success. I submit my heartfelt regards and sincere thanks to them.

I express my sincere thanks and I gratitude to my honourable Chairman, Prof. Dr A.K.NATESAN, M.Com. MBA., M.Phil., Ph.D., FTA, PHF for all the help he have provided in accomplishing this task.

I convey my kind regards and thanks to my beloved Principal, Dr. R. NALLUSAMY, M.E., Ph.D., who motivated me to take up this project work for having provided the suitable environment to work with.

I express my sense of gratitude and sincere thanks to the Head of the Department Dr. S. P. VENKATESAN, M.E., Ph.D., of mechanical engineering for his valuable guidance in the preparation and presentation of this paper work.

I express my profound sense of thanks with deepest respect and gratitude to my supervisor Mr.P.V.PRAKASH, M.E., Associate professor, Department of Mechanical Engineering for his valuable and precious guidance throughout the period of work.

My sincere thanks are due to my Friends, Teaching, Non-Teaching Staff members and the well-wishers for their constant support all the time.

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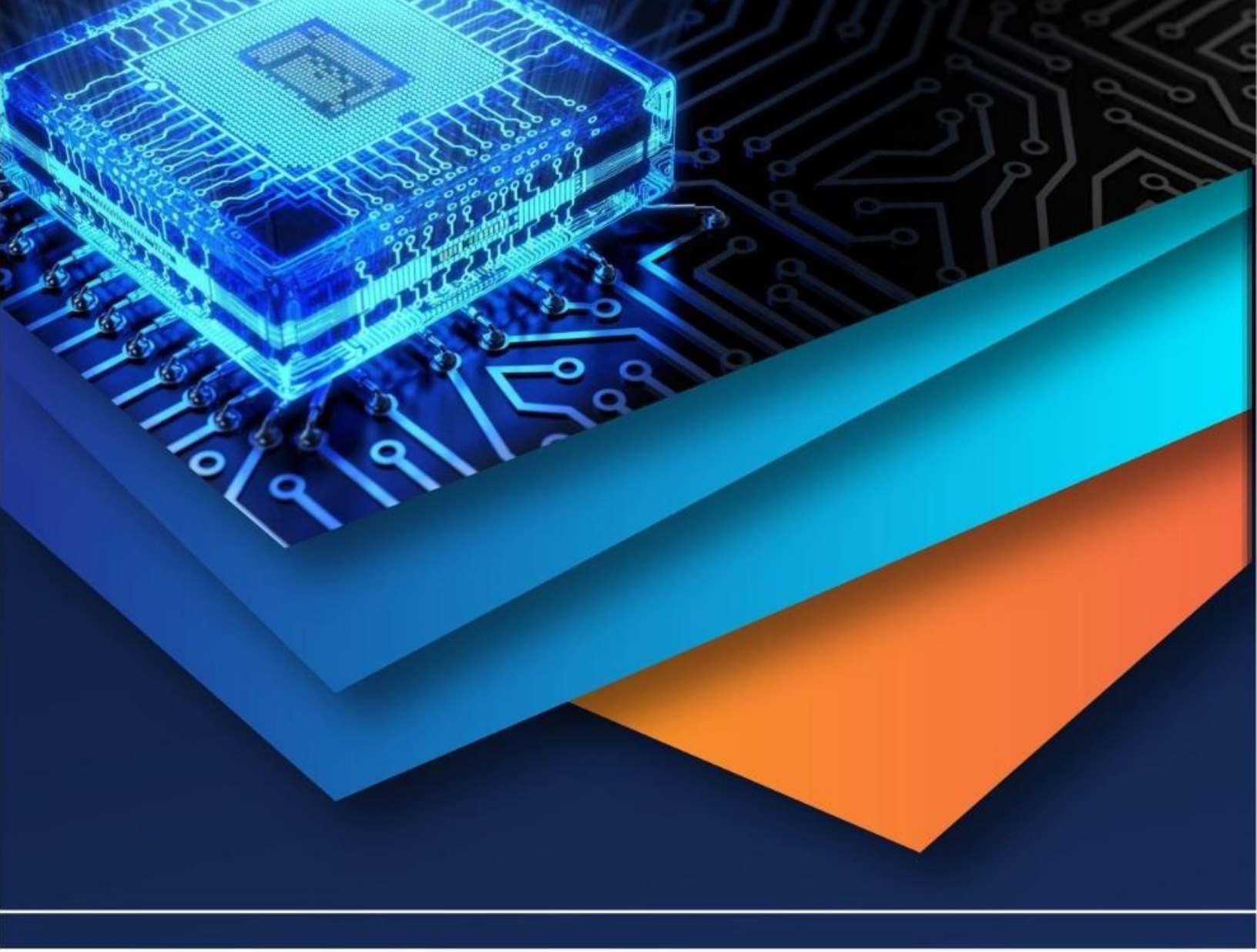

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