Journal of Balkan Science and Technology
journal homepage: www.jbst.nku.edu.tr/

Behavioral Based Observation Results of Employees in the Industries in the eBA Document Management System, Definition of Risk Index with Zero Accident Target and Assessment within OHS Leadership Practices

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Review Article

Keywords:
eBA Document
Record and Workflow
Management System
% Risk Calculation
AFR
TS methods

Received: 11.04.2023
Accepted: 31.07.2023
Published: 31.08.2023

DOI: 10.55848/jbst.2023.35

ABSTRACT

Site-based observation results in the paper industry were investigated in order to ensure that the workers in industries can observe Behavior Based Safety Observations (BBSOs) and understand the culture of occupational safety. Observations include both routine and non-routine activities. Within the scope of the this study, the observation forms prepared as a result of the interviews with the senior management of the company and the employees were filled and then employee BBSOs assessments were made. Then, the results of these evaluations were processed on the eBA Document, Record and Workflow Management System, where the entries of risky findings and safe findings, how many observation forms the employees gave, and the explanations of which departments they belonged to and the statistics of the data obtained were kept. The data entered into the eBA Document, Record and Workflow Management System was proactively and quickly ended with the intervention of unsafe behaviors with the approval of the senior management. Action plans for behavior change within the scope of Occupational Safety Leadership Practices (OSLPs) were created and monitored in the facility by comparing Accident Frequency Rate (AFR) and % Risk Ratio (RR). In line with these objectives, eBA responsibilities and competencies were determined, eBA behavior committee and Reporting System were established and a Safety Program that Integrated Behavior-Based Safety (IBBS) and Traditional Safety (TS) methods were described. In 2015, when TS methods were predominant and Behavior-Based Safety (BBS) observations were first implemented, AFR and % RR were found 2,15 and 6.0, respectively, while TS methods and BBSOs were more actively used together with eBA Document, Record and Workflow Management System in 2016 AFR 0, % RR 0,20 have fallen.

1. Introduction

BBSOs act on the basic assumptions of the behavioral approach in psychology in order to reduce risky behaviors such as "leaving materials in front of the emergency exit door or fire extinguisher" and to adopt safe behaviors. A clear definition is important so that everyone can understand the situation creating the risk in the same way and the security alternative can be defined correctly. It is also necessary in terms of determining what the factor that brings about this behavior is (prior, trigger) and what the person achieves as a result of the behavior. Determining the results that affect the behavior is also important for the managers to make changes in the action plans on these issues. The number of industries that implement BBSO in Turkey is increasing day by day. However, studies showing the results of studies on this subject are quite limited. The data of 83 different studies related to BBSO in the USA were examined and it was determined that there was a positive change in accident numbers in 33 of them.

According to the International Labor Organization (ILO) research, 270 000 000 workers are injured in occupational accidents every year and it is seen that this figure reaches almost four times the population of our country. It has been stated that 5 000 workers die as a result of work accidents every day and this figure reaches 1 825 000 on an annual basis. On the other hand, according to Turkish National Statistical Institute (TNSI) data, it has been reported that there are approximately 80 000 work accidents in our country every year, and according to official records, it has been shown that there is 1 work accident every 6 minutes, 1 500 workers die on average every year, in other words, 4-5 people die in work accidents every day. 4% of the Gross National Product (GNP) is lost in countries due to work accidents and occupational diseases. It is stated that 5-15% of the profits of workplaces are lost due to work accidents and occupational diseases. For these reasons, it is argued that we must understand that the justification for occupational safety is more important than our other important business goals [1].

The main cause was identified as unsafe behaviour in 96-98% of cases and in order to turn these into “Safe Behavior” quality, processes for creating behaviour change in the workplaces were initiated. It has been argued that the important thing is to make the right behaviour a habit and to be a repeatable action. At this stage, it was very important to conduct the trainings efficiently.It is stated that the way to change the

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behavior is to be conscious as well as having knowledge about the subject [2].

Chen and Tiana (2012) investigated in their study the BBSO application in a construction company in China. Key behaviours and critical task definitions were made, trainings were given, checklists of 30-40 items were created, unsafe behaviours were recorded and the Safety Index (SI) was defined. The SI was accepted as a test of BBSO's effect on accident prevention. Safe and unsafe behavior times were taken as the calculation method. The observations were based on the examination of the SI change on a certain day, in certain time periods and no document recording system was used. The BBSOs had made an impact on the improvement of the behaviour of the employees and this situation showed itself in the direction of a 15% increase in the SI [3].

The SI was considered proactive, as a low SI indicates that there are times of unsafe behavior and precautions need to be taken. Making SI index calculations on the basis of insecure and safe time provided another perspective to the study and the number of safe behavior and risky behavior findings were used in the calculations instead of time. Actions were taken according to the % RR. The eBA Document, Record and Workflow Management System was used to make all BBSOs more efficient and to get result [3].

Hermann et al. (2010) investigated 3 factories producing auto parts in Mexico. The program outputs of the TS methods integrated with BBSOs, which they obtained in a factory, were compared with the outputs of the other 2 factories where traditional methods were used. Thus, they tried to evaluate the effects of a safety program that combines BBSO and TS methods on employee AFR. The study showed that there was a 92% decrease in the last 2 years in the facility where the program integrated into the First Time Occupational Visit (FTOV) was implemented for the first time and a 99% decrease in the Lost Time Case Rate (LTCR) [4].

In a study by Filin and Yule (2004), Leadership Models were examined under the titles of First-level Managers (Team Leaders and Supervisors), Middle-Level Managers and Senior Managers within the scope of BBSOs and Transformational Leadership. They argued that transformational leaders are charismatic, inspiring, corrective and stimulating, they portray an image of success, self-confidence, belief to their followers, along with a sense of purpose and tell common goals, mutual understanding and an interesting future. It has been stated that Managers and Supervisors have direct and indirect effects on worker behaviours and indirect effects are related to the establishment of practices and procedures, while direct effects are related to the formation of safe and unsafe behaviours of Managers and Supervisors and the strengthening the behavior of the Second Tier through monitoring and control [5].

In the study conducted by Yaylalı in 2016, he tried to reveal the occupational safety performance of the metalwork workshop in terms of occupational health and safety by using the Elmeri method. He determined the measures to be taken with a proactive approach in order to create a healthier and safer working environment in the workshop. With the ELMERI method, the physical working environment and safety behaviours were observed considering the occupational health and safety factors. A total of 123 observations were made in the workshop according to the criteria gathered under 7 main headings specified in this method. While 67 of these observations show correct behaviors and situations, 56 of them show wrong behaviors and situations. According to the results of these observations, the current safety index of the workshop was calculated as 54.5%. The safety index of the workshop was increased to 74.6% by taking the recommended measures to correct the detected errors. The studies were followed completely manually and no data entry program was used [6].

In another study carried out in the literature in 2021, the concept and importance of Behavior-Based Occupational Health and Safety (BBOHS) training to be applied in enterprises have been examined, and it has been defined that the change in the behavior of the workers towards occupational safety is a positive and negative change in the observations after the training is applied. In the study, it was observed that unsafe behaviors decreased by 25% and the level of Occupational Safety awareness decreased by 70% [7].

Studies in the literature give us information about how BBSOs are made and what forms of practice exist in the industry to change behaviors positively.

The subjects that are generally examined in these studies are the way of observations, the creation of safety indexes from the calculation of safe findings, the examination of the effects of observations on the SI, the examination of the effects of BBSOs together with TS methods on accident frequency rates, the effects of leadership models on risky findings in order to adopt positive behaviours. It was observed that all controls were made manually and no document-document workflow management system was used in the examinations.

For this purpose, the BBSOs methodology blended with new designs was developed, taking into account the studies in the literature, in the facility examined in this study. In this methodology, the eBA Document, Record and Workflow Management System was used to monitor the observations made to change behaviors systematically, not manually. Evaluations were made faster and easier with eBA and it was evaluated proactively in preventing accidents caused by unsafe behavior. This approach has facilitated Occupational Health and Safety (OHS) leadership practices, especially by eliminating the unnecessary output burden and ensuring that healthy data and evaluation are carried out. To support these studies, a more active control system has been created in which TS methods and BBSO are used together. With this system, site-based observations and their results were examined in the pulp & paper industry example, in order to enable the employees in the industries to make BBO and to understand the occupational safety culture rather than knowing it.

In this context, this study was focused on the subjects such as that the frequency of the work, how long it will take, which observation forms will be used and how transfer of the forms to the eBA Document, Record and Workflow Management System. Furthermore, the other focused subjects can be summarized as eBA Document, Record and Workflow Management System, which data will be pulled from the system and reported, how the calculations will be, what kind of follow-

up system will be created according to the results obtained and how the responsibilities.

2. Material and Method

2.1. Material

The investigated facility transforms the packaging waste paper collected by licensed collection and sorting facilities into Fluting and Liner type papers with advanced technology within the scope of non-hazardous waste paper waste and packaging waste, which are released as a result of the production process from different sectors and cannot be evaluated in any way in the facilities. A total of 100 people work at the facility, including 22 office staff and 78 operations staff.

Within the scope of the study; the facility production is divided into 7 areas, taking into account the works in the production, the mechanical and electrical work area and the operations carried out in the outer areas. Then, Site-based BBSO forms were created as a result of interviews with employees and managers.

2.1. Material

2.2.1. Program Information Used in the Scope of the Study

The eBA Document, Record and Workflow Management System focuses on the automation of corporate facility processes. Since documents are the inputs or outputs of these facility processes, eBA System aims to use these documents in appropriate processes, at the right time and in the right place, beyond keeping corporate documents with its powerful workflow engine. In doing so, the entire life cycle of the document is managed, from the creation of a document to its versioning, reaching the right resources within the organization and destroying it when the time comes.

With the smart scanning features of the eBA system, documents can be digitized and electronically labelled and transferred. In addition, the system can also keep physical location information and can provide rapid access to both digital and physical forms of corporate documents.

eBA Document, Record and Workflow Management provides the benefits; below:

- Reaching the right document within seconds among millions of documents,
- Automating tedious and time-consuming manual processes such as filing and approval, producing or processing documents and information electronically,
- Accessing to these documents and processes from mobile devices even when away from the workplace.

2.2.1.1. Inputs Defined to the Program within the Scope of the Study

The main inputs defined in the eBA system in the investigated facility within the scope of the study are listed below;

- Site-based BBSO Forms
- BBO Officer Names
- Behavioral Observation Time
- Risky Finding Input
- Safe Finding Input
- Number of Observations
- Number of Shifts Worked During the Month

Behavior-Based Observation input parameters are created as follows and defined in the eBA system.

Site-1:

1) Is appropriate work equipment used while doing the job? (Handmade tools - Use of equipment with no inventory records)
2) Is there any material left in front of the fire cabinet-waste stations-?
3) Is there any material left on the walkway?
4) Are the ergonomics rules followed when lifting the load?
5) Are the chemicals stored properly?
6) Are the wastes properly separated and are the waste containers in place?
7) Are designated walking paths used?
8) Is there an electrical cabinet that is unlocked and unlabeled?
9) Is Personal protection Equipment (PPE) used fully and properly?
10) Does anyone cancel the safety switches and fences? (nail gun safety)
11) Is appropriate work equipment used while doing the job?
12) Is the ZES locking system applied during the maintenance?
13) Are the stack heights respected?

Site-2:

1) Do the forklift drivers act in accordance with the driving rules? (speed limits, seat belt use, etc.)
2) Is the forklift in the designated parking area while parked?
3) Do the forklift drivers honk at corners and blind spots? Do they make eye contact with pedestrian workers or slow down where necessary?
4) Do the forklift drivers engage in distracting behavior while driving? (use of mobile phones, etc.)
5) Do the forklift drivers act in accordance with the cargo transport rules? (Do not carry loads at a height that will hinder visibility, do not look back while carrying the load, etc.)
6) Did the forklift stop when the pedestrian signal started?

7) Have the truck drivers been checked to comply with the rules? (chocking, not loading with the forklift when pedestrians are present, truckers behaving appropriately)
8) Are designated walking paths used?
9) Is PPE used fully and properly?
10) Does anyone cancel the safety switches and fences?
11) Is material left in front of the fire cabinet-waste stations-?
12) Is there any material left on the walkway?
13) Are the ergonomics rules followed when lifting the load?
14) Are the chemicals stored properly?
15) Has the use of parachutes been checked in closing the tent?
16) Are the bale heights in accordance with the standards?

Site-3:

1) Is appropriate work equipment used while doing the job?
2) Is there any material left in front of the fire cabinet-waste stations-?
3) Is there any material left on the walkway?
4) Are the ergonomics rules followed when lifting the load?
5) Are the chemicals stored properly?
6) Are the wastes properly separated? Are the waste containers in place?
7) Are designated walking paths used?
8) Is there an electrical cabinet that is unlocked and unlabeled?
9) Are there insulation carpets in front of electrical panels over 50 volts?
10) Are the doors of high-voltage switchgears, transformer rooms and low-voltage power stations closed and locked, and unauthorized entry prevented?
11) Is PPE used fully and properly?

Site-4:

1) Is appropriate work equipment used while doing the job?
2) Is there any material left in front of the fire cabinet-waste stations-?
3) Is there any material left on the walkway?
4) Are the ergonomics rules followed when lifting the load?
5) Is the area where the oxygen cylinders are stored locked?
6) Are the chemicals stored properly?
7) Are the wastes properly separated? Are the waste containers in place?
8) Are designated walking paths used?
9) Is PPE used fully and properly?

Site-5:

1) Does anyone cancel safety switches and fences?
2) Is PPE used fully and properly?
3) Do you have an unlocked and tagless electrical cabinet?
4) Do forklift drivers act in accordance with the driving rules? (speed limits, seat belt use, etc.)
5) Do forklifts act in accordance with the load carrying rules? (Do not carry loads at a height that will obstruct the view distance, do not look back while carrying loads, etc.)
6) Did the forklift stop when the pedestrian signal started?
7) Have checks been made to ensure that truckers comply with the rules? (chocking, not loading with the forklift when pedestrians are present, truckers behaving appropriately)
8) Are designated walkways used?
9) Is appropriate work equipment used while performing the job? (Use of equipment without stock registration)
10) Is there any material left in front of the fire cabinet or waste stations?
11) Has anyone left any material on the walkway?
12) Are the wedges and the crane used properly when stacking the coils?
13) Are the ergonomics rules followed when lifting the load?
14) Are wastes properly segregated? Are waste containers in place?

Site-6:

1) Does anyone cancel safety switches and fences?
2) Is PPE used fully and properly?
3) Do you have an unlocked and tagless electrical cabinet?
4) Are designated walkways used?
5) When descending the stairs, does he descend properly by holding on to the handrails?
6) Is appropriate work equipment used while performing the job? (Use of equipment without stock registration)
7) The operating ground is clean, there is no oil, water puddle
8) Fire cabinet-waste stations- is material left in front of them?
9) Has anyone left any material on the walkway?
10) Are the ergonomics rules followed when lifting the load?
11) Are chemicals stored properly?
12) Are wastes properly segregated? Are waste containers in place?
13) Are situations affecting occupational safety reported without delay?

Site-7:

1) Is appropriate work equipment used while performing the job?
2) Are materials left in front of fire cabinets and waste stations?
3) Is there any material left on the walkway? Are the ergonomics rules followed while lifting the load?
4) Are chemicals stored properly?
5) Are wastes properly segregated? Are waste containers in place?
6) Are designated walkways used?

7) The operating ground is clean, there is no oil, water puddle
8) Is there any chemical spillage during chemical use or preparation?
9) Is attention paid to 5S applications?
10) Is PPE used fully and properly?
11) Are ZES and limited field forms filled and on-site inspection done?
12) Are situations affecting occupational safety reported without delay?

2.2.1.2. Outputs Defined to the Program within the Scope of the Study

Employees will define the input parameters as safe or risky in the eBA system as a result of their observations, and the number of Total Risky findings to be used in the % Risk calculation will be drawn from the eBA system in Excel format. In order to calculate the % participation;

- Total Number of Risky Findings (for % risk calculation)
- Number of Observations (for % Participation account)
- Number of Observation Forms filled
- Number of Actions

will also be automatically generated by the system and taken from the eBA system with an Excel format.

2.2.2. Calculation Method and Work Flow Process Used in the Investigated Facility

2.2.2.1. Calculation method

Observations were made over the Production Shift Supervisors, Electrical Maintenance and Mechanical Maintenance Supervisors, Warehouse Supervisor and OHS technician on the Site. These observations were carried out on a shift basis for 12 months and the calculations were based on working hours in the Sites specified in Table 1.

Observations included both routine and non-routine activities. In the Site studies, observation forms, which are prepared as a result of interviews with the top management and employees of the enterprise within the scope of this study were filled and behavior-based evaluations of the employees were made. Then, these evaluation results were processed into the risky findings and secure findings entry module in the eBA Document, Record and Workflow Management System.

Depending on these facilities, information such as how many observation forms the employees gave and which departments they belonged to were entered into the system, which also included explanations and the statistics of the entered data were kept. All employees of the enterprise have been authorized to participate in these processes voluntarily and to fill out the report through the eBA system. The data entered into the eBA system ended with the proactive and rapid intervention of unsafe behaviors with the approval of the senior management. By entering the data of the employees who created the reports into the eBA system, it was ensured that the results of the observations were retrieved from the system in Excel format.

Table 1. Site responsibles at investigated facility.

SİTE	PERSONAL	FREQUENCY
SİTE-1 Production Site -1	Shift Supervisor	Every Shift
SİTE -2 Production Site -2	Shift Supervisor	Every Shift
SİTE -3 Production Site -3	Shift Supervisor	Every Shift
SİTE -4 Mechanical Maintenance Boiler	Mechanical Maintenance Supervisor	08:00-16:00
SİTE -5 Electric Maintenance Boiler	Electrical Maintenance Supervisor	08:00-16:00
SİTE -6 Outside Site	OHS Technician	08:00-16:00
SİTE -7 Warehouse	Warehouse Manager	08:00-16:00

The % risk index and % Participation resulting from this reporting are defined by calculating according to the equations (1) and (2) below;

$$X = Y \times (100/ Z) \quad (1)$$

X : %Risk

A Total Number of Risky Findings

Z : Total Number of Findings

$$K = K1 \times (100/ K2) \quad (2)$$

C : % Participation

K1 : Number of Observations Made in the Month

K2 : Number of Shifts Worked in a Month

Since the AFR data could not be obtained from the eBA system, it was followed in a separate occupational safety reporting system and the AFR was calculated according to the equation (3).

$$A = (B \times 200\,000)/ (C-D)*E \quad (3)$$

A : Accident Frequency Ratio (AFR)
B : Total Number of Occupational Accidents
A : Total Working Days
D : Non-Working Day
E : Daily Working Time

Equation (3) is based on 200 000 working hours accepted by the investigated facility itself.

The necessary working environment and infrastructure have been created to ensure coordination in practice, eBA Document, Record and Workflow Management System responsibilities/other responsibilities and authorities have been defined, eBA Behavior Committee and Reporting system have been established, traditional Occupational Safety Practices integrated with BBSO have been defined and Occupational Safety Trainings have been determined to create a leadership culture.

The year in which the eBA Document, Record and Workflow Management System was fully used in the investigated facility was stated as 2016. BBO practices started in 2015 and continued to be implemented systematically in

2016. The number of observation forms was included in the reporting system in 2016.

In the calculation of the accidents affecting the AFR, significant and vital accidents were taken the basis and the first aid and Near Loss Accidents (NLAs) were not used in the calculation of this rate. Accidents which result in hospital treatment and leave the employee unable to work for a certain period of time due to accidents with more than 1 day of loss (Seam-crack- etc.) are considered as Notable Accidents. On the other hand, accidents that result in death or loss of a limb, prevent being at work for a long time, and result in disability such as organ damage, shock or brain trauma, Bone fracture, Crush, Peeling, and 2nd or 3rd degree severe burns are considered as Vital Accidents.

As a result of the comparison of AFR and % RR, action plans for behavior change were prepared and followed up within the scope of Occupational Safety Leadership practices in the industry.

2.2.2.2. Definition of the workflow process in the Facility where the work is done for the eBA Record, Document and Workflow Management System

The workflow process of investigated facility has been determined as follows;

A. Defining eBA Document, Record and Workflow Management System responsibilities/ other responsibilities and authorities

B. Defining eBA Document, Record and Workflow Management System Behavior Committee

C. Establishment of the Reporting System

D. Identification of TS practices integrated into BBSO

E. Establishing a Safety Leadership Culture

A. Defining eBA Record, Document and Workflow Management System Responsibilities

Within the scope of the study, the following responsibilities have been established with the Middle Level Managers and Senior Managers for the use of the eBA Document, Record and Workflow Management System;

a. Directors / Factory General Managers/ /IMS Manager

They are responsible for making observations in the areas under their jurisdiction in the examined facility in accordance with this procedure, allocating relevant resources for the elimination of process or behavior-related disruptions as a result of observations, and monitoring the results.

b. Integrated Management System (IMS) Engineer

He/She is responsible for making month-end reports and organizing the determined actions, by entering the behavior-oriented observation data made in accordance with the valid procedures in the areas under its authority, into the eBA Document, Document and Workflow Management System with its own password and printing out in Excel format.

c. Manufacturing Engineer:

He/She is responsible for preparing the month-end report for the Site Supervisor observations made in accordance with the procedures applicable in the areas where it is authorized and organizing the determined actions.

d.First Line Leader

Supervisors and technicians are defined as the first level managers in the program. These persons have been made responsible for the following matters in accordance with the procedures applicable in the areas in which they are authorized;

- Observing at the specified frequency,
- To evaluate the nonconformities identified in the observations made during the day.
- Conducting relevant activities if the risk can be corrected with quick actions (Example: If the question of finding materials in front of the fire cabinet is marked as risky, ensuring that this situation is corrected in the shift of the relevant Supervisor and technicians.)
- If other actions for risks cannot be taken instantly, this issue is evaluated by the relevant supervisor and to prepare action plans are and to follow
- By entering the observation reports given to him/her by the Site Officer and the Observation reports belonging to him to the eBA Document, Record and Workflow Management System with their own passwords.

e. Site Manager

The Site Manager is responsible for making observations about their own areas, checking that a site is in compliance with the Occupational Safety Rules, operating the machine or process, ensuring that the team works in accordance with the occupational safety rules, questioning the rules are applied or not within the scope of the Site Officer Observation Report at the beginning of each shift and during the shift and signing and delivering this form to the Shift Supervisor.

f. Maintenance Engineer:

The Maintenance Engineer is responsible for the followings;

- Evaluating the preliminary observations,
- Ensuring that the work is done after the hazards are eliminated,
- Preparing the month-end report
- Ensuring that the maintenance team evaluates potentially dangerous parts of the job before commencing work, checking for malfunctions or the need for periodic maintenance once all hazards have been removed.
- Ensuring that the maintenance team starts the work and informs the supervisor or engineer of every dangerous situation.

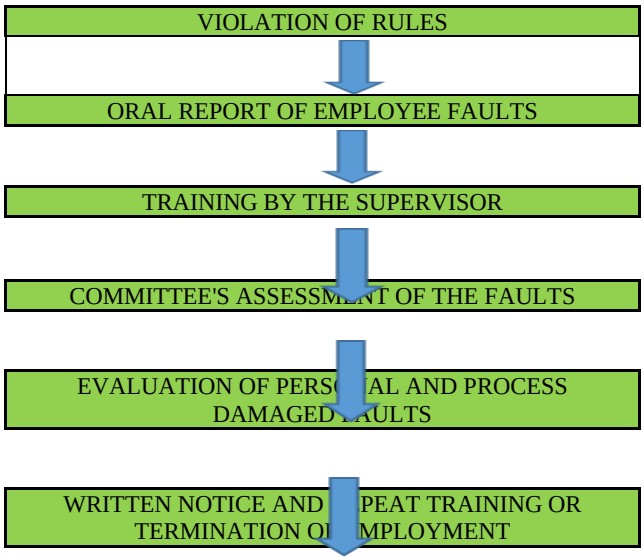

Fig. 1 Behavioral fault assessment process.

g. Human Resources Specialist, Maintenance, IMS, Production, Planning and Project Engineers

They are responsible for ensuring that their subordinates make observations in their respective areas of responsibility and for participating in the behavior committee.

B. Defining the eBA Document, Record and Workflow Management System Behavior Committee

The Behavior Committee is composed of Mid-Level and Senior Executives. It was obligatory to present the observations from the employees to the behavior committee with the reports prepared by the IMS and Production Engineers and the committee to meet every month. The process of evaluation is given in Fig. 1.

The following persons were decided to participate in the formation of the behavior committee;

- Factory General Manager
- Production manager
- EYS, Planning Maintenance, Production Eng.-CISG Technician
- Human resources specialist
- Employee representative

The behavior committee evaluates the results and determines whether the issue is related to process or employee behavior. It assesses actions, sets deadlines, identifies responsible individuals for process-related issues, and identifies areas requiring investment. Behavioral errors are evaluated, and training is planned to prevent the recurrence of errors. In cases where employees repeatedly violate the rules, their employment contracts may be terminated.

Examples of rule violations that may result in a written warning or written warning are described below. In case of repetition of these nonconformities, termination of the employment contract was deemed appropriate according to the process scheme;

- Failure to comply with both own and workplace cleaning rules
- Not using personal protective equipment
- Not separating waste properly
- Leaving materials on walkways in front of fire cabinets and emergency exits
- Leaving the locks of electrical cabinets unlocked
- Starting work without obtaining the necessary permission forms
- Not storing chemicals as described
- Exceeding speed limits on motorized equipment, etc.

In the following examples, it has been decided to terminate the employment contract without a written warning or warning;

- Smoking outside of the smoking area and/or intentionally or unintentionally causing a fire
- Intentional or unintentional intervention of the worker in the machine
- Intentional or unintentional exclusion of safety protection and switches
- Unauthorized unlocking of energy

C. Establishment of the Reporting System

Reports created by the First, Middle and Top Level Managers were prepared with the following content and defined in eBA Document, Record and Workflow Management System processes;

- Percentage of supervisor and technician's participation in observations (Behavior-oriented safety monitoring % attendance statistics table)
- Risk percentages of the sites % (Behavior-oriented observation % risk statistics table)
- List of Numbers of people with dangerous behavior (Number of employees who behaved dangerously)
- Action list (opened action, completed action numbers) (Action plan follow-up table)
- List of employees referred to the local disciplinary committee (Reasons)
- Site Officer Observation Reports (Mechanical maintenance & boiler behavior oriented observation report, Electrical maintenance & boiler behavior oriented observation report)
- Observations from employees (BBSO Report)

D. Identification of TS Practices Integrated Into BBSOs

BBO practices were reinforced with Administrative Occupational Safety practices. The use of NL and Hazard Identification Forms in the eBA Document, Record and Workflow Management System has been ensured by employees to identify existing potential hazards (Near-Loss form, Hazard identification card). The follow-up of these forms was carried out with the Hazard Identification Card and the NLA registration and tracking system. While the employee who reported the NLA was informed about whether the hazards identified by the employees were eliminated or not, it was posted on the information boards to announce it to all other employees. One-on-one Occupational Safety meetings were held with the participation of all employees. The topics discussed in these meetings were entirely in the direction of increasing awareness and participation in issues related to general occupational safety. Accident Statistics have been defined and recorded in a separate monitoring system to be used in the AFR account in case of an accident (Accident Analysis

Table). In each accident, the details of the accident are recorded in the system under the headings given in the accident analysis table.

E. Establishing a Safety Leadership Culture

Before starting the applications, it is aimed to create the Occupational Safety Leadership Culture on all employees together with the behavior-oriented observation culture.

In the facility, which was investigated for behavior-oriented observations, all employees were given the necessary safety information to safely and successfully fulfil their job responsibilities. Employees are trained to recognize workplace conditions, procedures or situations that could result in injury and are personally accountable for taking action to avoid and/or correct these hazards/risks. The facility has established and implemented an effective and documented pre-job/task safety assessment process to assess personal risk and implement appropriate controls, particularly for non-routine jobs/tasks. Sharing Meetings and TV broadcasts were held to increase the awareness of the employees, rewarding systems were used, and site tours were attended every month with the office and field employees. Since these practices are thought to be combined with Leadership features, Security Leadership training was given to all employees of the facility examined and to all important leaders working with hourly wages, which raises their basic skills. In this context, a Leadership training plan has been created. The necessity of Security Leadership Training was explained and these trainings were included in the periodic training table.

The minimum skills that a leader should have within the scope of Leader Training activities are defined as follows. Accordingly he/she must:

- Be able to actively recognize High Impact Moments in own task
- Demonstrate understanding of the "Security Case" and the importance of personalizing security with employees
- Demonstrate the understanding that good security is good business
- Demonstrate understanding that words and actions are essential elements in security leadership practices
- Lead by example when working with team members
- Be visible
- Identify high-risk areas
- Be open to dialogue
- Confirm the functionality of the controls
- Explain the importance of words in the daily practice of leadership
- Correctly use the term "speaking attention"
- Have a compelling speech and articulate it effectively in an appropriate setting
- Use the "work stop power" effectively in the workplace
- Show that he/she understands why people don't follow the rules
- Accurately identify the benefits of asking good questions
- Successfully apply "empathetic listening" when asking questions
- Accurately describe why safety meetings are truly High Impact Moments
- Explain why the lead enforcement role is the most important step in the change process
- Demonstrate that employees understand why they are resisting change
- Successfully demonstrate the practice of making changes in the workplace
- Define Early Warning Indicators and give examples
- Describe the attributes that produce an effective Early Warning Indicator
- Demonstrate understanding of the importance of establishing a baseline
- Successfully use Early Warning Indicators with the business team
- Demonstrate a full understanding of the terms "responsible", "accountable" and "result"
- Successfully apply the principle of "Listen. Let people talk"

3. RESULTS AND DISCUSSION [7]

Employees defined the input parameters as safe or risky in the eBA Document, Record and Workflow Management System as a result of their observations, and the number of Total Risky findings to be used in the % Risk calculation was withdrawn from this system in excel format.

In order to calculate the % participation, the number of observations for which employees are responsible, the number of actions to correct the risky finding, and the number of completed observation forms were also automatically created by the system and taken from the eBA Document, Record and Workflow Management System with an excel format including below information;

- Total Number of Risky Findings (for % risk calculation)
- Number of Observations (for % Participation account)
- Number of Observation Forms filled
- Number of Actions

Each non-conformity to be followed up is included in the CPA (Corrective Preventive Action) system. If the nonconformities transferred to the system are a situation requiring Mechanical Maintenance/Failure, a work order was assigned from the CPA System to the Maintenance and Repair Management System (MRMS). Thus, while the person who opened the CPA was responsible for closing the CPA by following it up, the department that received the work order from MRMS was also responsible for closing the MRMS. With this operation, actions are controlled within a system. The data captured in Eexcel format from the eBA Document, Record and Workflow Management System were followed up every month. A comparison of 2015 and 2016 % risk, % pParticipation, and Number of Observation Forms Filled are given in Table 2 and also aAccident behavior focused observation comparison is given in Table 3.

Table 2. Comparison of % Risk, % Participation and Number of Observation Forms Filled.

	Average Risk %	Average Participation Rate %	Number of Opened Actions	Number of Actions Completed	Number of Opened Actions	Number of Actions Completed	Number of Filled Observation Forms	Average Risk %	Average Participation Rate %
	2015	**2015**	**2015 Previous Year**		**2016 Implementation Year**		**Since New Year 2016**		
FACILITY	6,00	79,11	56	54	41	31	3789	0,20	92,60

Table 3. Comparison of accident behavior focused on observations.

Investigated Facility	Previous Year	Implementation Year
Accident Frequency Rate	2,15	0
Number of Accidents (NUMBER)	7	2
Behavior-based observation participation %	79,11	92,6

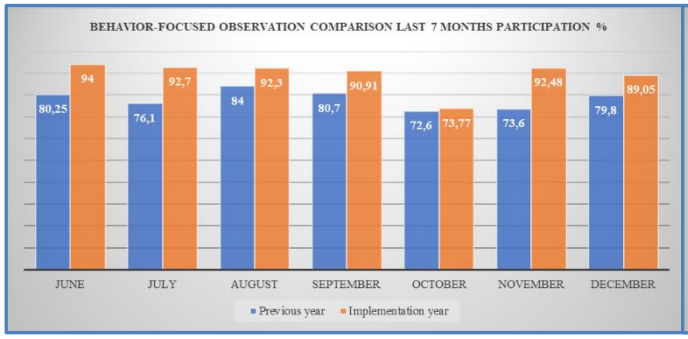

Fig. 2 BBSOs in 2016 (% participation rate comparison for the last 7 months).

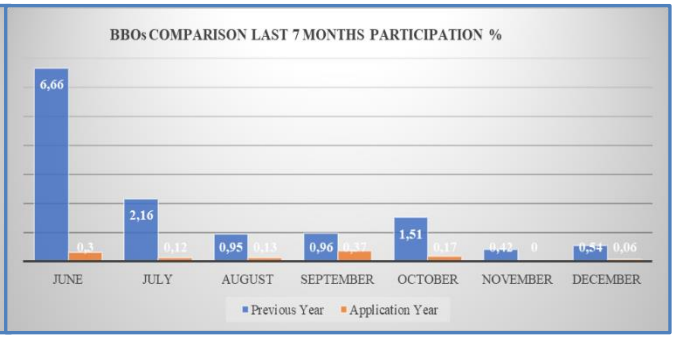

Fig. 3 BBSOs in 2016 (% risk finding comparison for the last 7 months).

When these data are examined, while the risk was 6.0% and the participation rate was 79.11% in 2015, these rates were determined as 0.20% and 92.60%, respectively, in 2016. In other words, as the participation rate increased, the risk decreased. In a study conducted by Chen and Tiana (2012) within the scope of BBOs, they reported that the SI increased thanks to the expectations and efforts of the employees, personal awareness increased compared to the previous situation, and the Total Accident Rate (TAR) decreased. In this study, Safe Working Time and Unsafe Working Time calculations are based and measures are taken to control the occurrence of accidents when the times of unsafe behaviors increase. That's why the SI has been called "proactive"[3]. While making monthly BBO reports and Occupational Safety Reports were also prepared on a monthly basis. The number of accidents, AFR, Actual Working Hours were tracked in these reports. The AFR calculation is based on historical 12-month data and the 12-month comparison of AFR is given in Table 4. In a study by Hermann et al. (2010), they reported that the use of BBSO and Traditional Security methods together gave more effective results, and the applicability and acceptability of these methods were seen as more effective in the enterprise [4].

It is understood that the results given in Table 2, Table 3 and Table 4 for the investigated facility also support the accuracy of this approach.

In another study conducted in the literature (Anonymous 2012), it was reported that a significant change was observed in positive and negative observations after training to change the behavior of workers within the scope of occupational safety [8].

Fig. 2 and Table 2 show the comparison of low participation and safe behaviors with the following year, as the trainings were initiated in 2015 when BBSO was implemented in the investigated facility.

Yaylalı (2016) used the Elmeri Method to calculate the SI with a manual calculation method in his study. It has been seen that applications increase the SI [6].

After the BBSOs results were manually entered into the eBA Document, Record and Workflow Management System in the investigated facility, the system automatically created the number of Safe and Unsafe (Risky) findings and this value was used in the calculation of the % risk value.

With the eBA Document, Record and Workflow Management System, error-free results were obtained in a short time. The use of eBA's system in 2016 (the Year of Implementation) became more active, and this enabled more employees to participate in the system (Fig. 2). It was used efficiently by the employees as it did not steal from working time. Active participation in the system has also been effective in improving behaviors, and the number of risky findings has decreased (Fig. 3).

It is also the year in which the Leadership trainings, which progressed in coordination with the BBSOs of the previous year (2015), started. A Leadership Training Plan was prepared and the trainings were completed in the implementation year (2016). With the trainings, the perspectives of the employees have changed and they have started to contribute more to the system. The Participation Rate Results shown in Fig. 2 supported this result.

It was observed in Fig. 3 that the number of Risky Findings decreased and according to Fig. 2, the Participation rates increased.

Table 4. AFR comparison for 12-months.

2014	WORKING HOUR	ACCIDENT NUMBER	MONTHLY AFR	12 MONTHS AFR
JANUARY	15761,00	0,00	0,00	0,00
FEBRUARY	14906,00	0,00	0,00	0,00
MARCH	17865,00	0,00	0,00	0,00
APRIL	15315,00	0,00	0,00	0,00
MAY	15349,00	1,00	13,03	1,08
JUNE	14756,00	0,00	0,00	1,08
JULY	15092,00	1,00	13,25	2,17
AUGUST	14429,00	0,00	0,00	2,17
SEPTEMBER	15780,00	0,00	0,00	2,16
OCTOBER	14344,00	0,00	0,00	2,16
NOVEMBER	15939,00	0,00	0,00	2,16
DECEMBER	16025,00	0,00	0,00	2,16
2015	**WORKING HOUR**	**ACCIDENT NUMBER**	**MONTHLY AFR**	
JANUARY	15841,00	0,00	0,00	2,15
FEBRUARY	14095,00	0,00	0,00	2,16
MARCH	15929,00	0,00	0,00	2,19
APRIL	14370,00	0,00	0,00	2,20
MAY	14252,00	0,00	0,00	1,11
JUNE	15465,00	0,00	0,00	1,10
JULY	14504	0	0	0
AUGUST	15115	0	0	0
SEPTEMBER	13400	0	0	0
OCTOBER	17164	0	0	0
NOVEMBER	15742	0	0	0
DECEMBER	16557	0	0	0
2016	**WORKING HOUR**	**ACCIDENT NUMBER**	**MONTHLY AFR**	**12 MONTHS AFR**
JANUARY	15362	0	0	0
FEBRUARY	15247	0	0	0
MARCH	16261	0	0	0
APRIL	15493	0	0	0
MAY	15867	0	0	0
JUNE	15189	0	0	0
JULY	13652	0	0	0
AUGUST	16578	0	0	0
SEPTEMBER	14985	0	0	0
OCTOBER	17458	0	0	0
NOVEMBER	15367	0	0	0
DECEMBER	16458	0	0	0

One of the problems experienced when BBSOs were first started in 2015 was related to the reporting system, and reports were created manually until the transition to the eBA Document, Record and Workflow Management System. Risky and safe findings are calculated manually and due to this workload, the approach of all employees to BBSOs was a waste of time. With the activation of the eBA Document, Record and Workflow Management System in 2016 (Year of Implementation), this workload was eliminated and the negative perspective of the employees on this issue was broken.

Another problem experienced was that the positive progress towards BBSO was slow due to the fact that the trainings were in the planning stage before the implementation started and was not given all at once and the completion of the trainings of the people selected as the Security leader coincided with the implementation Year (2016). However, with the completion of the leadership training, the employees became alert to their managers, which was considered a very good result.

Another problem belonged to managers who could not display exemplary behavior. In order to increase the communication between the Employee-Manager, the trainings were accelerated, more participation of the Managers was ensured (Site Tours and BBSO meetings) and this problem was solved by completing the trainings.

4. Conclusion

The aim of this study is to examine the site-based observation results in the investigated facility in order to enable the employees in the industries to make behavior-oriented observations and to understand the occupational safety culture rather than knowing it. For this purpose, the calculation of Accident Frequency rates on an annual basis and the processing of the observation results into the eBA Document, Record and Workflow Management System, and the total number of risky findings from the eBA system in Excel format, % risk calculations were made, AFR and % RRs were compared. According to the results obtained, action plans for behavior change were created within the scope of OSLPs practices in the examined enterprise and a monitoring-follow-up program was created in order to provide systematic management.

According to the monitoring-follow-up results, the employees participated more in the system with BBSO training, and this was demonstrated by the systematic reporting of % Participation rates. These participation studies carried out to change the behavior have ensured that more employees are included in the system. The increase in participation in the system also resulted in an increase in the number of Safe Findings and a decrease in the number of risky findings. With the BBSO trainings, the leadership characteristics of the employees were improved and the role of being an exemplary employee and an exemplary manager was adopted.

Within the scope of this study, methods of monitoring safe behaviors in the facility, which were investigated with applications related to BBOs, were developed. It has been concluded that the concept of leadership is extremely effective in BBOs in many subjects such as monitoring behaviors with these methods, providing trainings and following up on the results and examining the interaction of traditional methods with Behavior-Based Security (BBS).

Traditional Security Methods and BBSO were used together. Considering that the implementation year (2016) was more active, more positive results were obtained as a result of using these two methods together. % risk and % participation rates were used as Calculation methods. It was observed that AFR rates decreased with the decrease in Risky Finding rates and the increase in Safe Finding.

In 2015, when Traditional Security Methods were dominant and Behavior-based security observations were first implemented, AFR and % Risk were calculated as 2.15a nd 6.0, respectively, while in 2016, where TS methods and BBSO were used more actively together with eBA Document, Record and Workflow Management System, AFR and %Risk decreased to 0 and 0.20, respectively.

When BBSOs were first introduced in 2015 (Previous Year), one of the problems was related to the reporting system. While until the transition to the eBA Document, Record and Workflow Management System reports are created manually and the calculations of Risky/Safe findings are done manually, and therefore, the approach of all employees to BBSOs is considered a waste of time due to this workload, with the eBA Document, Record and Workflow Management System in 2016 (implementation year), this workload was eliminated and the negative perspective was broken.

In order for BBOs to be implemented efficiently, they must be followed within a system. Within this system, procedures, instructions, job descriptions and forms should be created and the BBSO idea should be included in the Policy. The resistance of the employees when they first started to implement this system can only be possible through training, development of leadership characteristics, communication, and in short, by ensuring the participation of the employees and taking their opinions. Practices carried out in this context have shown that; the development of the system can be allowed when it is educative and instructive rather than judging. In order to ensure the sustainability of the system in the examined facility, it is of utmost importance to monitor and control its functionality, collect and evaluate feedback, and implement inspection procedures. These measures help in maintaining the effectiveness and continuous improvement of the system.In particular, the easy implementation of Behavior-Oriented Observations by the employees, the comfortable and easy reporting, and the instant communication of risky findings to the entire staff of the Management can only be achieved with a reliable system. For these reasons, the eBA Document, Record and Workflow Management System is a very efficient system in terms of providing behavior-based change in facilities, which has been confirmed by the results of this case study.

Declaration

Author Contribution: Conceive-G.Y.T, G.C.; Design- G.Y.T; Supervision- G.Y.T.; Literature Review- G.C.; Writer- G.Y.T., G.C.; Critical Reviews – G.Y.T.

Acknowledgment: This review paper was organized based on the Msci Thesis titled "Behavioral Based Observation Results of Employees in the Industries in the eBA Document Management System, Definition Of Risk Index with Zero Accident Target and Assessment within OHS Leadership Practices" prepared by Göknur Canlı. The authors would like to express their sincere gratitude to the senior management and employees who provided the opportunity to conduct this research at the investigated facility.

Conflict of interests: The authors have declared no conflicts of interest.

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