

DISPELLING MYTHS AND MISCONCEPTIONS TO IMPLEMENT A SAFETY CULTURE

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ABSTRACT

Industrial accidents are typically reported in terms of technological malfunctions, ignoring the human element in accident causation. However, over two-thirds of all accidents are attributable to human and organizational factors (e.g., planning, written procedures, job factors, training, communication, and teamwork), thereby affecting risk perception, behavior and attitudes. This paper reviews the development of WESKEM, LLC's Environmental, Safety, and Health (ES&H) Program that addresses human and organizational factors from a top-down, bottom-up approach. This approach is derived from the Department of Energy's Integrated Safety Management System. As a result, dispelling common myths and misconceptions about safety, while empowering employees to "STOP work" if necessary, have contributed to reducing an unusually high number of vehicle, ergonomic and slip/trip/fall incidents successfully. Furthermore, the safety culture that has developed within WESKEM, LLC's workforce consists of three common characteristics: 1) all employees hold safety as a value; 2) each individual feels responsible for the safety of their co-workers as well as themselves; and 3) each individual is willing and able to "go beyond the call of duty" on behalf of the safety of others. WESKEM, LLC as a company, upholds the safety culture and continues to enhance its existing ES&H program by incorporating employee feedback and lessons learned collected from other high-stress industries, thereby protecting its most vital resource - the employees.

The success of this program is evident by reduced accident and injury rates, as well as the number of safe work hours accrued while performing hands-on field activities. WESKEM, LLC (Paducah + Oak Ridge) achieved over 800,000 safe work hours through August 2002. WESKEM-Paducah has achieved over 665,000 safe work hours without a recordable injury or lost workday case since it started operations on February 28, 2000.

INTRODUCTION

Although waste management organizations are faced with the growing need to process voluminous amounts of wastes containing hazardous chemicals, heavy metals, radioactive materials, asbestos, and polychlorinated biphenyls, competition is causing a sea of change to ensure that processing these wastes are performed in a safe, timely and cost-effective manner. Since the formation of the Occupational Safety and Health Administration (OSHA) in the early 1970s and the promulgation of safety standards, organizations are operating safely and efficiently today by incorporating engineering, administrative and personal protective equipment controls. However, employees and their supervisors are typically confronting longer work hours, are often being asked to take on multiple functions or maintain facility systems under rapid outage schedules sometimes with smaller staffing levels, while continuing to meet performance-based milestones. With smaller, start-up companies entering the waste management industry to meet these specialized demands, there is a perception that safety resources and employees are being lost to retirement and that safety commitments have diminished. Furthermore, power plant accidents have triggered new concerns in recent years about hazard notification, monitoring performance, and maintaining a safe workplace.

For example, an explosion at the Longford gas production and processing plant in Victoria, Australia, occurred on September 25, 1998, and was followed by an embattled three-year court case. Hot, lean oil at 230°C (446°F) was re-introduced into a chilled vessel where the temperature had fallen to -48°C (-54°F). The temperature difference created stress causing a brittle fracture in the vessel causing a rupture that released hydrocarbon vapor and liquid. The vapor traveled towards the fired heaters where it ignited causing an explosion and fire. Two employees were killed and eight employees were seriously injured. The explosion and fire cut gas supplies to about one million homes and businesses in Victoria until October 14, 1998. Charges included failure to conduct adequate hazard identification, failure to carry out adequate risk assessment, operating the gas plant without adequate procedures relating to loss and restoration of lean oil circulation, and failure to provide the means to ensure the equipment operated at temperatures within design specifications.

In the past, these types of industrial accidents were reported in terms of technological malfunctions and the human element in accident causation tended to be ignored. Since the frequency of technological malfunctions has diminished, the role of human error has become much more obvious. Still, accident reporting systems are vulnerable to underreporting, may have incomplete records, and do not necessarily provide a complete picture of the conditions when the accident occurred. It is generally conceded that over two-thirds of all accidents are attributable to human and organizational factors (1), thereby affecting risk perception, behavior and attitudes. For example, human and organizational factors consist of:

- Planning (e.g., poor job planning and distractions are major contributors to accidents)
- Written procedures (e.g., do procedures provide enough detail to mitigate hazards?)
- Job factors (e.g., is this activity a new task?)

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- Training, skills and use of equipment (e.g., was there insufficient training and lack of skills to operate specialized equipment?)
- Communication (e.g., is the information communicated in a timely manner?)
- Teamwork and dynamics (e.g., are employees working together for the first time, is there adequate staffing for the job?)

Research in other industries (e.g., construction, transportation and mining) has demonstrated the importance of management's role in safety and employee empowerment. Essentially, the first place where safety "happens" is in the executive office with the Chief Executive Officer (CEO) or President. The last place where safety "happens" is on the front line with every employee. This paper reviews the development of WESKEM, LLC's Environmental, Safety, and Health (ES&H) Program that addresses human and organizational factors from a top-down, bottom-up approach. This approach is derived from the guiding principles and core functions found in the Department of Energy's (DOE's) Integrated Safety Management System (ISMS) (2). Furthermore, dispelling common myths and misconceptions about safety and empowering employees to "STOP work" if necessary, contributed to reducing an unusually high number of vehicle, ergonomic and slip/trip/fall incidents successfully.

THE ES&H PROGRAM

How does management know the company is safe?

Management's duty of care is to ensure that reasonable safeguards are in place to prevent violations of ES&H laws. The company must have in place an information and reporting system which provides timely, accurate information allowing management and the Board to reach informed judgments concerning both the corporation's compliance with the law and its business performance. Failure to take reasonable measures to ensure that a comprehensive system such as this is in place exposes the company to significant violations, including civil and criminal penalties. At the Board level, this can involve personal liability.

Therefore, a comprehensive ES&H compliance and auditing program has been established to address these needs. For WESKEM, LLC, elements of this program consist of:

- **An Environmental, Safety, and Health Policy Statement** - *The WESKEM, LLC Headquarters' Environmental, Safety, and Health (ES&H) Program is established to be proactive in assessing current ES&H programs and setting strategies for years ahead. Emphasis is directed to continuous compliance, continual improvement, and pollution prevention strategies. It is essential that ES&H needs be considered starting points to work execution. WESKEM utilizes integrated ES&H management systems to implement its Headquarters goal for Zero Accidents involving personnel and the environment. Regulators and industry are learning that integrated ES&H management systems provide a positive approach to compliance assurance and elevate opportunities for performance improvement. For these reasons, WESKEM embraces the key elements¹ common to many strong ES&H management systems as standard work practice for every job.*

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¹The “key elements” mentioned in the policy statement refer to the elements discussed in this paper - an organization chart, the planning process, implementation, records and documentation, checking, and on-going reviews.

Since WESKEM, LLC’s mission is to conduct its waste management activities in a manner that protects human health and the environment, top management communicates organizational requirements to all personnel, contractors, and additional interested parties (e.g., regulators, insurers, clients, citizens). For example:

- A commitment to ‘0’ accidents and ‘0’ releases.
- A commitment to achieving pollution reduction goals and continual improvement targets.
- Communicating ES&H awareness and policy to all personnel.
- Seeking performance improvement input from stakeholders.

This policy statement and noted requirements have the support of top management and is disseminated throughout the company, committing them to comply with all applicable laws and regulations. Furthermore, a high-level commitment such as this, signed by the President, sends a powerful message that the organization takes environmental concerns seriously. WESKEM, LLC’s top management operates its projects in a manner consistent with controlling ES&H requirements (e.g., DOE Orders and Policies, Occupational Safety and Health Act, state and local environmental regulations, prescribed plans, permits, applicable standards, and procedures).

- **An Organization Chart**

WESKEM, LLC’s organization chart outlines clear assignments of responsibility and accountability. Managers and supervisors are empowered to be safety leaders and are fully accountable for safety performance (e.g., zero injury, illness, and incident expectations) and the continual communication of hazards and hazard controls to the workforce. In addition, all work is controlled under the quality umbrella designed to meet project-specific needs and universal ES&H management system elements. All events (e.g., recordable injuries, first aids, vehicle accidents) are reported to WESKEM, LLC’s President and Safety Director within one hour of the incident.

- **The Planning Process**

The planning process elevates work to a task-specific hazard review paired with an appropriate review of potential site hazards or unique conditions using DOE’s ISM System. This system is a management tool uniform to all WESKEM, LLC projects (Figure 1) which encompasses new project reviews and planning in parallel with job safety and hazard analyses. The hazards are identified and appropriate measures are taken before work starts to ensure that personnel and equipment are adequately protected. A component of the WESKEM, LLC ES&H Program is the site-specific ES&H Plan that establishes appropriate hazard mitigation through specification of engineering, administrative, and work practice controls, including personal protective equipment

as necessary. Goals and milestones are developed and scheduled for each relevant level and function of the organization. Responsibilities and performance measures for achieving the planned goals and milestones are established in the work plan.

- **Implementation (education and training, communication, incentives)**

WESKEM LLC's ES&H Plan establishes the compliance foundation for all projects. Employees and subcontractors are held accountable to the expectations prescribed in the plan. In order to allocate resources effectively, a top-down staffing plan is provided on every project. Job descriptions are developed to assure accountability. Training and competence needs are then specified for a project prior to commencement of work. Furthermore, internal and external communication (e.g., receiving, documenting and responding, community outreach) is defined for the various levels and functions of the organization. Employee incentives are awarded (e.g., shirts, lunches) based on exceeding performance-based indicators and milestones established for the project (e.g., volume of waste shipped and "zero" accidents).

- **Records and Documentation**

WESKEM, LLC has already established and is currently maintaining procedures reflecting project operations and control of all records and documentation necessary to verify compliance. Records and documentation are appropriately maintained, accessible, periodically reviewed, updated as necessary, approved for adequacy, and available at all locations. Obsolete documents are removed from circulation or marked for unintended use. Outdated documents are retained for legal and/or other document control purposes.

- **Checking (corrective actions and emergency response)**

Compliance assurance oversight is a scheduled task in WESKEM, LLC projects. External audits, internal assessments, surveillance by line management, and inspections by frontline supervisors support the ongoing review process adopted to ensure continuous compliance performance.

In addition, WESKEM, LLC monitors and measures, on a regular basis, key characteristics of its operations and activities to track performance, such as characteristics of newly generated waste, ambient monitoring, facility inspections and conformance. Management audits, surveillances, and inspections are conducted on an established schedule. Also, corrective actions are implemented to eliminate the causes of nonconformances and are appropriate to the magnitude of the event. If off-normal events occur that impact operations, emergency preparedness and response teams are called to mitigate the hazard and prevent escalation. Those employees involved with an off-normal event participate on the accident investigation team. Obtaining employee feedback has led to an increase in productivity and safety. This team effort is used as a catalyst to maintain open communications with the Union employees.

- **On-Going Reviews**

WESKEM, LLC's top management will, on a scheduled basis, review the ES&H management system to ensure continuing suitability, adequacy and effectiveness. The ES&H representative communicates the status of project ES&H performance to management in regularly scheduled meetings.

- **Incorporating Lessons Learned From Other Industry Case Studies - When An Accident Happens, It's Too Late**

The investigation following the Longford accident, mentioned earlier in this paper, identified deficiencies in operator and supervisor training to address off-normal events. In addition to their training being inadequate, current operating procedures were not available to guide them in dealing with the encountered situation. The parent company needed to reevaluate the facility's design of critical areas to minimize the risk of another serious accident. Training programs and written procedures needed to demonstrate all identifiable hazards and mitigations under start up, shutdown, emergency shutdown, and deviations from normal operating conditions. In addition, written procedures needed to be readily available to operators enabling them to respond to off-normal process conditions. Incident reporting mechanisms needed to be in place whenever injuries to personnel or damage to plant equipment occurred.

Finally, the plant was required to show how operations are monitored and operating practices are overseen at an appropriate level. This would require an assurance that access to engineering, operations and maintenance-skilled employees would be available on site at all times. Regular and comprehensive surveillance of operating practices as well as day-to-day observations would be documented using properly kept records.

DISPELLING SAFETY MYTHS AND MISCONCEPTIONS

Although WESKEM, LLC's management was empowered to develop an ES&H program (i.e., "paper program") resolving any questions about management's duty of care, roadblocks still prevented immediate field implementation. Common myths and misconceptions about "programmatic" vs. "field operations" were clarified and eliminated before safety was accepted into the workforce culture and integrated into field operations successfully.

Myth #1 - Safety is just a "paper program." This is probably the most common perception to change while trying to integrate safety into the workforce culture. Traditionally, companies have talked about their safety "paper programs" or have implemented new safety "processes." In some cases, it is being overreactive, for example, following a dramatic rise in the number of accidents that serve as a "wake up call" for the company. Progress is achieved when safety becomes a corporate value and when changes are made in small increments based on reachable goals.

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Myth #2 - Safety is all about compliance; i.e., making sure employees follow all safety rules and regulations imposed on the company, and that employees meet the company's internal safety goals and targets. However, compliance is not what drives change in our approach to safety. What drives change is a top-down and bottom-up commitment. This commitment involving the entire employee workforce is focused on building an aggressive, zero-tolerance attitude about accidents, injuries and near misses.

Myth #3 – Safety is someone else's responsibility. Management employees must fully understand their roles as chief safety officers, extending this role throughout the work teams and into each line of business. Management must visibly support the safety effort and provide the resources and tools to implement an effective program. Invisible top-down support is worthless in creating a strong safety mindset. The leaders of the company must work hand-in-hand with employees to ensure that everyone is committed to the ultimate goal - for everyone to go home safely at the end of the day.

Misconception #1 – The only way to evaluate success is by tracking injury rates (e.g., recordable and lost workday injuries). The number of "STOP work" events and business units participating in self-assessment reviews provide positive measurement information and feedback.

Misconception #2 - Safety does not contribute to the bottom line. It is fair to say that safety may not show up on an income statement, balance sheet, or as a line item in a company's cash flow statement. However, safety is an intangible asset that can still have a significant impact on the profitability of a company. For example, financial organizations responsible for rating companies, such as commercial power utilities, are starting to incorporate safety information into their ratings. A rating is defined as a judgment of a borrower's creditworthiness based on relevant risk factors. It is expressed by a letter grade or symbol and can be thought of as a probability of default. A company is rated based on its business and financial standings. Under business, the rating is based on the utility's competitive strengths and how these strengths will improve or deteriorate in the future. From a financial position, the financial cushion allows the utility to respond to changing conditions. Therefore, if a company believes in its safety effort and has done everything possible to ensure that employees develop positive attitudes - both on the job and at home, this approach will translate into stronger results for the company over the long term, yielding greater shareholder wealth. Poor performance in safety resulting in fines would yield higher costs and thus lower the business and financial ratings. Furthermore, contract negotiations and renewals typically include reviewing the company's safety records (e.g., first aids, recordables, accidents, lost workday injuries).

PUTTING EVERYTHING TOGETHER

Once safety was accepted into the workforce culture and integrated into field operations successfully, a recovery plan was developed to target an unusually high number of: 1) vehicle; 2) ergonomic; and 3) slip, trip and fall incidents occurring in the field.

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Vehicles: Traffic and parking conditions were assessed around all facilities to help reduce the backing problem in congested areas. A defensive driving policy and procedures were developed and implemented. Afterwards, defensive driving training was conducted based on feedback from the employees.

Ergonomics: Ergonomic disorders were identified as the most significant health and safety issue contributing to days away from work. WESKEM, LLC used its existing program to evaluate and modify employee work stations, if necessary, and train employees to perform ergonomic exercises when sitting for extended periods.

Slip/trip/falls: The ultimate goal is to achieve and sustain “zero” accidents through continuous improvement with the understanding that all accidents are preventable. Therefore, root causes such as resolving field housekeeping issues, equipment storage and assigning employees to address corrective actions were identified and incorporated into the pre- and post-job briefings.

Also, every employee is issued a “STOP work” authorization card, where employees have the right and responsibility to: 1) report unsafe conditions; 2) interrupt work; or 3) stop work without fear or reprisal. The card states that:

Front: "I (employee name), have the right, obligation, and authority to stop work immediately if work jeopardizes the safety and health of my coworkers, the environment, or me, or creates a significant condition adverse to quality. Safety is the bottom line."

Back: "My 'Stop Work' authority can be exercised if ever I observe 'imminent danger' at the work site. Imminent danger means a condition or hazard that would reasonably be expected to cause death or serious harm to workers or members of the public immediately before such condition or hazard can be eliminated through normal practices. I may exercise this right at a WESKEM work site without fear of reprisal." Authority Granted By: L. Dean Eyman, President, WESKEM, LLC.

When employees are empowered, they work to achieve success instead of working to avoid failure. On the contrary, individuals held accountable for issues outside of their control create distress and apathy. Personal choices involving safety increase commitment, ownership, and involvement.

In addition, the company's safety record, the importance that it represents, and employee incentives are communicated to all affected employees. Furthermore, it is just as important to have employee ownership of the various safety-related programs. In WESKEM, LLC, all employees are involved with accident investigations, safety advisories, lessons learned, and provide input at the plan-of-the-day/ISMS forums.

CONCLUSION

A company will never succeed when dealing with generalities. Therefore, the purpose of establishing safety performance standards (e.g., zero accidents) is to provide an effective method of measuring how well guidelines and principles of the health and safety policy and procedures

are incorporated into the daily work routines and overall work environment. This approach helps develop safety requirement “specifics” based on desired performances instead of undesired events. These “specifics” then have to be identified and measured. When performance is measured against a safety performance standard and reported, the rate of improvement accelerates.

Also, where there is a set of formal organizational agreements, over time another set of arrangements tends to develop or emerge. These arrangements are usually implicit and not written down anywhere, but they influence a good deal of behavior. The “informal” organizational arrangements may, therefore, either aid or hinder organizational performance. Success is achieved when the structure (e.g., goals, rewards) of the formal organization is consistent with those of the informal organization.

Being a combination of tangible and intangible elements (i.e., “specifics” and the “informal” organization), a safety culture developed over time may still be difficult to define and quantify, yet easy to see. It cannot be instituted, regulated, mandated, or delegated. It begins with a keen awareness of the importance of every job; of the responsibility that each employee possesses in carrying out their jobs; and an awareness of the dependency that each employee has on each other. The way to maintain this balance is to assure that strong internal communication fosters problem resolution. Furthermore, the safety culture that has developed within WESKEM, LLC’s workforce consists of three common characteristics:

- All employees hold safety as a value.
- Each individual feels responsible for the safety of their co-workers as well as themselves.
- Each individual is willing and able to “go beyond the call of duty” on behalf of the safety of others.

In addition to the three common characteristics of our workforce, WESKEM, LLC as a company upholds the safety culture, thereby protecting its most vital resource - the employees.

How do we know the program is working?

The success of this program is evident by reduced accident and injury rates, as well as the number of safe work hours accrued while performing hands-on field activities. WESKEM, LLC (Paducah + Oak Ridge) achieved over 800,000 safe work hours through August 2002. WESKEM-Paducah has achieved over 665,000 safe work hours without a recordable injury or lost workday case since it started operations on February 28, 2000.

Research and Program Enhancements

Because of the Longford explosion and other events described by Gordon *et al.*, enhancements to WESKEM, LLC’s ES&H Program come from employee feedback and evaluating operations against lessons learned collected from other high-stress industries (e.g., the offshore oil industry) (1).

- Property damage
- First aid
- Near miss
- Property damage
- Environment
- Injury

When human factors data are collected and applied properly, companies are provided with a wealth of underlying causation information. For example, in one lessons learned, a weld failure occurred at the base of a 2.5-cm (1-inch) branch to a 15.2-cm (6-inch) stage recycle gas line while packaging a gas export pipeline with a gas compressor. The failure caused a release of gas that was noticed by an operator stationed at the compressor. The original report classified the incident as property damage, finding that no unsafe acts or conditions contributed to the incident. The two causes identified in the original report were: 1) vibration leading to fracture; and 2) lack of bracing and support of line. A human factors investigation revealed that communication between departments coordinating the work was poor and the exchange of information while packaging was not clear and concise due to the noise of running machinery. Poor communication had not been addressed in the original corrective action plan and could have exacerbated the problem. A followup equipment failure investigation identified an unsafe condition since the fire and gas detection system was out of service. This failure could have gone unnoticed if it were not for the operator stationed at the compressor who noticed the release.

As demonstrated in the lessons learned mentioned in this paper, the key is to compile human factors data instead of focusing on just technical failures, which is typically collected based on the employee's own comfort level and expertise when completing an accident investigation report. Incorporating human factors data into WESKEM, LLC's ES&H Program reduces the probability and severity of these types of incidents from occurring in the future and are definitely in concert with Energy Secretary Spencer Abraham's comments made at the Department of Energy's Executive Safety Summit (3):

"Our commitment to safety begins with our current employees - it is our first concern. There is no higher priority."

REFERENCES

1. R. GORDON, K. MEARNS, R. FLIN, P. O'CONNOR, AND S. WHITAKER, "The Development and Evaluation of a Human Factors Accident and Near Miss Reporting Form for the Offshore Oil Industry", Factoring the Human into Safety: Translating Research into Practice (Volume 2 of 3), HSE OTO 2000 062 Report, University of Aberdeen Industrial Psychology Group, King's College, Old Aberdeen, Scotland (2000).

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2. Assistant Secretary for Environment, Safety and Health, Safety Management System Policy, DOE P 450.4, U.S. Department of Energy, Washington, DC. October 15, 1996.

3. Energy Secretary Spencer Abraham, "Safety is Good Business", U.S. Department of Energy's Executive Safety Summit, Chantilly, VA. December 3, 2002.

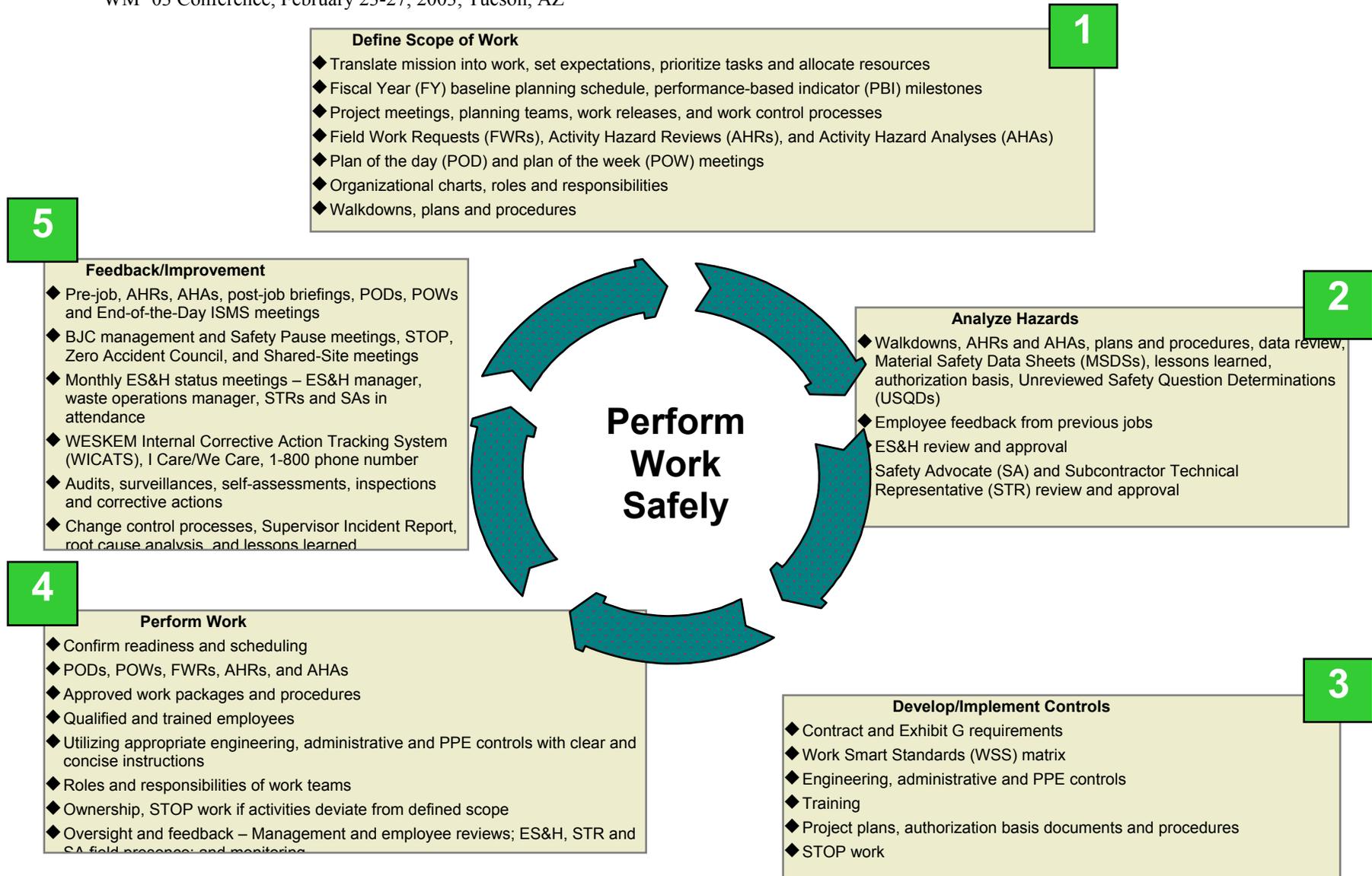


Figure 1. WESKEM, LLC's ES&H Program Incorporated into the 5 ISMS Core Functions