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Behaviors, Values, and Positive Reinforcement: Developing a Strong Workplace Safety Culture - 22166

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ABSTRACT

The U.S. Department of Labor reported that in 2019 alone there were 2.8 million nonfatal workplace injuries and illnesses, as well as over 5,000 work-related fatalities recorded in the United States. That same year, the U.S. Department of Energy (DOE) reported 4,413 workdays lost, transferred, or restricted due to occupational injuries and illnesses across the Office of Environmental Management (EM) complex.

Various accident and event casual studies have shown multiple underlying factors contribute towards these workplace accidents. That said, Herbert W. Heinrich, author of the 1931 text *Industrial Accident Prevention: A Scientific Approach*, identified unsafe behaviors by employees as the leading root cause to most workplace incidents - attributing nearly 90% of accidents to worker behaviors. While much of Heinrich's "Domino Theory" has been replaced by more modern scholarship and his original findings are somewhat controversial, unsafe workplace behaviors are still considered to make up a significant share of event precursors by contemporary accident causation models.

During the late 1990's, the DOE developed and published an Integrated Safety Management (ISM) Policy with the purpose of lessening the frequency and severity of workplace accidents. The objective of the ISM system is to encourage the use of processes and initiatives aimed at improving organizational and individual performance. This is done by integrating safety into management and work practices at all levels, addressing all types of work and all types of hazards to ensure safety for workers, the public, and the environment.

Savannah River Remediation LLC (SRR), a prime contractor at the DOE's Savannah River Site in South Carolina, has recently implemented two such initiatives for improving organizational and individual performance: Safety-Talks Achieve Results (STAR) with Four Keys of Safety and Reinforcement for Achieving Values and Expectations (RAVE). The STAR program is designed to focus on specific work behaviors and actions that are determined to present the greatest risk for injury.

The RAVE program is centered around a web and mobile application that allows employees at all levels to nominate another employee for work that exemplifies one of SRR's Core Values: Safety, Integrity, Ownership, Teamwork, and Continuous Improvement. By focusing on the principles of immediate, frequent, specific, and face-to-face recognition, the RAVE program works to reinforce SRR's Core Values by rewarding employees for demonstrating positive behaviors, actions, and attitudes.

Together these programs have been implemented as part of an even broader effort to promote a strong Safety Culture and have helped SRR to experience reportable injury rates significantly lower than those reported for comparable industries across the United States. While many contractors across the EM complex utilize similar programs, the injury statistics published by the Departments of Labor and Energy show that opportunities remain to refine and improve workplace safety practices.

To assist with those efforts, this paper provides a brief review of literature regarding workplace safety programs, with a focus on Behavioral-Based Safety and Nuclear Safety Cultural approaches. A discussion of the programs implemented at SRR and their impacts follows. Lastly, this paper provides a series of best practices for managers developing their own workplace safety programs.

INTRODUCTION

During the 2019 calendar year, the U.S. Department of Labor's Bureau of Labor Statistics received 2.8 million reports of nonfatal workplace injuries and illnesses, as well as over 5,000 fatal work injuries from across the nation [1, 2]. The National Safety Council, America's leading nonprofit safety advocate, estimates that these workplace injuries resulted in a cost to society of approximately $171 billion USD [3].

During that same year, the Department of Energy's Office of Environmental Management (DOE-EM) program office reported a Total Recordable Case (TRC) rate of 0.5 per 200,000 workhours (or approximately 100 Full-Time Employee years) among its contractors. These injury events resulted in 1,700 workdays lost and over 2,600 days transferred or restricted [4].

Figure 1 shows the 2018 and 2019 workplace injury rates for the ten private-industry occupations with the highest number of injury cases involving days away from work in the United States. For comparison, the Days Away, Restricted, or on Job Transfer (DART) case rate experienced by DOE-EM across its Federal and contractor workforces is also shown.

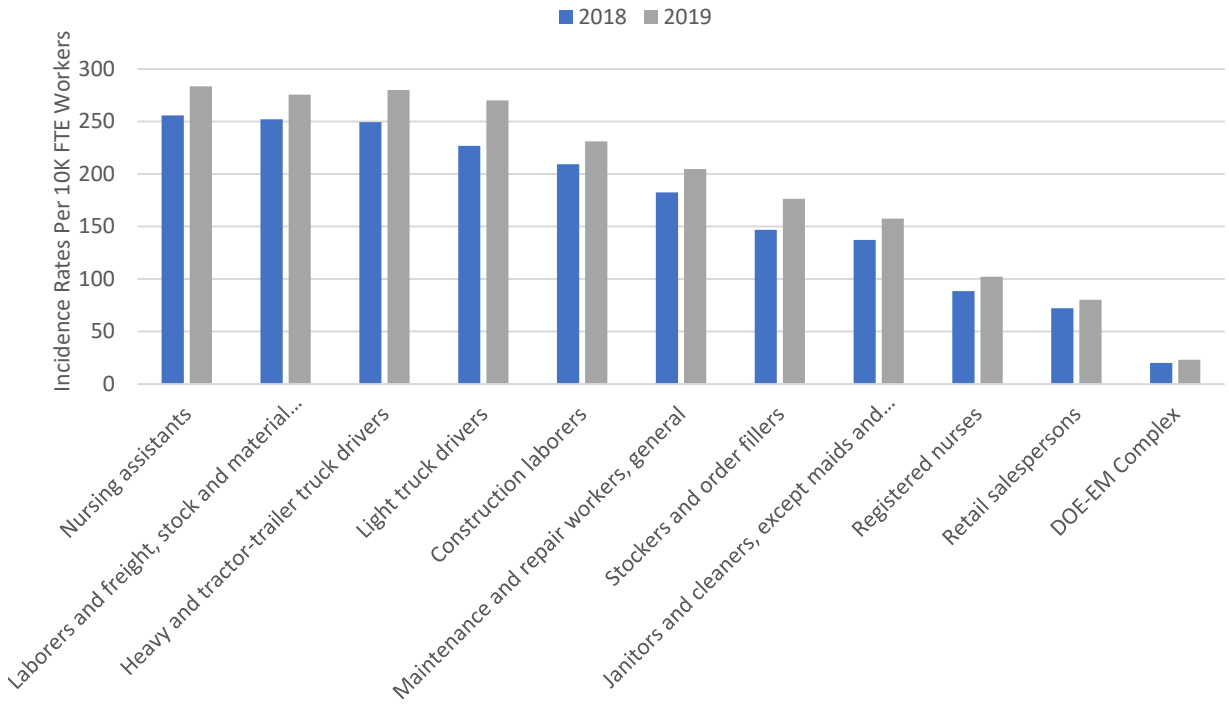

Fig. 1. Injury rates involving days away from work for select occupations in private industry and the DOE-EM complex, 2018-2019 [1, 4].

It's clear from these data that workplace injuries are occurring and result in serious consequences – both in private industry and throughout the DOE complex. All employers should strive to safeguard their workforce, so what can be done to reduce workplace accident and injury rates?

Early workplace safety pioneer Herbert W. Heinrich developed his "Domino Model of Accident Causation" to explain how a series of linear factors and events can ultimately result in a workplace injury [5]. According to Heinrich's work, 2% of injury-causing accidents are unpreventable, 10% can be attributed to unsafe conditions, and the remaining 88% are caused by unsafe behaviors. Over the decades since Heinrich first published his work, workplace safety scholarship has moved away from linear causation factors and

developed an understanding that "complex systems fail in complex ways" [e.g., 6, 7, 8, 9]. Even so, unsafe behavior remains one of the more prevalent research topics in safety science. It is well understood that the behaviors exhibited by workers in their daily jobs have direct and immediate effects on health and safety [10].

Contemporary academics focus on addressing and modifying behaviors that have the potential to result in accidents and injuries through a combination of two convergent methods: (1) Establishing a safety-conscious culture and (2) implementing Behavior-Based Safety (BBS) programs. In general, safety cultural approaches emphasize the "fundamental importance of the organization's safety culture and how it shapes and influences safety behaviors and safety program effectiveness" while BBS programs focus on the "identification and modification of critical safety behaviors and emphasize how such behaviors are linked to workplace injuries and losses" [11].

DESCRIPTION OF METHODS

Organizational Culture and Core Values

An organization's culture is a representation of its members' shared assumptions, values, and beliefs [12]. The term "Safety Culture" is often cited when organizations focus on developing and strengthening shared values and beliefs related to safety. The DOE's Integrated Safety Management System (ISMS) Guide defines Safety Culture as "an organization's values and behaviors modeled by its leaders and internalized by its members, which serve to make the safe performance of work the overriding priority to protect the workers, public, and the environment" [13].

The bedrock of an organization's culture is often a set of published value statements or self-identified Core Values. Just as individuals have values that comprise what is most important to them, so do organizations – an organizational "bottom line" that reflects "what really counts" [14]. The importance of identifying safety as a Core Value to promote a strong safety culture is already well recognized by DOE-EM contractors. Browsing just a handful of contractors' public websites demonstrates that for those who identify the critical components of their cultural values, "safety" is rarely left off the list:

- *Battelle Energy Alliance*: Excellence, Inclusivity, Integrity, Ownership, Teamwork, **Safety** [15]
- *North Wind*: **Safety**, Commitment to our People, Honesty/Reliability, Creativity [16]
- *PermaFix Environmental Services*: Integrity, **Safety**, Commitment to Our People, Innovation, Value Added, Commitment to our Customers, Commitment to Our Communities [17]
- *Savannah River Nuclear Solutions*: **Safety**, Teamwork, Integrity, Customer Satisfaction [18]
- *Savannah River Remediation*: **Safety**, Teamwork, Integrity, Ownership, Continuous Improvement [19]
- *Washington River Protection Solutions*: **Safe**, Innovative, Reliable, Technically Inquisitive, Integrity [20]

These Core Values are more than slogans to stitch onto clothing or append to the bottom of correspondence. Thomas Watson, Jr., son of IBM's founder, their second president, and one of *TIME* [a] magazine's most influential people of the 20th century, wrote "any organization, in order to survive and achieve success, must have a sound set of beliefs on which it premises all its policies and actions… that the most important single factor in corporate success is faithful adherence to those beliefs" [21].

Academic research supports Mr. Watson's beliefs as evidenced by a study of companies making up Standard and Poor's Top 500 (S&P 500). Specifically, it was found that for firms identifying and valuing

[a] *TIME is a registered trademark of TIME USA, LLC.*

integrity as a Core Value, the greater the sense of integrity workers perceived from their managers, the stronger the firm's performance – including productivity, profitability, and higher job attractiveness. Conversely, the same study found no significant correlation between the frequency and prominence of specific Core Values to any measure of short- or long-term performance [22].

This goes to support Mr. Watson's belief that organizations must take steps beyond simply identifying their Core Values and must "faithfully adhere to their beliefs" for those Core Values to have tangible, measurable impacts. When implemented properly, these Core Values become "shared values", which in turn shape corporate culture [14].

Behavior-Based Safety

When it comes to promoting workplace safety, cultural approaches seek to produce changes at the leadership level by encouraging organizational values and diffusing these changes throughout the organization (a "Top-down" approach). On the other hand, BBS programs are "Bottom-up" approaches by driving changes in critical front-line safety behaviors to produce positive effects. These changes then diffuse upward in the organization and contribute to changing the organization's safety culture [11].

Traditional BBS elements include baseline observations, feedback, goal setting, and interventions [10]. While the concepts of establishing a baseline, providing feedback, and setting goals are common practices in a business environment, one of the most important organizational tools for improving worker willingness to enact safety behaviors is a reward distribution system [23, 24]. Rewards used as an incentive to encourage safety behaviors can be both financial (e.g., money or prizes) and nonfinancial (e.g., positive appraisal, recognition, or positive feedback). Multiple reviews of professional occupational safety literature find that when used in conjunction with training and feedback, positive reinforcement through safety incentives is associated with several positive outcomes [25, 26, 27, 28].

While there is no better solution for reducing worker injuries than eliminating safety hazards and risks through direct engineering or administrative controls, research literature on BBS programs since the 1970s provide ample evidence that BBS programs can be effective accident prevention strategies [29]. A review of academic literature on the effectiveness of various BBS programs identified 33 studies that reported data on changes in incidence rates following BBS implementation – 32 of which reported reductions in injuries. These 33 studies involved numbers of participants ranging from five to almost 40,000 across settings that included construction sites, grocery distributors, electrical and gas utilities, manufacturing plants, mines, police departments, railroads, shipyards and transit systems. And although most studies were conducted in the U.S., some involved sites in Chile, Cuba, Finland, Hong Kong, Spain and the U.K [30].

Positive success of BBS programs aside, it is important to recognize that unsafe behaviors often have deeper underlying causes or contributing factors that lie within the work/organization. Too great a focus on unsafe behaviors alone can lead to "victim-blaming", and BBS programs should be managed as an integral part of a much larger, holistic workplace safety strategy – including hazard controls, training, and communication.

DISCUSSION - ESTABLISHING A STRONG SAFETY CULTURE AT SAVANNAH RIVER REMEDIATION

In June of 2019, the leadership team at Savannah River Remediation LLC (SRR) [b], a prime contractor at the DOE's Savannah River Site in South Carolina, announced a new set of Core Values and their associated expectations (Figure 2). While safety has always been a priority at SRR, the most recent generation of Core Values were developed to promote consistent, clear messaging of expectations to employees. At the time,

[b] *The DOE contract held by Savannah River Remediation has been superseded by one awarded to Savannah River Mission Completion, LLC. Refences to Savannah River Remediation/SRR were correct at the time of writing.*

Tom Foster, then-SRR President, stated that "SRR Senior Leadership recently got together to discuss our company values. What jumped out immediately is that we haven't been consistent in how we have referred to them and communicated them… Even though they were all similar, we realized we needed to get a consistent set that everyone in the company can identify with and use to keep ourselves aligned" [31].

To promote and reinforce these renewed Core Values of Safety, Teamwork, Integrity, Ownership, and Continuous Improvement, a suite of communications and employee-led programs and initiatives were launched over the subsequent 18 months. These programs include the "Reinforcement for Achieving Values and Expectations" (RAVE) application, the "Safety-Talks Achieve Results" (STAR) program with the Four Keys of Safety, and the awarding of Success Posters.

Fig. 2. SRR's 2021 "Values and Expectations" poster.

Reinforcement for Achieving Values and Expectations (RAVE)

The company's flagship values program, RAVE, is a positive reinforcement tool for SRR employees to recognize their coworkers for displaying SRR's Core Values and Expectations. The RAVE program is implemented via a web and mobile application that allows any SRR employee to nominate another employee for exemplary performance. Using the RAVE application, the nominator submits the recipient's name, the Core Values/Expectations demonstrated, and a short description of the positive behavior. An automatic email or text then notifies the nominator's manager to review and approve the submission. Upon approval, the nominator is notified that they may pick up a gift card (usually for $25) and award certificate to present to their coworker.

The goal is to make the RAVE process simple, effective, and easily accessible for any employee to participate in. The importance of employees' participation has been recognized as a fundamental aspect of safety performance in organizational settings [24].

As described by Phil Breidenbach, SRR President and Project Manager, "the whole idea behind RAVE is to recognize peers and coworkers as champions, celebrating and thanking them for a job well done" [32]. There are four specific aspects of RAVE that make this purpose successful:

- *Immediate*: recognize the behavior as close to the time of occurrence as possible.
- *Frequent*: the more reinforcement is given, the better.
- *Specific*: the receiver gets to know exactly what is being reinforced.
- *Face-to-Face:* a conversation is more memorable than an email.

Due to the automated nature of the RAVE application, the mean time from when a nomination is submitted to when the nominee receives the gift card is only 41 minutes. And in addition to streamlined ease-of-use, the RAVE application also allows for nomination tracking and trending via Microsoft's Power BI [c] business analytics software. SRR's senior management team is able to track which individuals and organizations are giving and receiving awards, the total number of awards given over time, and which Core Values are most recognized (Figure 3). "Safety" was identified as an exhibited Core Value over 2500 times across all RAVEs awarded at SRR. The most commonly cited Core Value is "Teamwork", with over 5100 citations.

[c] *Microsoft, Power BI are registered trademarks of the Microsoft group of companies.* https://www.microsoft.com/

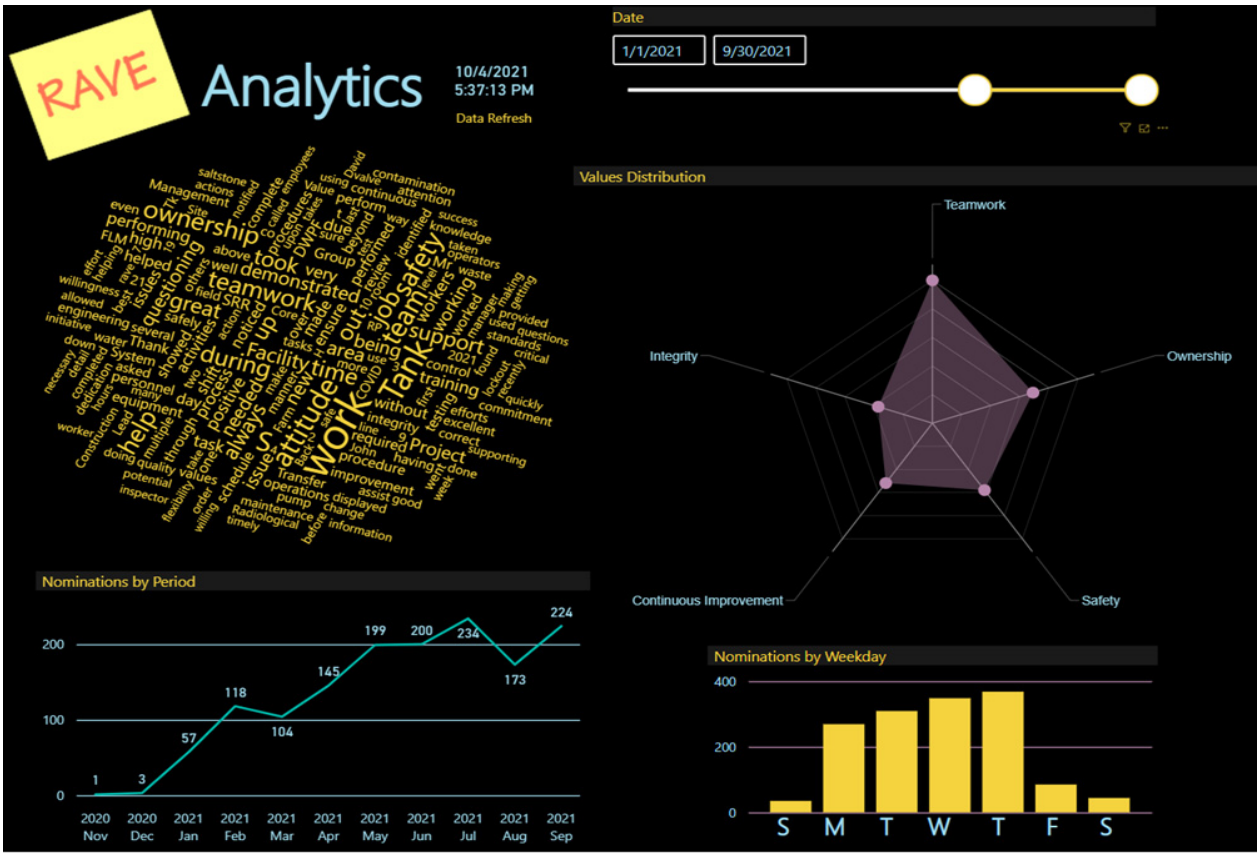

Fig. 3. Examples of data available for SRR's RAVE Application. Information includes number of awards given over time, most common values recognized, and awards given per organization.

These data have allowed SRR to recognize that a chief goal of RAVE, namely that it be a peer-driven program used between colleagues, has not only been met, but exceeded. RAVE was created to provide everyone, at all levels of the organization, an opportunity to recognize the contributions of their coworkers. Figure 4 shows that 70% of RAVE Award nominations received so far have been submitted by team leads or employees outside of a management position. This is critical to the success of RAVE as it allows an opportunity for employees who work outside of regular exposure to middle- or upper-level management to be recognized for their efforts.

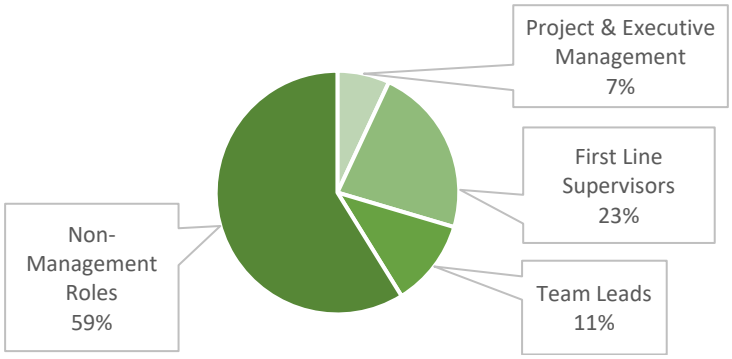

Fig. 4. Percent of RAVE Award nominations by nominator's management level.

RAVE was first tested by SRR's approximately 350-employee engineering organization, and more than 300 nominations were submitted during the eight-month pilot period. Since then, SRR has implemented the RAVE program company-wide and is averaging over 100 RAVE nominations a month across its approximately 2,600-employee workforce.

SRR's RAVE application has received positive feedback across its workforce, management teams, and from its DOE customer. Additionally, Amentum (an SRR parent company) honored the RAVE development team with Amentum's 2021 Athlon Team Award for the "Value our People" category.

Safety-Talks Achieve Results (STAR)

In addition to the RAVE application, SRR also revamped its BBS field program and launched "STAR" – Safety-Talks Achieve Results. STAR is SRR's primary tool for employee engagement and feedback for safety-related issues. STAR is a program designed to reinforce the importance of conversations on safety between coworkers and between frontline employees and management at all levels.

One of the primary drivers for developing a new BBS program at SRR was simplification and enhancing ease-of-use. SRR's previous BBS program provided a list of over 160 individual behaviors for employees to observe and highlight. Of these behaviors, only 40 were documented consistently. Rather than casting a broad net over a swath of behaviors, the new STAR program was designed by SRR's Safety Leadership Teams to focus on specific work behaviors or actions that were determined to present the greatest risk for injury – the "Four Keys": (1) Slips, Trips, and Falls Awareness, (2) Safe Tool & Equipment Use, (3) Seatbelt Use, and (4) Safe Lifting, Pulling, or Pushing.

Each of these Four Keys represents a focused work action or issue that is important for worker safety. The goal of establishing just four focus areas was to direct the greatest energy and resources towards the most common injuries and at-risk behaviors occurring across SRR. By targeting the most frequent unwanted events, SRR has the greatest chance of preventing the most injuries.

A primary tool of the STAR program is the "Safety Talks" themselves. Led by Safety Mentors, Safety Talks are conversations focused on having an interactive, open, and productive discussion between workers on safety matters. The Safety Mentors ask workers about the Four Keys and their importance to the work at hand. Information and feedback collected during these Safety Talks is then used to determine worker knowledge of these important work actions. The critical concept being pursued by the STAR program is that when key actions are not committed to memory, they will not become work habits.

Any employee can volunteer to receive training to become a designated Safety Mentor. Volunteers undergo introductory training covering Safety Mentor responsibilities, techniques on how to perform Safety Talks, and various program terms and take-aways. Once the training is completed, the employees can then participate in on-the-job training by shadowing experienced Safety Mentors during the performance of Safety Talks in the field.

Since the program's launch, 48 employees have undergone Safety Mentor training and have logged over 8,250 observations. At the end of every month the data analyst for each of SRR's Safety Leadership Teams will review the observations and make note of any positive and negative trends. The STAR program utilizes the Safety Leadership Teams to help voice issues and concerns in the field. These same concerns drive periodic revisions to SRR's Four Keys to Safety – ensuring that employees are focused on the most pressing issues being seen in the field (Figure 5).

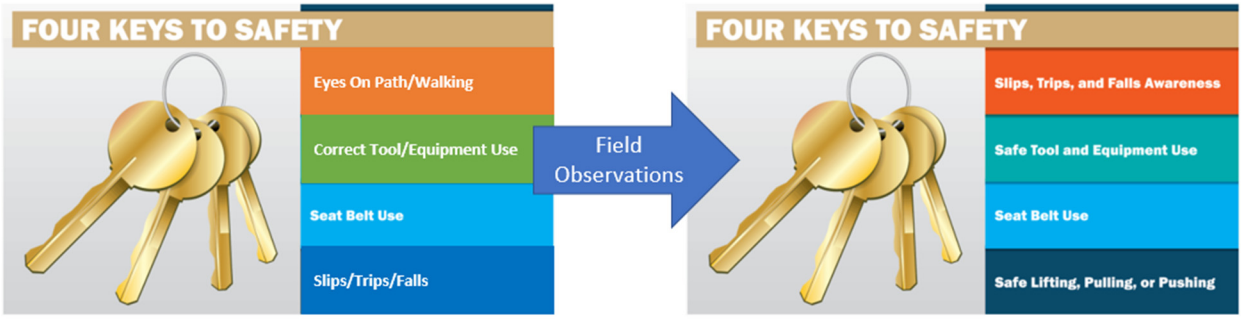

Fig. 5. SRR's Four Keys To Safety – focus areas for the Safety Talks Achieve Results program. These keys are reviewed on a periodic basis and revised based on data collected during Safety Talks and field observations.

Success Posters

An additional part of SRR's efforts to highlight Core Values in action are the development and presentation of "Success Posters". While the RAVE program focuses on recognizing individuals who demonstrate the company's expectations, Success Posters are awarded to groups and teams. While not as formalized as the RAVE process, Success Posters are awarded in a similar way – an outstanding project, event, or achievement is brought to the attention of SRR's Public Affairs and Project Communications group, who then develop a poster that highlights the SRR employees and their accomplishment. Special focus is given towards teams of employees who have shown particular dedication to the company's mission and Core Values. Some example posters that have been awarded are shown in Figure 6.

Fig. 6. Examples of three Success Posters awarded for accomplishments at SRR.

Since the Success Poster program began in October 2020, 41 posters have been awarded to workgroups across SRR. Once awarded. the posters are used in corporate promotional material and displayed in SRR facilities (Figure 7) to further foster a culture of teamwork, recognition of achievement, and as a reminder to employees of their past successes.

(a) (b)

Fig. 7. (a) A Success Poster being presented to SRR employees by SRR President and Project Manager Phil Breidenbach, and (b) Success Posters displayed in a conference room at SRR.

SRR's Safety Culture Success

These programs, along with the many other measures that SRR's leadership team takes to ensure safety is at the forefront of every employees' mind, have collectively fostered a superior safety culture at SRR. Company leadership recently enlisted Oak Ridge Associated Universities (ORAU) to conduct an independent evaluation of safety culture perceptions and attitudes of employees at SRR and provide recommendations to management on how SRR can advance its safety culture [33]. The evaluation was conducted during April and May 2021, and found that "overall, perceptions among the SRR workforce were consistently higher compared to those of both the DOE reference population and the DOE EM sites" (Figure 8).

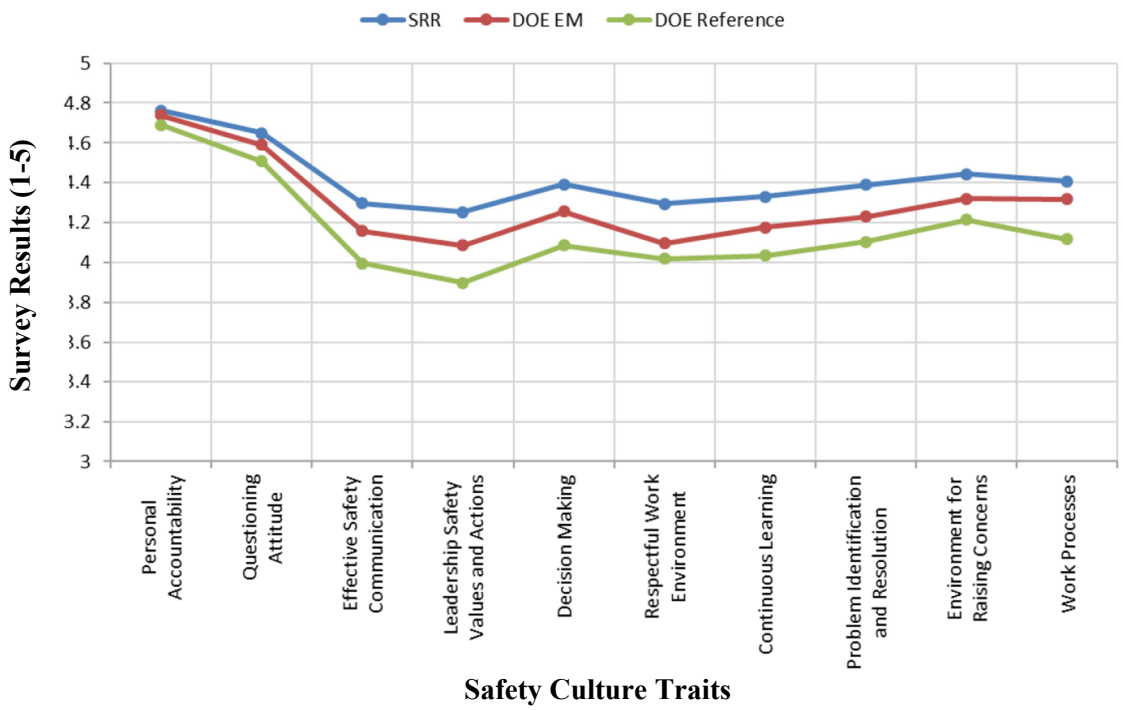

Fig. 8. Comparison of SRR Safety Culture results with DOE and DOE-EM reference populations [33].

The evaluation found that most of the employees who responded to the evaluation's survey believed SRR has a strong, deeply ingrained safety culture where it is evident that leaders are committed to the safety of employees, the general public, and the nation. Additionally, many respondents "enthusiastically and passionately" commented about the organization's "impressive dedication" to safety and how "safety is always at the forefront". Perhaps even most importantly, employees often noted the desire to mirror that dedication by extending their safety mindset and behaviors to their lives off-site to protect their families and community [33].

Ultimately, the ORAU evaluation found that employees at SRR believe that their "leaders' demonstrated commitment to safety translates to their employees feeling proud to work at the site, as well as valued, respected, cared for, and assured that they will return home safely".

The survey data collected during the 2021 evaluation indicated improved safety culture trait scores compared to previous safety surveys conducted at SRR in 2014 and 2017. The evaluation report states that "recent efforts by the SRR leadership team to expand safety communication avenues and more effectively recognize employees as part of safety culture activities were noted as positive steps to improving the culture". These efforts include, of course, the RAVE program, the STAR program, and SRR's Success Posters.

These conclusions drawn during the safety culture evaluation performed by ORAU are backed-up by real-world data. SRR's most recent DOE Voluntary Protection Program (VPP) triennial onsite review found that SRR achieves accident and injury rates that are 90% or more below comparison industries [34]. The VPP review also identified that "SRR managers are committed to the principles of Integrated Safety Management and Nuclear Safety Culture, and recognize these principles as enablers for mission success. SRR has a comprehensive and cohesive set of policies and procedures that encourage safety and health excellence".

Perhaps most importantly, the VPP review committee found that SRR's managers "establish appropriate expectations, provide resources, and create an environment that values and rewards accomplishing the mission safely, without pressuring workers to take risks to meet a schedule. Workers understand the hazards they face, exercise caution in all work tasks, and pause or stop work when conditions deviate from expectations" [34].

CONCLUSION

Recognizing the value of safety is a critical component to the reduction of workplace accidents and injuries. But having a list of values is not enough to make a difference in the workplace – companies must have companion programs and initiatives in place to reinforce those values on a daily basis. Companies with strong cultures and shared values see higher degrees of desired worker behaviors than companies without them [14]. When it comes to workplace safety and reducing workplace accidents and injuries, companies must make the effort to reinforce safety as part of their culture. Steps must be taken at all levels of leadership to encourage safe behaviors and a strong safety culture. Almost a hundred years ago, Heinrich wrote that it was time to "stop talking, roll up the sleeves, and go to work" [5].

Thankfully there are many resources and success stories for members of management looking to foster strong safety cultures in their own workplaces. For example, the DOE's ISMS guide provides focus areas and associated attributes that are useful for attaining a strong safety culture that supports both safety and mission performance [13]. And while there are many ways to promote these key workplace attributes, there are those methods that have been found to be most effective, as well as those that can be detrimental to workplace safety. For example, it's been seen that incentive systems can actually lead to increased frequency of unsafe behaviors by employees when improperly implemented – specifically when presented criteria is ambiguous to workers [23]. Additionally, and perhaps most importantly, "safety incentive programs will probably fail in a work setting where employees do not truly believe their organization values their contributions and cares about their well-being" [35].

A review of safety programs in the construction industry has led to the conclusion that the success of an incentive/penalty system is dependent on the following six main factors [36]:

(1) Incentive distribution method
(2) Proper labor training
(3) Special attention to risky situations
(4) Role of safety committee and sub-contractors
(5) Specialized works and equipment safety
(6) The proper form of incentive and penalty

SRR has addressed each of these critical items through the implementation of the RAVE and STAR programs, as well as other day-to-day systems and processes, such as the awarding and displaying of Success Posters. Together these programs have established an effective safety culture and a safety-conscious work environment. The ORAU safety culture evaluation summarized that "continual safety communication is one of the major contributing factors to the overall sense of a strong safety culture at SRR… Employees indicated that they receive constant reminders every day about best safety practices, values, and expectations".

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