

Becoming a World-Class HSE Organization

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Abstract

In order for an organization to be recognized as a world-class Health, Safety and Environmental (HSE) organization certain elements and resources need to be in place. This applies whether the organization is an engineering or an operating company. The most important element is qualified personnel in the areas where HSE needs to be developed and maintained. It may not be necessary to have experts in all the areas where excellence is desired, but an in-house person that fully understands and has had hands-on experience in these areas is required. That person will hire, permanently or temporarily, the experts that will execute the pertinent part of the job. As such, he/she should be able to define the needs, the scope and the extent of the work, plan and execute the plan and assess the quality of the HSE work as it is being implemented. Knowledge and understanding of all applicable regulations, codes and standards is essential. These should serve as a basis and starting point and should be interpreted to enhance the company's HSE and not narrowly to satisfy minimum requirements.

The areas that are under the scope of HSE are the health, safety and risk, and environmental domains. For matters related to health an understanding of the impact of chemicals on people is needed and knowledge of the available resources to assess this impact (for example, Safety Data Sheets). The safety and risk domain (in which process safety resides) may be the most extensive in terms the analyses and information required. These include hazard identification (HAZID), consequence analyses, facility siting, fire protection design, process hazards analyses (PHAs), and operating knowhow. Processes to maintain the safety long-term such as management of change (MOC) and development of operating procedures, among others, are required. In the environmental domain familiarity with the effects of the process on the air, water, and noise, and how to minimize them, is essential.

This paper will address in detail the HSE needs of the organization, for both engineering and operating companies, and the levels of expertise and experience that are necessary to reach in order to stand out.

Introduction – A World-Class HSE Organization

What is a world-class HSE (Health Safety and Environmental) Organization? Putting it simply, is one that is recognized by its peers as excelling in the HSE area, a company from where people buy their products knowing they will be safe, where their employees go to work with a feeling that their workplace is safe, and have a feeling of satisfaction knowing that the product that they are producing and the process leading to that product will not harm people or the environment. In addition, the company is also known as a contributor to the safety and environmental wellbeing of the community where they do business.

A recent analysis of HSE award-winning companies (Campbell Institute at National Safety Center, 2013) found that the main characteristics of these organizations are:

1. **Leadership.** There is a safety culture that places safety on a par with business performance and management leads by example.
2. **Integrated systems approach.** HSE is not a separate function but is integrated with all business functions and the management of those functions is responsible for the HSE performance. In many cases quality, security and sustainability are also integrated in the same business systems. Applicability is universal throughout the organization, including contractors.
3. **Performance measurement.** Organizations with world-class safety records rely on a combination of leading and lagging indicators to promote and monitor continuous improvement activities of safety management systems.
4. **Alignment to core organizational initiatives.** Regardless of the business challenges, world-class HSE organizations maintain HSE firmly aligned with other organizational goals, strategies, and values. The alignment is achieved by making HSE part of the corporate mission, vision, strategic planning and making it part of the company's budget.
5. **Corporate citizenship and off-the-job employee safety.** In addition to striving for HSE excellence in their operations, the organization promotes the health and safety of their employees off-site, as well as the health, safety and environmental wellbeing of the surrounding community.

Of course, these companies already have developed programs to handle safety, process safety, health, and air, water and noise environmental issues. Management uses the performance measurement results for continuous improvement of these programs.

Becoming a World-Class HSE Organization

A company that has realized that HSE excellence is tied to business excellence has already attained a significant degree of safety culture (Forest, 2010) as evidenced by this realization. At this point in time there is a certain integration between the business and HSE and the company may be striving to become a world-class HSE organization. It is not the intent of this paper to discuss changing the structure of an organization and its integration of HSE into the business, but to touch on the challenges, and the tasks and resources necessary to achieve HSE excellence. Each organization will design its HSE management system in a manner that is tailored to its specific business. Each business unit is responsible for its HSE performance and the HSE department is there to provide guidance to management and has available the necessary technical knowhow to accomplish the job.

Although the tasks and resources should be applicable to any organization the focus will be on the process industries. Where needed, differences between an engineering design company (referred to as Engineering, Procurement and Construction, or EPC firm) and an operating company will be highlighted.

Foundation of HSE Excellence

The first part of excellence in HSE is uniform global application of company operating principles. Although there may be different requirements in different countries or regions, the highest codes and standards under which the company operates should be uniformly applied in any place where the company conducts business. Less stringent laws and regulations may allow lower standards in a country but the company needs to decide beforehand what the minimum standard that will maintain operational and safety integrity is. Some companies spell in detail their HSE policies and make it a corporate commitment to strictly follow them such as ExxonMobil with their Operational Integrity Management System (ExxonMobil, 2014).

It could be said that EPC companies have a greater challenge than operating companies in establishing a set of operating principles given the fact that they have to respond to many corporate customers, each with his own corporate culture. But similar to the operation of multi-national companies in multiple countries, the company needs to establish minimum standards that conform to its HSE principles and include them in contracts.

Codification of these principles is essential for assuring consistency across the company and maintain long-term viability of HSE excellence. A system for maintaining these policies, procedures and learnings and making them available throughout the organization is crucial (Chosnek, 2010).

Building HSE Excellence

Having set the stage with a vision, a safety culture, integration of HSE into the business and continuous improvement, it remains to build an HSE infrastructure to support and maintain the path to quality HSE. There may be a perception that only large companies can achieve world-class HSE because of economies of scale in acquiring and maintaining qualified resources. But smaller companies have always have been capable to stay competitive by being able to rapidly transfer knowledge throughout the organization. By being efficient in managing external resources a small HSE organization can provide quality support as well as a large company. Thus, each type of company needs to have one or more HSE experts that understands the arising needs and can obtain the necessary resources, either by localizing them internally or by having previously vetted external resources and being able to contract them.

The HSE expert will be able to locate and understand laws, regulations, codes and standards that are relevant to the task. These include local application of environmental laws (related to air and water quality, solid waste and noise), which very well may have substantial requirements in addition to the national or global ones. Some industry segments may entail specialized knowledge of the applicable regulations, for example LNG (Chosnek, 2014). The world-class HSE organization will though, go beyond existing regulations and adhere to practices that are not mandatory but have been tested in industry, such as the American Petroleum Institute's (API) Recommended Practices (American Petroleum Institute, API,

2014) which originally were intended for the oil and gas industry but have found applicability throughout the process industries. The company will also engage in methods that may lead to improvements in HSE performance that are being developed by the international process safety community. The company will lead in practices that define the “Regularly and Generally Accepted Good Engineering Practices” (RAGAGEP) as required by the U.S. Occupational Health and Safety Administration (OSHA) in its Process Safety Standard (OSHA, 1992).

The HSE expert will keep up to date with advances in the HSE field through attendance to symposia and congresses, two of which have world-wide recognition: the Global Congress on Process Safety organized by the American Institute of Chemical Engineers (AIChE, 2014) and the Mary Kay O’Connor Process Safety Center International Symposium (Mary Kay O’Connor Process Safety Center, 2014). The world-class organization will join and participate in industry-technical alliances such as that of the Center for Chemical Process Safety (CCPS) and the Mary Kay O’Connor Process Safety Center.

The HSE expert will follow investigations of major incidents, such as those undertaken by the U.S. Chemical Safety Board (U.S. Chemical Safety Board, n.d.), in order to bring lessons learned into the organization utilizing the company’s regularly scheduled internal safety meetings.

The company will maintain safety awareness for its workforce through regularly scheduled training (e.g. refresher training, basics of risk, etc.) and opportunistic formal communication, such as results of process safety analyses, incident investigations, audit findings, etc. The HSE department will also organize weekly or biweekly safety meetings bringing general safety topics or talks about hazards that potentially may be encountered at work or in the community.

The main task of the HSE organization is to help minimize risk to the company and thus minimize human harm and economic losses. The second task is to help in measuring the HSE performance of the company and propose a path forward for improvement. Besides having hands-on experience in risk assessment/risk management, the HSE specialist will collect and analyze data from process safety indicators and monitor the quality of the various HSE processes.

Assessing and Minimizing Risk

Process risk (as opposed to financial risk) in a company is a sum of the risk of all the activities of the company. Not all the components of risk have the same weight and furthermore, in the process industries some of those components are heavily interrelated. The elements of process safety that were selected and regulated by the U.S. Occupational Safety and Health Administration (OSHA, 1992), and which have been adopted by some other countries and many companies outside the U.S., are (acronyms added):

- Application
- Employee Participation
- Process Safety Information (PSI)
- Process Hazards Analysis (PHA)
- Operating Procedures
- Training
- Contractors
- Pre-startup Safety Review (PSSR)

- Mechanical Integrity
- Hot Work Permit (Safe Work Practices)
- Management of Change (MOC)
- Incident Investigation
- Emergency Planning and Response
- Compliance Audits
- Trade Secrets

Other U.S. government agencies such as the Environmental Protection Agency (EPA) with its Risk Management Plan (U.S. Environmental Protection Agency (EPA), 1996) adopted similar elements with added environmental impacts. In the U.K. also similar elements were included in the COMAH regulation (U.K. Health and Safety Executive (HSE), 1999), although the implementation requirements are different. Other Commonwealth countries also subscribe to the HSE regulations and European Union (EU) countries will have similar requirements. In the U.S. offshore industry, safety regulations and their management evolved in recent years with the major role being played by the BSEE (Bureau of Safety and Environmental Enforcement) which has included some API Recommended Practices in its regulations (Sutton, 2014).

The world-class HSE organization will have robust programs for all the elements of process safety that comply or exceed the requirements of any of the regulations and apply them universally, without regard to just meeting the minimum requirements. They will highlight Human Factors and Facility Siting beyond the minimal mention in OSHA Standard and consider ALARP. Although ALARP (As Low as Reasonably Practicable) principles in risk assessment may be required in other countries (U.K. Health and Safety Executive (HSE), n.d.), some companies outside of the Commonwealth and the EU are applying the principles, in spite of not being a regulatory requirement and not being exactly defined (Sutton, 2011).

The organization will also have programs that go beyond these basic elements and develop elements that have been shown to have an impact on process safety. It will add Safety Culture as one of the main elements given its demonstrated importance on process safety since the Baker report came out (Baker, 2007), to the point that OSHA is currently providing guidelines for developing one (OSHA, 2014). In this vein, operating companies that want to excel will also subscribe to Conduct of Operations and Operational Discipline principles (Klein, 2010).

The approach will be one of risk-based process safety (CCPS, 2007) as the best HSE companies realize that not all hazards and risks are equal and resources have to be prioritized to focus first on the higher ones. This involves, among other things, identifying and understanding the risks, managing the changes that may impact those risks, and being prepared and able to respond to any incidents that may occur.

The world-class company will endeavor to use Inherently Safer Design (Kletz, 1996) in the design of its processes. Although easier to apply for EPC companies as a starting concept in design, operating companies can also strive to apply the principles to existing plants (Edwards, 2012). The design process would be started with a Hazard Identification (HAZID) study once the Process Flow Diagrams (PFDs) have been developed. The study would be done using a simple technique such as 'What-If' and use the results for the development of a plot plan. In this and subsequent Process Hazards Analyses (PHAs) during the design, Inherently Safer Design should be maintained as a guideword. All throughout the design process,

starting with design philosophies and an HSE management plan up to start-up of the plant, HSE should be integrated into the design (Edwards, 2013).

Since the plant layout will have a significant impact on the safety of the project, it behooves the organization to perform consequence analyses of the various potential configurations. Tools such as DNV's PHAST (DNV, n.d.), which allows for dispersion, radiation and overpressure modeling in 2-dimensions, or GexCon's FLACS, a 3-D Computational Fluid Dynamics (CFD) tool (GexCon US, n.d.). The analyses are applied to the PHAs to obtain a better measure of the potential consequences of a process deviation, during the design process or when operating the plant. These analyses are re-applied when adding new equipment, structures or buildings, or relocating existing ones.

The company's HSE specialists will manage the conduct of safety studies, whether periodic PHAs, PHAs at various stages of a project, or safety studies as a consequence of changes. The management will involve good preparation and skilled facilitation of the studies, in-house or with contracted personnel, use of software tools that will help to easily integrate the results into the organization's process safety information for review and follow up, and a tracking system for seeing to their closure. Proper identification of the risks during this process is essential (Chosnek, 2014). As such the specialist will lead Layer of Protection Analyses (LOPAs) in order to reduce uncertainties in the probability of identified high consequence hazards (CCPS, 2001) (CCPS, 2013).

After identification and mitigation of risks the company will sustain a robust Management of Change (MOC) process that will help maintain risks at a low level (Chosnek, 2010). Although conduct and coordination of changes will be up to each individual department of the company, support for the necessary safety studies and follow up on the performance of the system will be the responsibility of the HSE organization.

If, in spite of all its efforts to minimize risk, an incident should occur, the company is ready with an emergency plan that includes trained personnel to mitigate the effects of the event. Besides having the sufficient fire detection and protection capabilities, the company may have leveraged these capabilities even further with a Mutual Aid plan (International Association of Fire Chiefs, 2006). The company will systematically investigate these incidents (and near misses) and have trained personnel to convey the learnings from them throughout the organization (James, 2014).

Measuring HSE Performance – Continuous Improvement

With the objective of continuous improvement, the world-class company will gauge the performance of its HSE system by monitoring a set of leading and lagging indicators (CCPS, 2011). One example of a lagging indicator is tracking near misses (Zacharias, 2012). Most importantly, performance will be measured by monitoring the quality of the various HSE processes. The hazards identified by the PHAs and other safety studies, the findings of periodic comprehensive HSE audits, results of quality audits that impact HSE, and incident investigation recommendations are kept in a Hazards Register. Maintenance and closure of these items is tracked by the HSE organization. In order to ensure quality, a skilled HSE employee will participate in PHAs (as facilitator or team member), be a member of the corporate audit team, participate in incident investigations, and provide advice and feedback on other activities such as emergency planning and drills.

The organization takes especial care on monitoring its MOC program. As opposed to the other elements, in which there are occasional activities that can be addressed when they occur, changes introduce risk from the moment they are started until they are completed. The MOC program should be managed with a system that automatically produces metrics as it aids in managing the changes (Chosnek, 2010). The quality of the MOC system is maintained by having peer review, besides supervisory review, of the required safety studies.

Any HSE deficiencies that are encountered during the course of business, or any resulting trends from the measured indicators that may result in increased risks, will be noted and potential corrections included in the next planning cycle.

Conclusions

The organization at the leading edge of HSE practice thrives in a culture where it is implicitly understood that the safety and wellbeing of its employees, customers and the community are essential to fulfilling its corporate mission. It also realizes that all hazards and risks are not equal and will concentrate more resources into the larger hazards and higher risks, thus optimizing its resources. And, in order to achieve its safety goals, will integrate HSE into all its operations through strategic planning complemented by training of its workforce. The support of this effort will demand a strong HSE organization composed of experienced individuals that are highly trained and have the tools to optimally leverage their expertise throughout the company. The company will judiciously identify the hazards involved in its operations, analyze the risk, measure its performance in reducing it, apply learnings from deficiencies, and then plan new efforts to minimize risk further.

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