

³BEHAVIOR-BASED SAFETY AND ITS IMPACT ON ENVIRONMENTAL COMPLIANCE IN INDUSTRIAL OPERATIONS

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1 Abstract

Behavior-Based Safety (BBS) is a systematic approach used in industrial organizations to improve workplace safety by identifying, observing, and modifying critical employee behaviors through feedback, reinforcement, training, and continuous participation. Although BBS has traditionally focused on occupational safety, its underlying behavioral principles can also contribute to environmental compliance because many environmental risks in industrial operations depend on routine employee actions. These actions include proper waste segregation, chemical handling, spill prevention, adherence to operating procedures, pollution-control practices, housekeeping, reporting of environmental abnormalities, and efficient use of resources. This study examines the relationship between Behavior-Based Safety and environmental compliance in industrial operations through a review of relevant safety-management and workplace environmental-behavior literature. Existing research indicates that behavioral observation, constructive feedback, employee participation, management commitment, training, and positive reinforcement can improve compliance-oriented workplace behaviors. BBS may therefore complement environmental management systems by converting environmental policies and procedures into observable day-to-day employee practices. However, behavioral approaches should not be used to place responsibility for environmental failures entirely on individual workers because non-compliance may also arise from inadequate equipment, poor procedures, excessive workload, insufficient training, weak supervision, or organizational deficiencies. The study concludes that integrating behavioral principles with environmental management can promote employee awareness, strengthen procedural compliance, reduce environmentally unsafe practices, and support a proactive environmental culture in industrial organizations.

Keywords: Behavior-Based Safety, environmental compliance, industrial operations, environmental behavior, safety culture, employee behavior, environmental management, behavioral observation, positive reinforcement, environmental performance.

2. Introduction

1.1 Concept and Development of Behavior-Based Safety

Behavior-Based Safety is an occupational safety approach that focuses on understanding and improving observable behaviors associated with workplace risk. Instead of depending only on accident investigations, rules, inspections, and disciplinary measures, BBS identifies critical behaviors, observes how work is actually performed, provides constructive feedback, and reinforces desirable practices. The approach is based on principles of behavioral science and recognizes that workplace behavior is influenced by consequences, feedback, organizational expectations, supervision, environmental conditions, and social influences. Recent reviews describe BBS as a structured intervention involving behavioral observation and feedback designed to increase compliance with desired safety practices. Empirical applications in manufacturing and process industries have also reported improvements in observed safe behaviors following structured BBS interventions.

A successful BBS program normally involves identifying critical behaviors, developing observation criteria, observing workplace activities, discussing safe and at-risk practices, providing feedback, analysing behavioral trends, and developing corrective actions. Positive reinforcement is generally preferred to blame or punishment because employee participation and trust are important for sustaining behavioral improvement. However, BBS should not be interpreted as an approach that assumes employees are solely responsible for accidents or non-compliance. Modern applications increasingly recognize that employee behavior interacts with management systems, equipment design, workload, organizational culture, training, and workplace conditions. Therefore, behavioral intervention is most effective when combined with improvements in the wider work system.

1.2 Environmental Compliance in Industrial Operations

Environmental compliance refers to an organization's adherence to applicable environmental laws, regulations, permits, internal procedures, standards, and other environmental requirements. Industrial activities can generate air emissions, wastewater, hazardous waste, chemical releases, noise, excessive energy consumption, and other environmental impacts. Organizations consequently establish environmental procedures relating to waste disposal, chemical storage, pollution-control equipment, spill management, emissions monitoring, wastewater treatment, resource conservation, and emergency

response. Environmental management systems provide a structured approach for incorporating these responsibilities into routine organizational operations.

However, environmental compliance cannot be achieved through policies and equipment alone. Employees are responsible for performing many of the daily activities through which environmental requirements are implemented. Frontline actions and decisions can directly affect whether environmental procedures are followed correctly. Research on environmental compliance therefore increasingly recognizes the importance of individual awareness, risk perception, attitudes, management support, and employee behavior. Studies of workplace pro-environmental behavior have similarly demonstrated that organizational efforts as well as individual characteristics influence how employees behave toward environmental objectives.

1.3 Relationship Between Safety Behavior and Environmental Behavior

Safety and environmental management have traditionally been treated as related but separate areas. In actual industrial operations, however, many employee behaviors have both safety and environmental consequences. Improper chemical handling, for example, can expose employees to hazardous substances while simultaneously creating a risk of soil or water contamination. Poor housekeeping can increase the probability of slips and falls while also resulting in improper disposal of hazardous materials. Failure to follow operating procedures may contribute to an occupational accident, equipment failure, excessive emissions, or accidental environmental release.

The behavioral principles used in BBS can therefore be extended to environmentally significant activities. An organization can identify environmentally critical behaviors in the same manner that it identifies safety-critical behaviors. Examples include placing waste in designated containers, keeping chemical containers closed and correctly labelled, reporting leaks, avoiding unnecessary discharge, inspecting pollution-control systems, following spill-prevention procedures, and switching off equipment when it is not required. These behaviors can then be observed, measured, discussed, and reinforced. Workplace environmental research supports this behavioral emphasis: individual and organizational factors influence pro-environmental behaviors, while leadership and organizational support can encourage employees to perform environmentally responsible actions.

1.4 Role of Observation, Feedback, and Positive Reinforcement

Observation is one of the central components of Behavior-Based Safety. During behavioral observations, trained employees or supervisors examine whether predetermined critical behaviors are being performed correctly. The purpose should not simply be to identify violations but to understand why certain practices occur. A worker may fail to follow a procedure because instructions are unclear, suitable tools are unavailable, the task is poorly designed, workload is excessive, or the employee has not received adequate training. Therefore, observations can provide useful information about both employee behavior and deficiencies in the management system.

The same principle can be applied to environmental compliance. An environmental behavioral observation checklist might include correct hazardous-waste segregation, appropriate handling of chemicals, proper closing of containers, leak reporting, prevention of unnecessary water use, compliance with wastewater procedures, and maintenance of clean working areas. Immediate constructive feedback can help employees understand the environmental consequences of their actions. Positive recognition for appropriate practices can further strengthen desirable behavior. Studies of BBS demonstrate that structured observation, feedback, employee engagement, and recognition can improve compliance-oriented safety behavior, suggesting that similar behavioral mechanisms can potentially strengthen environmentally critical operational practices.

1.5 Management Commitment, Employee Participation, and Environmental Culture

Management commitment is essential for both BBS and environmental compliance. Employees are unlikely to consistently follow safety or environmental procedures if management appears more concerned with production targets than with responsible operations. Supervisors influence employee behavior through the priorities they communicate, their personal example, the resources they provide, and their response when employees identify problems. Strong management commitment demonstrates that safe and environmentally responsible behavior is considered an organizational value rather than merely a regulatory requirement.

Employee participation is equally important. Workers have direct knowledge of operating conditions and are often able to identify unsafe practices, leaks, inefficient processes, waste-generation problems, and other deviations before managers become aware of them. Participation in observation programs, environmental improvement initiatives, near-miss reporting, toolbox discussions, and corrective-action

development can therefore strengthen employee ownership of both safety and environmental performance. Research among Indian manufacturing organizations found that organizational efforts influence workplace pro-environmental behavior, while broader environmental-behavior research highlights the importance of leadership and perceived organizational support.

A strong environmental culture develops when responsible environmental practices become routine rather than being performed only during inspections or audits. BBS principles may contribute to such a culture by repeatedly reinforcing desired behaviors and creating continuous communication about operational risk. In this way, environmental compliance can move beyond a checklist-oriented approach toward shared responsibility and routine behavioral practice.

1.6 Integration of BBS with Environmental Management Systems

The greatest benefit is likely to occur when BBS is integrated with an organization's existing Safety, Health, and Environmental or Environmental Management System rather than implemented as an independent program. Environmental management systems establish policies, responsibilities, objectives, operational controls, training requirements, monitoring arrangements, audits, and corrective actions. BBS can complement these elements by examining whether critical environmental controls are actually translated into everyday behavior.

For example, an environmental procedure may state that hazardous waste must be stored in labelled containers. Traditional auditing verifies whether the procedure and containers exist, whereas a behavioral approach additionally observes whether workers consistently use them correctly during normal operations. Observation findings can then be analysed to determine recurring problems, followed by training, engineering improvements, procedural changes, or reinforcement. Environmental management research shows that employee commitment and behavior are important in translating formal environmental systems into practical environmental performance.

Importantly, integration must avoid reducing complex environmental problems to individual worker behavior. If employees repeatedly fail to perform a required environmental task, management should investigate whether equipment, procedures, staffing, training, workload, incentives, or workplace design are contributing to the problem. Contemporary BBS literature itself warns against narrowly targeting workers while ignoring systemic causes.

2. Objectives of the Study

1. To understand the concept and major principles of Behavior-Based Safety in industrial operations.
2. To identify environmentally significant employee behaviors that can influence industrial environmental compliance.
3. To examine the role of behavioral observation and constructive feedback in improving compliance with safety and environmental procedures.
4. To assess the contribution of employee participation and positive reinforcement to environmentally responsible workplace behavior.
5. To analyse the influence of management commitment and organizational culture on safety and environmental compliance.
6. To examine the potential integration of Behavior-Based Safety principles with Environmental Management Systems.
7. To identify limitations and challenges associated with using behavioral approaches for environmental compliance.
8. To determine whether behavior-oriented interventions can support a proactive safety and environmental culture in industrial organizations.

3. Results and Findings

The review indicates that Behavior-Based Safety has considerable potential to support environmental compliance when its principles are applied to observable environmentally significant behaviors. BBS studies demonstrate that systematic observation, feedback, recognition, and employee involvement can improve compliance-oriented workplace behavior. For example, process-industry research has reported increases in safe behaviors and reductions in unsafe behaviors following structured BBS implementation.

The findings also indicate that environmental performance depends partly on employees' everyday actions. Research in manufacturing organizations shows that both individual characteristics and organizational efforts influence workplace pro-environmental behavior. Therefore, behaviors such as proper waste segregation, chemical handling, leak reporting, spill prevention, housekeeping, and adherence to operating procedures can potentially be strengthened through behavioral observation, feedback, training, and reinforcement.

Management commitment, employee participation, communication, and organizational support emerged as important conditions for sustainable behavioral change. BBS is unlikely to produce long-term environmental improvement if employees perceive the program merely as surveillance or if management ignores underlying technical and organizational problems.



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