SH&E is too often considered a functional area or a center of specific expertise, and SH&E managers see themselves too often and too much as a capsulated competence center. Such an approach to SH&E will always fall far short of what is needed for a successful, holistic, proactive and preventive safety culture. SH&E is an environment or network of many stakeholders with different roles, objectives, expertise and backgrounds. It is also a cobweb of many processes and functions within and outside of SH&E that are all correlated with dependencies and interdependencies.

Above all, SH&E is not an island within a corporation but part of the production chain and part of the operative process, from sustainable purchasing and supply change, to safe operations, sustainable product design and productions and on to continued on page 6
Operational safety, or better operational excellence, must be a corporate objective intertwined with all operational areas. In such an environment of preventive safety culture, safety management cannot be handled as an isolated functional area by capsulated experts who focus on safety processes and regulations to drive compliance and best practices only. Such an approach requires:

- a comprehensive integrated approach;
- connecting people and functions that normally may not connect or interact;
- integrating data from various functional areas for a holistic picture and to have a sound database from which to derive actions and activities;
- creating the ability to monitor operational excellence and safety performance on a near to real-time level;
- establishing a corporate safety culture and operational excellence model to continuously monitor this environment and react in due time on any alteration within the organization.

To achieve this level of operational excellence, most companies, as mentioned, have a long road ahead. It is time to think about long-term operational excellence aspirations and about the way forward, the roadmap to a successful safety culture.

Especially when a company comes from a rather rudimentary safety organization with a rather reactive approach to safety management, it is important to have the necessary insight into actual performance to drive the evolution, to become more systematic with a managed approach, and in the final transformation phase, to create—a based on experience and insight—a practiced safety culture and proactive safety management.

The right approach can only advance via a clear picture of the ideal scenario, from which a suitable and individual roadmap must be derived. Developing the roadmap and implementing the system prerequisites, policies and process-
es, as well as driving development in the relevant people starts from the status quo with all its restrictions and limitations.

**Change Process Outlines**
Anybody who faces the challenge of implementing a comprehensive setup for a proactive safety management system to support operational excellence as mentioned here will need a systematic approach or roadmap for the way forward.

Such a systematic approach can have different designs or granularities, but keep five principal steps in mind:
1) problem analysis;
2) process design;
3) integration design;
4) solution setup;
5) flexible deployment.

**Problem Analysis**
First, perform a detailed and concise analysis of the status quo, the present situation, the challenges and the objectives that have been set for a new corporate concept for operational excellence.

**Process Design**
Based on step one and focusing on the future vision for the operational excellence concept, a detailed design should be created. Such a design should not focus on functions but rather on processes—processes that in many cases are cross-functional and interdisciplinary. In the case of safety management, this becomes apparent when drawing the flows of action and information across the organization and over organizational boundaries.

**Integration Design**
Cross-functional processes also become visible where information exchanges between two or more functional areas are needed. The previously discussed comprehensiveness of a corporate operational safety approach creates a complex SH&E solution landscape with many facets of dependencies, interdependencies and a high degree of collaboration.

Consequently, system interaction is an important factor for success.

**SH&E Solution Setup**
The next step is the setup of a system or processes to facilitate the operational excellence and safety activity. Given the many different stakeholder groups around SH&E and operational excellence and their different needs, a solution must have a certain degree of user orientation, adaptability and ease of use. Apart from the pure need for the processes, the solution’s usability and its acceptance by users are key factors for success.

**Flexible Deployment**
Running this environment of operational excellence should be driven as a flexible deployment. A key factor of success for organizations today is to keep pace and sustain momentum as a learning organization.

**Comprehensive Setup: Bringing Safety into Shape**
It is necessary to achieve a systematic and comprehensive approach for a proactive and successful safety culture. This means bringing together all stakeholders into a complete picture, but also leaving enough flexibility to act and react within a highly volatile organizational environment.

Starting from the status quo, it must be analyzed where the various links are between functional areas within SH&E and between SH&E and other units of the corporation, as shown in Figure 3 (p. 8).

Figure 3 shows only part of the world around SH&E, but it makes clear that one faces a complex reality.

First, there is the chain of links between hazardous substance management (HSM), industrial hygiene (IH) and occupational health (OH). HSM deals with the materials that constitute a certain element of risk for the company, employees and environment. The same materials become an integral part of the exposure profiles in IH as soon as people are exposed to them. The exposure profiles within health risk assessment (HRA) and information from human resources (HR) together form the basis for medical protocol planning in OH.

There is also a clear link between waste management and HSM since hazardous substances often end up as waste, and this waste often must be handled as a special form of hazardous substance. As such, it again constitutes an exposure for coworkers involved in waste handling. Moreover, it is important to state that HSM is closely intertwined with the material flow within a company from the outset, from the point of purchase until the substance leaves the company as a product, part of a product or waste. Waste management is also connected to purchasing and material manage-
ment to a certain extent in terms of the procurement of waste disposal services and the storage of waste.

Furthermore, the financial dimension of waste disposal is also of crucial importance since waste management costs contribute to overall material costs and may in fact influence purchasing decisions with respect to alternative substances. As a result, it is necessary to link this component with cost accounting and financial accounting. Waste management also incorporates environmental compliance (i.e., legal reporting), with respect to appropriate waste disposal.

The functional area of incident management with hazard reporting/near-miss reporting incorporates a range of integration aspects. The aftermath of an incident often brings numerous other functional areas into play, including claims management, disability management, and return to work. Injuries and subsequent medical treatment necessitate the involvement of OH. One example is information about the injuries and first-aid treatments needed as input for incident reporting. Of particular importance is the link between incident management and IH as a principal trigger of incident prevention since the incidents, hazard reports and near-miss reports are a key starting point for corrective actions measures designed to make work areas safer.

A link also exists between the areas of disability management, HR and OH. Reintegration strategies for coworkers with restrictions are compiled in cooperation with reintegration managers, HR and OH along with additional input from IH, such as information about exposures in alternative work areas.

HR is interlinked with many functional areas in SH&E related to the workforce, including any area that addresses safeguarding of employees. Parallel to this HR integration is a link to third-party management since whatever applies to in-house employees also applies to external employees, such as contractors. It is possible to draw a direct link between IH and plant maintenance in regard to the corrective measures that must be triggered as a follow-up to HRA and incidents.

When discussing incidents, it is impossible to ignore incident management for environmental compliance management. This is particularly true during a leakage or spill that is harmful to the environment and subject to legal reporting obligations. With regard to regular emissions, such as greenhouse gases, CO\textsubscript{2} or other kinds of emissions subject to legal reporting, the necessary consumption information with regard to input quantities needs to be obtained from purchasing or material management so that the relevant emission figures can be calculated.

Furthermore, it is crucial to mention the human interface. In any holistic SH&E approach, the “individual” must be considered a key factor for the SH&E management system’s success. Alongside expert users, such as industrial hygienists and occupational health practitioners, many other stakeholders need to be involved in the concepts for SH&E. Various hierarchies of management exist, each with different information requirements ranging from condensed and exception-triggered C-level reporting down to the manager’s view of team members’ exposures, OH planning, safety training, and so on.

Finally, one must consider all employees and contractors as a whole. It is a generally accepted fact that the top level of safety awareness can only be achieved by incorporating everybody into the SH&E concept. In other words, everybody must be a part of the SH&E world. This can be achieved uniquely by involving all individuals via self-service portals for SH&E, employee info centers with information about exposures, safety regulations, PPE and planned and executed medical protocols. Transparency and inclusion are the first and most important steps toward achieving an excellent behavioral safety culture. To deliver a successful holistic SH&E approach, it is
essential to make the integration of people a core element of the SH&E strategy from the very outset.

If one also takes aspects of product safety/product compliance into account in such a concept, one will likely discover even more interdependencies and interactions that will need to be added to the solution landscape setup for SH&E.

Another aspect that further compounds this complexity is that most modern companies are part of a global economic system. Their customers, partners, and contractors are international. Similarly, most industries are interwoven into a global system of plants and subsidiaries in various countries and jurisdictions with differences in terms of language and culture. When seeking to design a successful global corporate SH&E strategy that will work for all regions and adequately support all languages and local or regional requirements, it is imperative that this international or global aspect is given sufficient consideration.

Essentially, all of these aspects of interaction and interdependence point toward one crucial message—an isolated approach to any functional area of SH&E is bound to miss the target.

If a comprehensive approach to SH&E is brought into the broader complex of operational excellence, this intertwines it further with enterprise asset management.

Bringing these worlds closer together, one quickly realizes that they are not only information exchanges or interfaces. There is much overlap of functional areas and processes.

For example, a hazard or potential danger is discovered. This hazard is reported in an incident as hazard observation, which, as a natural consequence, triggers audits, risk assessments, preventive measures, corrective actions, etc. The HRA might detect some particular exposure that makes it necessary to execute some change in the process, in the flow of production, in the material composition or something else. The change itself constitutes a new and particular risk. Many incidents happen during irregular activity, such maintenance and changes in assets and operations. Consequently, the decision to make this change subject to a management of change (MOC) process may be made. Within MOC are established standard operation procedures for change processes with special steps to ensure the safe execution of changes. Examples of this are pre-change risk assessment, postchange risk assessment, prestartup safety procedures and poststartup risk assessment.

Within this complexity, the change itself is only one step, embedded in all relevant procedures to ensure safe operation at any point in time. The change (i.e., maintenance activity) is then again subject to specific change-related safety procedures, like shutdown and tagout

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**Figure 4 Comprehensive Approach to SH&E**

[Diagram showing the comprehensive approach to SH&E with various interrelated processes and decision points.]
The maintenance workers must be aware of all latent dangers and exposure and they must be informed of all relevant safety measures. Depending on the exposure and activity, they might need special training or medical checkups related to the intervention that is about to be executed.

A complex chain of processes and activity can be triggered from various points within the operation and between maintenance and safety management. At any point in time, there must be a certain level of transparency for operations management to enable management to comply with the necessary standards of care and diligence.

No stakeholder and no activity can be considered an isolated task or responsibility. Every person and process must be part of a complex, highly integrated and flexible system environment to ensure what was previously defined as operational excellence.

**Conclusion**

Safety management cannot be seen as a bundle of functional areas in a rather capsulated approach. On the way toward a proactive and preventive safety culture, more and more enterprises are implementing safety management and SH&E as part of a comprehensive concept of operational excellence to address the challenges and risks.

This implies:

- **Asset Integrity**: Ensuring operational performance and maintenance with a high degree of visibility.
- **Operational Risk Management**: Detection, assessment and mitigation of all relevant risks of the operation, including risks for the individuals, the environment and the enterprise.
- **Energy and Resource Efficiency**: Transparency of consumption to minimize the environmental footprint, to comply with environmental regulations and to raise the efficiency and profitability of the operation.
- **Quality Management**: Ensuring quality of materials and products to comply with regulations and to guarantee marketability of the produce.

None of these entrepreneurial objectives can be achieved at a high level without keeping the other areas of responsibility in mind. Operational excellence and safe operation are not a functional area but rather a kind of neuronal network of nodes and synapses across an operation. Like any neuronal net-work, it is by its nature as flexible and agile as it is fragile.

The primary question is what is safety? Safety is difficult to define, and safety can only be defined by the absence of something else (i.e., the absence of dangers and hazards). Safety can be ensured only in a continual system of responsibility and alertness, without any danger of relapses into complacency. In other words, safety is a continually maintained nonstatus that requires everybody at any point in time to be kept up. The underlying safety management system must reflect this network of activities and responsibilities and must facilitate it to bring it to a maximum efficiency.

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