INTEGRATING THE H
A Holistic Approach to Imp

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BOTH BEHAVIOR-BASED SAFETY (BBS) and human and organizational performance (HOP) have been used successfully in various settings to improve safety performance. When applied correctly, both approaches include continually improving system factors to influence human behavior/performance, sustaining legitimate management support for safety, soliciting more hourly employee input for safety, and finding ways to minimize human error and safety-related shortcuts that contribute to injuries and fatalities.

Unfortunately, these approaches have been presented as competing methods to improve safety. Leemann (2014) says, "Frankly, in many respects, HOP is the archenemy of BBS." Some HOP proponents claim BBS overemphasizes employee behavior and ignores system factors contributing to injuries/fatalities. Their message is essentially that BBS targets the worker, not the system (Dekker, 2017).

Some in the HOP community mistakenly characterize BBS as blaming the worker and fail to understand or acknowledge important BBS concepts such as improving leadership behaviors to support safety, the importance of personal choice in making safe decisions, the value of coworker-to-coworker safety-related feedback to prevent injuries, and the benefits of behavioral trend analyses to identify and correct system problems.

The reality is that both approaches encourage safe work practices and safety system improvements to prevent injuries and fatalities. This article briefly reviews both approaches and demonstrates how HOP and BBS should be viewed as complementary, not competing philosophies to improve safety performance.

KEY TAKEAWAYS

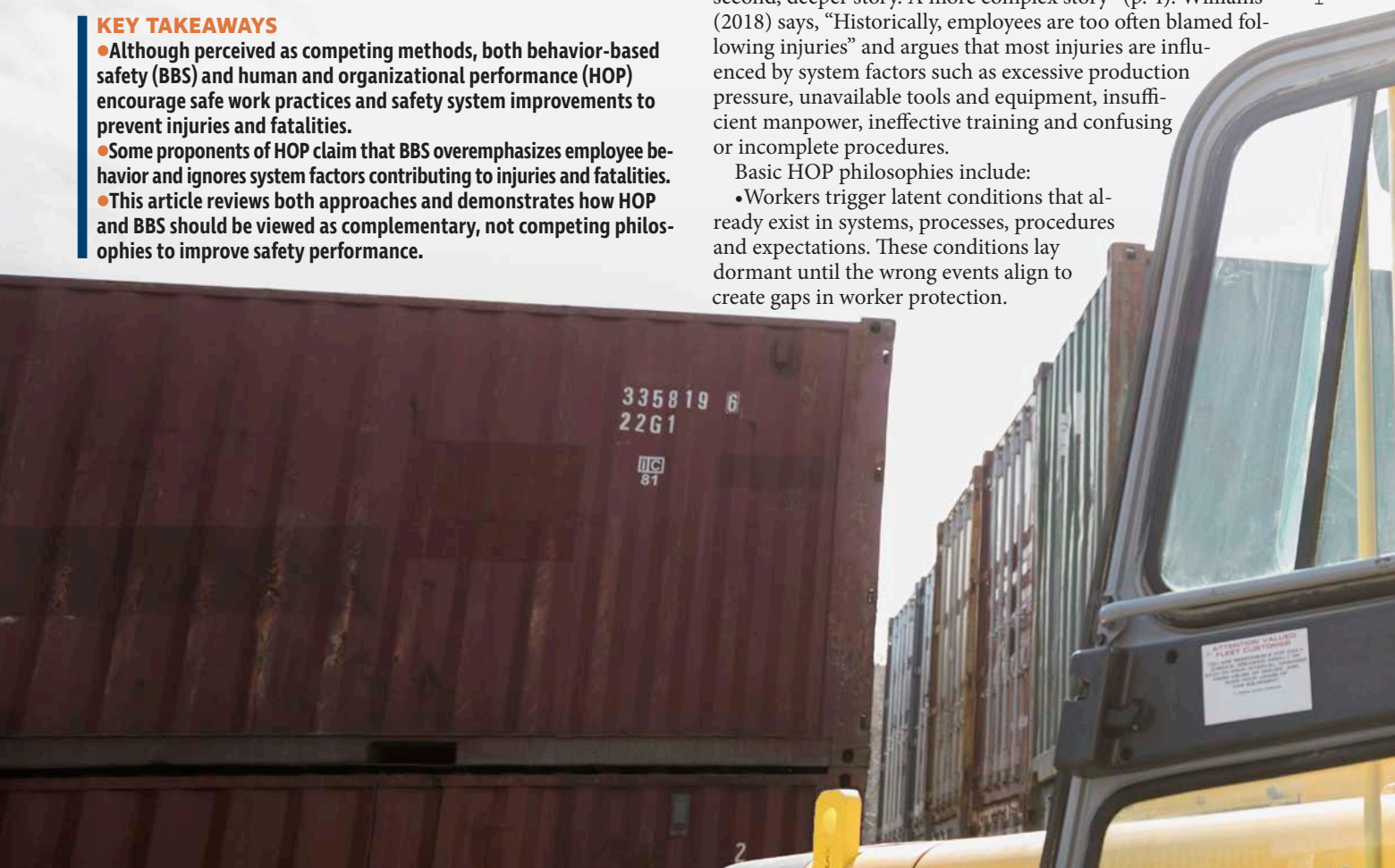
- **Although perceived as competing methods, both behavior-based safety (BBS) and human and organizational performance (HOP) encourage safe work practices and safety system improvements to prevent injuries and fatalities.**
- **Some proponents of HOP claim that BBS overemphasizes employee behavior and ignores system factors contributing to injuries and fatalities.**
- **This article reviews both approaches and demonstrates how HOP and BBS should be viewed as complementary, not competing philosophies to improve safety performance.**

HOP Overview

Organizations, including those currently using BBS, should educate their workforce on key HOP principles. Two major benefits of HOP are 1) reducing the blame-the-employee mentality following injuries and 2) recognizing that injuries and fatalities reflect system failures. As Dekker (2014) notes, "Underneath every seemingly obvious, simple story about error, there is a second, deeper story. A more complex story" (p. 4). Williams (2018) says, "Historically, employees are too often blamed following injuries" and argues that most injuries are influenced by system factors such as excessive production pressure, unavailable tools and equipment, insufficient manpower, ineffective training and confusing or incomplete procedures.

Basic HOP philosophies include:

- Workers trigger latent conditions that already exist in systems, processes, procedures and expectations. These conditions lay dormant until the wrong events align to create gaps in worker protection.



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BEST OF BBS & HOP
roving Safety Performance

•In explaining failure, do not try to find out where people went wrong. Instead, try to understand what made sense to the person at the time of the incident.

•Safety should not be viewed as the absence of events but rather the presence of solid, consistent defenses against human error.

•Error-likely situations are predictable, manageable and preventable (Conklin 2011; 2012).

With this framework, human error is a predictable outcome of human beings operating in flawed environments. When problems arise, system weaknesses should be immediately targeted. When incidents occur, system factors (not individual employees) should be the focus of analysis. Accordingly, human error is viewed as the starting point for incident analyses to assess system factors contributing to the mishap.

When employees are injured, managers should make it clear that their primary concerns are that the person is okay, whether systems are now safe for operations and what steps can be taken to prevent the event in the future. Without this emphasis, employees may believe that management is simply trying to determine who is to blame for the incident, when normal operations can resume and whether they must classify the incident as a recordable injury.

Table 1 (p. 42), adapted from Dekker (2014), demonstrates past and current thinking on human error. To further explain human error, Reason (1990) uses the Swiss cheese model to illustrate how incidents occur when layers of defenses fail (Figure 1, p. 42). Each

TABLE 1

EVOLUTION OF HUMAN ERROR BELIEFS

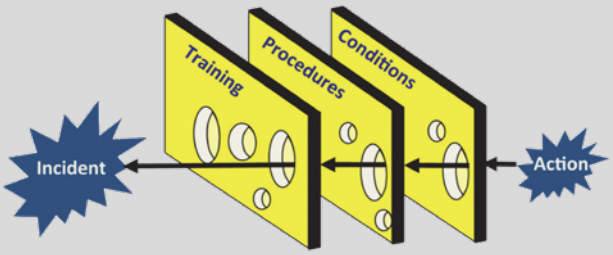
Past	Current
Who is responsible for the error?	What is responsible for the error?
Human errors and near-hits are covered up.	Human errors and near-hits are communicated openly without blame.
Incident investigations blame employees.	Investigations ask what made sense to the person at the time of the incident.
Human error is an acceptable conclusion to incident investigations.	Human error is the starting point for further analyses.

Note. Adapted from *The Field Guide to Understanding "Human Error"* (3rd ed.), S. Dekker, 2014, Farnham, England: Ashgate.

FIGURE 1

SWISS CHEESE MODEL OF ERROR

Each slice of cheese represents a layer of defense, such as procedures, equipment and safety training.



Note. Adapted from *Human Error*, by J. Reason, 1990, Cambridge, England: Cambridge University Press.

slice of cheese represents a layer of defense such as procedures, equipment and safety training. These defenses normally prevent incidents when errors occur. However, weaknesses (represented by holes) in layers of defense occasionally line up, causing defenses to fail, which allows incidents to occur. This is because latent errors are hidden in the system until these weaknesses line up in this manner.

The *Deepwater Horizon* explosion that killed 11 employees and injured 17 more is an informative case study to explain how layers of defenses failed. Contributing factors of the event include 1) poor quality cement used at the bottom of the borehole, which ultimately led to gas leaking through the pipe to the surface; 2) valve failure at the bottom of the pipe; 3) pressure test misinterpretation about whether the well was sealed; and 4) problems with gas alarms and blowout preventers when mud and gas began overflowing on the rig. It is noteworthy that safety documentation, emergency procedures and inspections were incomplete.

Error precursors are normally present before catastrophic events such as *Deepwater Horizon* occur. Error precursors are unfavorable conditions embedded in the environment that create mismatches between job tasks and employees. These precursors include task demands (e.g., excessive workload, hurrying, confusing procedures), individual capabilities (e.g., inexperience, fatigue, poor communication), work environment (e.g., awkward equipment layout, equipment/facility problems) and human nature (e.g., poor habits, stress, complacency). High-reliability organizations have effective engineering (e.g., equipment safeguards), administrative (e.g., procedures) and cultural (e.g., organizational values for safety) defenses to mitigate the influence of these error precursors (U.S. DOE, 2009).

Rasmussen (1982) distinguishes between knowledge, rule and skill-based errors in categorizing human error.

- Knowledge-based errors include new employees performing unfamiliar tasks or experienced employees performing new jobs in novel environments. This is typically slow, effortful work that requires high mental workload. Knowledge-based errors include task overload, lack of knowledge and improvisation in unfamiliar environments. These are the most common types of errors.
- Rule-based errors are less common and often involve employees trying to follow rules in which underlying reasons of the rules and system principles may be unknown (e.g., fire drill). Misinterpretation or misapplication of rules are the main causes of these errors.
- Skill-based errors involve employees performing routine jobs in familiar environments. This is typically fast, effortless work and involves automated routines that require little mental effort or feedback (e.g., riding a bike). These errors are the least common and may be caused by inattention, slips, habituation to hazards and complacency.

Although some HOP proponents acknowledge the occurrence of intentional and unintentional deviation, most emphasize normalized deviation, which reflects larger system issues (Vaughan, 2016). Normalization of deviance has been used to explain the *Challenger* explosion and other catastrophic events. Essentially, employees operate below the highest standards of the job and fail to follow all prescribed procedures and job expectations. This includes both active and latent errors. Active errors are unsafe acts by employees, such as slips, lapses, mistakes and procedural violations. Latent errors are hidden failures built into the system, such as faulty equipment, inaccurate procedures, insufficient training, excessive production pressure and insufficient personnel for the job.

Over time, these errors are ignored or go unnoticed by fellow employees and supervision. They become normalized in the system. As a simple example, teenagers learning to drive get both education and training on following traffic laws and safe vehicle operations (e.g., turn signal use, maintaining proper following distance). These behaviors are normally performed safely when people learn how to drive. However, these standards often drop over time as people learn they can "get away with" operating less safely. This is further supported by the risky actions of other drivers on the road. Drifting from higher to lower standards is a natural process that both individuals and organizations must constantly guard against. HOP offers numerous tools to combat normalized deviance and other types of human error. Some of these tools are described here.

Prejob Briefings

A prejob briefing is a planned, interactive discussion that occurs just prior to the task to raise situational awareness, summarize critical steps of the task, discuss potential errors and review past experiences. This brief discussion includes all relevant personnel for the given task and is designed to ensure that all steps are taken to prevent any surprises or errors during the task.

In some cases, employees involved with performing the work should prepare for and lead prejob briefs. Also, prejob briefing forms may be used to help with these discussions. Questions to discuss include:

- Have we performed this task before?
- What are the critical steps in this task?
- Are document reviews needed?
- Do unusual conditions or special circumstances exist?
- Are tasks properly assigned and understood?
- Where errors are likely to occur?
- What injuries/fatalities are possible?
- What steps can be taken to mitigate these risks?

These forms can also be collected and analyzed for future planning.

Two-Minute Analysis

The 2-minute analysis involves employees taking time before a job to assess any potential hazards or error-inducing situations in the environment. This is completed after the prejob briefing but before starting the job. The 2-minute analysis helps employees develop a clear understanding of the work environment, determine the status of tools and equipment, review key standard operating procedures (SOPs), discuss relevant issues with coworkers, and identify and address any hazards.

Self Checking

A self check is performed before completing specific job tasks. The employee pauses to focus his/her attention on the intended job and takes inventory of all steps needed to complete the task safely. Self checks help employees 1) remain mindful and not distracted prior to performing actions; 2) perform tasks without rushing; 3) pause and self check between actions when performing multiple steps within a task; and 4) stop the job when uncertainties exist.

Peer Checking

With peer checking, an employee simply observes a coworker and respectfully points out any potential risks or errors. Peer checks are especially helpful with error-likely situations, difficult conditions, new employees and with tasks that are historically error prone. Peer checks can be conducted between employees or by HOP teams who perform walk-throughs throughout the site. These discussions are designed to get employee input to keep them safe and should involve open-ended questions such as:

- Do potential hazards exist that make you nervous with this task?
- Do you need new or different tools or equipment?
- Do procedures need to be updated?
- Do any system issues need improvement?
- What other issues with this job or task must be addressed?
- What recommendations do you have to improve this task in the future?

Procedural Use & Adherence

To maximize the effectiveness of procedures, organizations must:

- Ensure that all procedures are accurate, complete, consistent and understood.
- Consistently and effectively share rules and procedures with all employees, including contractors. This includes rule/procedure changes and updates.
- Make sure procedures are updated in an open, ongoing manner with input from relevant employees.
- Avoid blanket policies following incidents that may not be relevant or applicable to all employees.

Time-Outs

The purpose of the time-out is to encourage employees to stop a job, without fear, anytime a potential hazard or error-inducing situation is identified. This is especially important when uncertainty exists about the task (e.g., tools needed, SOPs required) and when conditions in the environment change. Time-outs give workers the opportunity to gain more information about the situation from other informed individuals before proceeding and afford an opportunity to bring work teams together to discuss the reasons for taking the time-out.

Postjob Briefings

A postjob briefing is an interactive discussion that occurs just after the job with all personnel involved in the job. The purposes of postjob briefings include:

- Confirming that procedures are appropriate for the task.
- Ensuring that proper procedures were followed.
- Offering opportunities for process refinement.
- Documenting lessons learned.
- Determining whether lessons learned can be applied to other tasks.
- Allowing opportunities for supervisory recognition.

Postjob briefing forms can be used to summarize these findings. Questions to discuss include:

- Was task completed as expected?
- Were prejob briefings and 2-minute rules completed?
- Was a time-out needed during task completion?
- Were self checks completed? Were formal self-check forms used?
- Were peer checks completed? Were formal peer-check forms used?

FIGURE 2
POSTJOB FINDINGS DOCUMENT

Task: Moving boxes in the warehouse		
What was successful?	**What was not successful?**	**What should be done differently?**
• Proper PPE was used throughout the job. • The task was completed ahead of schedule. • There were no injuries or close calls.	• An automated lift is needed on Line 2. Some employees felt the boxes were too heavy for them to safely handle. • Housekeeping was poor when beginning the shift. This includes improper storage and organization of certain tools. • There was some confusion among contractors about specific job duties and tasks.	• Consider adding automated lifts or additional manpower on Line 2. • Discuss the importance of proper housekeeping after the shift. • Improve communication with contracting company about specific contractor responsibilities in the warehouse.

•Were procedures followed?
•Are procedures appropriate?
•Did errors occur?
•Do conditions exist that may lead to future error?
•What lessons learned may help for the future?
•Were postjob findings completed and shared?

In addition, a postjob findings card can be used with specific tasks to document and track what was done successfully or unsuccessfully, and what must be done differently in the future (Figure 2, p. 43).

Taken together, these tools put HOP principles into everyday practices. Overall, HOP helps employees to be more vigilant before, during and after job tasks to minimize human error.

BBS Overview

Like HOP, BBS focuses on employees following proper steps and procedures to stay safe. However, in addition to considering flawed organizational systems, BBS also emphasizes the need for people to make proper choices to behave safely, especially when system problems such as excessive time pressure, faulty equipment and insufficient manpower are evident.

In fact, BBS largely assumes that employees will be working in less than ideal situations and must make numerous decisions about working safely even though alternative safety-related shortcuts are easier, faster, more convenient and may be encouraged by system pressures, as noted. So, employees sometimes take calculated risks and the more people "get away with" or receive some benefit from these risks, the more powerful they become in the future. This is like HOP's explanation of normalized deviation. Behavioral psychologists use the activator-behavior-consequence model to explain risky shortcuts, then address ways to prevent risky behaviors in the future (Geller, 1998).

BBS includes three primary components. First, BBS involves more employees identifying the critical behaviors that can lead to injury. Next, BBS engages more people analyzing factors that encourage at-risk behaviors and inhibit the occurrence of safe behaviors. Finally, BBS involves more people providing supportive feedback to increase the frequency of safe behavior, corrective feedback to decrease the occurrence of at-risk behavior, the identification and removal of barriers to safe behavior based on a behavior analysis, and the development or modification of organizational systems to motivate and support safe behavior.

Although BBS starts by identifying critical behaviors that could influence occupational safety, BBS considers a broad spectrum of potential contributing factors to understand and improve these behaviors, including leadership focus, physical environment/conditions, organizational systems, opportunities for employee engagement and internal person factors (Roberts & Geller, 2018). Whether working from an HOP or BBS perspective, failing to adequately consider the full range of factors to help understand and improve safety-related behaviors will lead to an incomplete safety improvement process.

BBS Checklists

Behavioral safety checklists help combat people's natural tendencies for shortcuts that are reinforced by system pressures. Broadly speaking, the purpose of these checklists is to encourage peer-to-peer feedback in a positive, open and respectful manner. This includes not only pointing out issues that may lead to injury but also acknowledging especially safe work practices. Further, the observation-and-feedback process helps both parties learn from each other about best practices (and possible hazards) for error-free work. Specific system problems encouraging risky behavior should be documented on the BBS checklists (Geller & Williams, 2001).

Employees use these checklists voluntarily when they see opportunities to help coworkers. The purpose is to provide constructive feedback, not tell other people how to do their jobs or "catch" risky behavior. Also, names of those being observed are never documented to ensure that the process is "no-name/no-blame." Ensuring that BBS remains nonpunitive is a key component of BBS implementation (Williams, 2010).

Internal personnel, including hourly employees, create the customized BBS checklists and guidelines. These checklists contain key safety behaviors that the team believes must be assessed (e.g., tool/equipment use, body position, housekeeping, mobile equipment). Ideally, all employees observe each other regardless of position or work area. This improves communication across the organization and helps reduce conflicts between groups that sometimes exist (e.g., management vs. hourly, maintenance vs. operations).

After a brief observation, both parties then use the checklist to discuss what was observed. Employees are in the best position to give coworkers safety feedback (with or without a checklist) because they are job experts for their tasks who understand the subtleties of the job.

Of course, employees do not need a checklist to give each other safety-related feedback. But, these checklists can help pinpoint specific behaviors that need attention. Also, group (behavioral) data in the form of graphs and charts are provided to illustrate trends in risky performance and show improvements (Krause, Hidley & Hodson, 1996; McSween, 2003). This information is used to improve system factors such as safety training, preventive maintenance with equipment, policies/procedures and tool/equipment availability. System improvements from the BBS data should be shared with employees to demonstrate management commitment to safety, raise morale, and show employees the benefits of observation and feedback (Geller, 1996).

Note that BBS encourages coworker feedback both formally (with checklists) and especially informally (during daily activities). Williams (2010) contends that continual, respectful communication between employees is a higher priority than checking whether BBS checklists have been completed.

Communication

Giving and receiving safety-related feedback can be difficult with or without a BBS checklist. Employees may be reluctant to give this feedback because they fear that coworkers will be resentful or unappreciative. In many organizations, people believe safety feedback is the job of management or OSH personnel and they do not want to meddle in other people's business or tell them what to do.

So, employees often fail to speak up for safety even though they want to. Survey results show a 13% difference between employees' desire to give feedback when they see coworkers doing something risky and their actual likelihood of speaking up. Further, 91% confirm that they welcome safety suggestions from others, but only 58% think coworkers want this feedback (Williams, 2010). These misconceptions illustrate how employees not only want more coworker feedback for safety but also are willing to speak up and listen if they believe others feel the same way. BBS is designed to create this culture of actively caring for coworkers and speaking up (Williams & Geller, 2016).

Some in the HOP community mistakenly characterize BBS as blaming the worker and fail to understand or acknowledge important BBS concepts such as improving leadership behaviors to support safety, the importance of personal choice in making safe decisions, the value of coworker-to-coworker safety-related feedback to prevent injuries, and the benefits of behavioral trend analyses to identify and correct system problems.

To this end, BBS emphasizes communication strategies to make safety communication easier. These recommendations include asking permission first before giving feedback, taking time to understand the context of a situation before offering suggestions, stating opinions as suggestions instead of facts, asking questions to facilitate discussions, and acknowledging people's experience and skill (Williams, 2006). Overall, safety feedback should be exploratory, nondirective and empathic. Geller (2018) notes that showing more empathy and compassion in conversations creates more impact on improving attitudes and behaviors. Good BBS training should spend more time addressing communication and listening skills than filling out checklists.

BBS & Person-States

BBS also examines key factors to influence employees' attitudes and beliefs (Williams, 2003). This includes person-states that influence employees' propensity to actively care for coworkers' safety. Geller (2005) writes extensively about self-esteem, belonging, self-efficacy, locus of control and optimism. These states can be improved to increase pro-social behavior such as providing respectful safety feedback, appreciating behavioral feedback from others, avoiding at-risk shortcuts, working safely even when supervisors are not present, and sharing safety suggestions and close calls with coworkers and supervision.

BBS & Leadership Behaviors

Unfortunately, behavioral safety has sometimes been mischaracterized as only focusing on employees' behavior and simply filling out checklists and meeting quotas for checklist completion. In poorly designed or outdated processes, this may be true (Eckenfelder, 2004). Krause (cited by Johnson, 2017) says, "If your organization's position on BBS is the same now that it was 5 or 10 or 20 years ago, you are out of date," and emphasizes the importance of safety leadership and culture improvement.

Good BBS processes specifically address the behaviors of managers and supervisors to support safety (Williams, 2002). Often this is done in conjunction with safety culture assessments to identify system and culture strengths and weaknesses.

Also, behavioral safety training normally begins with leadership groups where managers are encouraged to better balance safety and production, discuss safety one-on-one with employees, maintain sufficient manpower, avoid excessive overtime, encourage preventive maintenance, consider safety when purchasing new tools/equipment, and invest sufficient money and resources to ensure a safe work environment.

Further, supervisors are reminded to 1) quickly address safety hazards; 2) effectively balance safety and production; 3) set good safety examples through personal behavior; 4) avoid overlooking hazards to get the job done; and 5) provide safety-related feedback for both safe and risky behaviors. Overall, increasing positive leadership behaviors improves the safety culture and sets the conditions for better applications of safety initiatives.

BBS & Safety Management Systems

In addition to addressing specific leadership behaviors, BBS focuses on improving safety management systems. As Ludwig (2018) notes, risky behaviors lead to most incidents, but the vast majority of these behaviors are influenced by system problems. Improving safety-related systems includes (Williams, 2012):

- Incident analyses should be system focused and not blame oriented. Results from these analyses should be shared (to the greatest extent possible) to avoid future incidents. Hourly employees should be involved with analysis teams to provide their perspectives and improve perceptions of fairness with the process.
- Safety rules should be clear, practical and determined with input from employees. Companies should avoid the shotgun effect in which impractical or nonapplicable blanket policies are sometimes applied for all employees. Also, safety procedures should be continually updated and communicated to all employees.
- Safety meetings should be regularly conducted in all areas. This includes pre- and postjob briefings. Hourly employees may lead these discussions.
- Safety training should be ongoing, job specific and interesting. Computer-based training should supplement, but not supplant hands-on training. Mentoring between more experienced and newer employees should be facilitated.

•Employees should regularly conduct audits/inspections and organizations should respond quickly and effectively to audit findings.

•Near-hit reporting should be nonpunitive and encouraged. Improvements from these reports should be timely and complete.

•Safety suggestions should be solicited from employees both formally (e.g., forms, meetings) and informally (e.g., discussions). Organizations should keep employees informed of improvement status and quickly, effectively address changes. They should also let employees know when barriers exist that prevent immediate improvements and what short-term protections to administer until longer-term improvements can be implemented. In this case, bad news is better than no news, which employees may interpret as management not caring.

Overall, BBS is broader than simply observation and feedback. It includes leadership behaviors and systems, person-states and communication, in addition to the use of BBS checklists.

HOP/BBS Integration

This article has discussed HOP and BBS basics. Organizations should incorporate the best elements of both BBS and HOP to improve safety performance. Too often, companies move from one solution to the next without attempting to integrate the best elements of different philosophies. This leads to a silo effect in which numerous, separate initiatives coexist without any meaningful integration. This can overwhelm and confuse employees. It also leads to a flavor-of-the-month culture in which old initiatives are simply discarded and new ones are presented as "the next big thing." This recurring pattern diminishes the good elements of past programs and hinders optimization of future initiatives with employees skeptical of new initiatives.

The reality is that HOP and BBS are aligned philosophically in that both emphasize the following:

•System factors (e.g., faulty equipment, extreme production pressure, excessive overtime) contribute to most risky behavior/human error and the resulting injuries/fatalities.

•The first question to ask following an injury is, "Where did the system fail?"

•Employees are too often blamed following an injury. Discipline should be extremely rare and only reserved for willful, malicious noncompliance or repeated violations.

•More employee input is needed with safety procedures, audits, incident analyses, safety suggestions, close-call reporting, rewards and peer-to-peer feedback.

•System improvements with employee input should be ongoing.

•Improving system factors reduces human error/risky behavior and corresponding injuries and fatalities.

Benefits of HOP for BBS Users

HOP elegantly illustrates the importance of fixing the system to reduce errors. This includes the previously discussed Swiss cheese model of error and the dangers of normalized deviation. This reflects Deming's directive, "Don't blame people for problems created by the system" (Geller, 2016).

Although a core component of BBS includes a focus on system factors to understand and improve at-risk behavior, this can be a flawed omission of some poorly executed BBS programs. Therefore, HOP serves as a reminder to anyone involved in BBS to ensure that their programs do not simply stop at the identification of at-risk behavior or peer feedback. It should also include an analysis of environmental and system factors that contribute to risky behavioral trends, which is done with mature BBS efforts.

In addition to helping shape how people consider human error, HOP provides effective tools like prejob briefings, 2-minute analyses, self and peer checks, time-outs, and postjob briefings for BBS users. These tools help employees troubleshoot error-likely situations in the environment before, during and after task completion.

FIGURE 3

BBS CHECKLIST WITH SYSTEM & CONDITION FACTORS INCLUDED

Category	Safe	At-Risk	Comments
1) Tools and equipment a) All necessary tools and equipment needed for the job are available. b) Tools and equipment are in good working order. c) Correct tools and equipment are being used for the task. d) Tools and equipment are being used properly.			
•What tool and equipment issues need to be addressed? •Do problems exist with current tools and equipment? •What additional tools/equipment are needed for the job? •Do SOPs need to be revised regarding tools/equipment use?			

Using HOP to Improve BBS Tools

Discussing error-likely situations in prejob briefings and 2-minute analyses provides valuable information for observers completing BBS checklists later in the day. Also, BBS checklists have more impact if they are reviewed during time-outs and postjob briefings. Essentially, HOP offers additional opportunities to use information collected during BBS observations. Also, these standalone tools should be incorporated in a mature safety program if they are not already being used.

In addition, HOP elements should be added to behavioral observation checklists to include system, policy and facility factors. This makes observation checklists more holistic and complete. For example, a typical BBS checklist

includes the behavior "tool and equipment use" with subcategories including "employee selected the right tool for the job," "tools are in good condition" and "tools were used properly." Adding system/condition factors as shown in Figure 3 would strengthen this category.

Expanding behavioral checklists to include system and condition factors should 1) make BBS cards more complete and effective; and 2) make it more appealing for HOP practitioners to use.

Benefits of BBS for HOP Users

U.S. Department of Energy's (U.S. DOE, 2009) human performance improvement handbook states:

> Behavior is an observable act that can be seen and heard, and it can be measured. Consistent behavior is necessary for consistent results. . . . Sometimes people will make errors despite their best efforts. Therefore, behavior and its causes are extremely valuable as the signal for improvement efforts to anticipate, prevent, catch or recover from errors. (p. 13)
>
> Field monitoring of individual performance is an excellent technique for gathering information about how well the organization supports job-site performance. The purpose of an observation is not to criticize or to judge people, but to review the quality and effectiveness of work preparation, policies and work practices, as well as their implementation. . . . Results should be recorded for trending purposes to help identify strengths and weaknesses. Behavior observations can flush out organizational weaknesses that may not be obvious by other means, especially when this data is included with other information. (p. 18)

This clearly reflects the position that behavior observation and feedback helps reduce human error. HOP users should incorporate BBS principles and tools to strengthen their efforts to improve the system and reduce error. BBS provides a scientific method for identifying, predicting and systematically reducing at-risk behavior and human error that has a history of long-term success in a wide variety of settings (Cooper, 2003; Daniels, 1989; Fellner & Sulzer-Azaroff, 1984; Williams & Geller, 2000; Zohar, Cohen & Azar, 1980). BBS identifies critical safe and at-risk behaviors in the environment, then moves on to help employees analyze why risky behaviors occurred. This drives organizational personnel to identify the system-level factors that influence behavior so they can be improved.

Organizational systems not only include equipment, machines and processes, but also people and their behaviors. As Agnew (2018) notes, "Human error is behavior. . . . Preventing or minimizing error requires understanding behavior." Understanding the full range of factors contributing to human error and even intentional at-risk behavior enables the most comprehensive approach to improving safety performance. Note that people sometimes knowingly take risks on the job (e.g., not following lockout/tagout procedures, failing to use safety harness at height) just as they do off the job (e.g., standing on a chair instead of a ladder to change a light bulb, speeding on the highway, smoking). HOP practitioners should not discount or minimize the role these choices play in understanding at-risk behavior. It is important to consider these choices, along with environment and organizational systems, to properly analyze all the critical factors to understand and improve at-risk behavior and human error.

An effective BBS process uses the identification of any at-risk behavior, whether it resulted from unintentional error or from choice, as the starting point for further analysis. Even if the at-risk behavior was a choice, proper analysis of the behavior considers the reasons for such a choice. These reasons often include system influences such as excessive production pressure, unavailable tools or equipment, insufficient manpower, ineffective training, and confusing or incomplete procedures.

Behavioral observations can be a critical first step in identifying risky behavioral trends (many reflecting normalized deviation) that most need improvement. Without the upstream identification of at-risk behaviors from BBS, these system inadequacies may never be identified, or they might be revealed only after a close call or injury.

Optimal systems always include a means of both error identification and error correction. Behavioral observations, among other measures, provide an effective and proactive means of error identification. Coworker-to-coworker safety-related feedback following observations provides a means of immediate error correction before any potential injury occurs. Also, analyzing cumulative observation data provides a tool for error identification and corrections in a systematic, area-specific and ongoing manner. This includes comments on the BBS checklists. For example, if several people report that automated lifts are needed in an area with identified bending and lifting concerns, OSH personnel have additional information and evidence to make these changes. So, BBS observations help improve the system to prevent error. Also, BBS observation and feedback during ongoing work can help prevent injuries and fatalities in the moment, even before latent errors present in the system have been identified and corrected.

In addition to augmenting efforts to improve the system, BBS principles and tools helps HOP in encouraging coworker-to-coworker feedback for safety. Employees can prevent injuries and fatalities by speaking up instead of choosing to look the other way when they see risky behaviors. Behavior observation and feedback is designed to increase the quality and quantity of peer-to-peer feedback for safety.

Using BBS to Improve HOP Tools

BBS checklists provide specific, behavioral data that is informative and applicable for HOP tools such as prejob briefings and 2-minute analyses. This includes reviewing past data, trends and comments from the BBS checklists to identify potential error-likely situations.

Using BBS checklists with time-outs should help employees detail specifically (and behaviorally) the problems that occurred during the task, and identify specific steps that must be taken in the future to prevent similar problems. BBS data should also be used with postjob briefings to better determine what went well, what needs improvement and what changes must occur.

Finally, HOP practitioners can benefit from other BBS elements previously addressed. This includes 1) detailing key leadership behaviors to support safety; 2) providing specific guidelines to improve safety management systems; 3) understanding how person-states can be influenced to increase involvement in safety activities, including peer-to-peer safety feedback; and 4) providing comprehensive guidelines on improving communication skills for safety.

Conclusion

Overall, both HOP and BBS offer powerful principles and practical applications to improve safety systems, culture and performance. Unfortunately, these approaches are sometimes presented as incongruous or competing. Agnew (2018) notes, "When it comes to HOP and BBS, it's not an either/or. Let's keep working together, building on what we collectively have learned." Mathis (2017) succinctly states, "If these two programs quit debating and start cooperating, the result would be a much more holistic approach."

Organizational leaders should use the best elements of both philosophies in an integrated fashion to help prevent injuries and fatalities. Also, companies using BBS should benefit from HOP applications, and vice-versa. These approaches are complementary, not contradictory, in this pursuit. **PSJ**

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