MOST SH&E PROFESSIONALS have been involved in an audit at some time during their careers. Audits are no small matter; those involved must designate time to prepare, interview employees and conduct a facility walkaround. Over the years, audit programs have matured, with the 1990s ushering in a period of tremendous improvement through management systems in response to new business challenges and pressures including:

• public demand for more information from companies regarding SH&E performance and risk mitigation measures;
• internal customers expecting more (for less) from the audit program and expecting it to provide greater value to the organization;
• audited facilities expecting the process to provide high value and, in some cases, expecting it to provide a “safety net” to ensure that nothing has been overlooked (Greeno and Wilson; Arthur D. Little).

These challenges have revitalized audits and their function. With upper management commitment and endorsement from corporate SH&E officers, organizations are striving to:

• increase the proficiency of both full- and part-time audit staff;
• employ rigorous audit scheduling methodology to justify resource allocations and audit scope;
• implement procedures to measure and track performance improvements across the organization;
• focus greater attention on program quality and efficiency (Greeno and Wilson; Arthur D. Little).

While the comprehensive audits described here are more typical of large multinational companies, many of the issues discussed are applicable to any company auditing program effectiveness.

Challenges for SH&E Auditing

The success of implementing these changes lies with the audit program manager. S/he is in the best position to ensure that the audit program moves forward as a major contributor to a facility’s success in managing SH&E issues to a business advantage. The challenge is to build a strong case for what the tailored audit program should be in order to meet the needs of a rapidly changing organization in a dynamic business environment (Figure 1).

As companies rightsize or downsize, their SH&E functions are being pressured to maintain effectiveness while reducing costs. In the face of constant downsizing, even in a profitable environment, the most pressing concern facing audit programs is people resources (Greeno and Wilson; Arthur D. Little). The issue is not so much the number of auditors needed; rather, companies are hoping to achieve the same results using part-time auditors. This demand is contrary to typical audit standards of independence and objectivity. Therefore, to balance the needs of stakeholders, the board of directors, employees and the public, a company must carefully coordinate a plan to maximize return on its audit resource dollar through effective training, team selection and oversight, quality control and feedback.

SH&E professionals also need to develop and implement quality control measures for the audit process (Figure 2). Such controls help to ensure that thorough audits are conducted on a consistent basis. For example, a company may require that each team member understand the basis for control systems and verification strategies; formal review and sign-off by team leaders; and daily team meetings to review audit progress and the nature of issues being identified [Greeno, et al(b); Arthur D. Little]. A company may also develop a systematic training program that requires each auditor, full-time and guest,
as well as team leaders, to be routinely trained in auditing techniques [Greeno, et al(b); Arthur D. Little].

The SH&E Audit Process

Developing an audit process ensures that a consistent methodology is implemented for repeatability. The process should cover pre-audit, on-site and post-audit activities (Figure 3). Table 1 presents a summary of principal activities and intended outcomes for each step.

Standard Operating Procedures

Since the audit program must be responsive to divergent applications, feedback mechanisms must be built into the process; this includes team-leader reviews, third-party oversight reviews, customer/facility feedback and periodic program reviews (ISO 14011). The audit leader plays a key role in keeping the audit on track, managing the team and giving feedback to team members to ensure quality of the individual work product. When collecting customer feedback, it is best to provide facility managers with a short questionnaire, rather than a long, detailed document (Figure 4). In addition, some companies maintain auditor profile sheets as a sort of “report card” on part-time auditors [Greeno, et al(b); Arthur D. Little]. These profiles cover an auditor’s expertise in applicable areas and are provided by those being audited and other team members. Such information helps the company target auditor training to specific weaknesses.

Assessing Strengths & Weaknesses

An audit is designed to assess a facility’s strengths and weaknesses. This process encompasses the following activities:

• **Identify operational risks.** What are the inherent risks (considering magnitude and likelihood) if a particular expectation is not managed appropriately?

• **Evaluate management and control systems.** Are management practices and procedures designed soundly? Are these systems, coupled with the engineered controls, appropriate given the inherent risks? Will the controls function within the framework of the asset or department?

• **Document strengths and weaknesses.** What verification strategy will provide the optimum allocation of available resources to ensure that issues representing high-risk and weak practices and procedures/control systems receive sufficient attention (“BPXA Assessment”)?

Evaluating the soundness of a facility’s management and control systems is essentially a subjective process. While explicit compliance requirements are common, detailed criteria or standards that define adequate practices and procedures are rare. In the absence of such criteria, seven key principles can be used to evaluate management systems (“BPXA Assessment”):

1) **Policies, program or procedures.** The facility has defined consistent policies, programs or procedures that document SH&E controls and practices and provide guidance.

2) **Clearly defined responsibilities.** Facility personnel understand their roles, responsibilities and authorities in achieving the desired level of SH&E performance.

3) **Systems for project review and approval.** The facility has established an effective system for reviewing and approving nonroutine or out-of-specified operations.

4) **Trained and experienced personnel.** Facility personnel have sufficient experience, training and awareness to accomplish the SH&E function or task. Personnel are familiar with applicable regulatory requirements and internal standards and policies.

5) **Protective measures.** The facility is aware of the risks its equipment, materials and operations pose to personnel and the environment. Safeguards have been established to prevent or control major problems.

6) **Recordkeeping system.** The facility has an accessible, comprehensive recordkeeping system that provides documentation of SH&E activities and addresses compliance with governmental regulations and company policies.

7) **Internal verification.** The facility has established a system of checkpoints, reviews, sign-offs, etc., that serve as day-to-day SH&E assurance.

Verification strategies subsequently employed should be dependent on the evaluation of the strengths and weaknesses of management systems and internal controls, combined with an assessment of inherent risks associated with a particular issue. To develop a verification strategy, it is best to select...
sites which need to be audited are evaluated in a timely manner. An effective targeting scheme can be developed based on risk. For example, the risk-based audit scheduling model (Figure 5) establishes a solid rationale for site selection by mathematically evaluating and prioritizing facilities according to several risk factors. These factors include variables such as size and nature of facility operations; types of chemicals used or manufactured; regulatory climate for environmental and safety; number of contractors employed; age of the facility; and nature of the surrounding community. This method generates scores for each facility, which are used on a relative basis. For example, one might select which sites to audit as a percentage of the whole (e.g., top 10 percent highest grossing scores) or one might select the top highest grossing scores (e.g., top 10 scores).

Another option is the audit timeless index (ATI), which is used to schedule audits based on an algorithm made up of four factors: hazard, prior audit, time since last audit and plant production (Figure 6). A site-specific component is included, such as in a laboratory location. These factors all contribute to the index. Facilities with an ATI of 10 or higher are considered priority locations for audits.

In response to cost-consciousness and quality concerns, some firms use a grouping process. This means a few locations among a large number (e.g., five out of 50) of similar small facilities in a group are audited. Results can then be generalized and shared among the group. Whatever method is chosen, the audit program must provide assurances (and a comfort level for upper management) that auditors are assessing facilities which need attention and are evaluating the most critical items.

Self-Assessments

Since it may not be feasible to audit every site, it is necessary to provide a method that allows facilities to perform self-assessments to some company standard. Self-assessments help to ensure that the processes required to meet identified management system components have been developed and implemented; employees are aware of management system requirements and their roles; processes are complied with and are effective; and the local facility is learning and improving.

Self-assessment questions include:
Based on management system elements and the type of facility being assessed, an expectation scoring system should be developed. This allows the local facility to gauge its performance against SH&E performance indexes and enables management to more easily communicate improvements or opportunities for improvements. Table 2 illustrates such an expectation scoring system.

Self-assessments are typically performed by a cross-functional team of facility personnel and can be subjective. Interviews with personnel and review of documents and records may or may not be performed. Although more informal than an audit, self-assessments are a viable tool for local management.

### Table 1

**Basic SH&E Audit Process**

<table>
<thead>
<tr>
<th>Basic Step</th>
<th>Principal Activities</th>
<th>Outcome</th>
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| Plan the audit. | • Review relevant policies, standards and procedures.  
• Review federal, state, local regulations.  
• Annotate protocols.  
• Review facility background information. | • Annotated protocols.  
• Audit plan and schedule.  
• Preparatory material for opening meeting. |
| Understand management systems. | • Conduct opening meeting.  
• Take site tour.  
• Review internal controls.  
• Conduct initial interviews.  
• Review key documents.  
• Conduct limited verification testing. | • Strong working knowledge of key systems on site.  
• Key issues to review. |
| Assess strengths and weaknesses of internal controls. | • Review Step 1 information.  
• Identify risks associated with activity.  
• Assess effectiveness of internal controls.  
• Discuss assessment with audit team. | • Priorities and strategies for verification work.  
• Reallocation of audit resources.  
• Risks identified.  
• Strengths and weaknesses of systems. |
| Gather audit evidence. | • Develop testing and verification strategy.  
• Perform physical inspections.  
• Conduct focused interviews.  
• Examine data and records.  
• Perform verification testing. | • Analysis of site programs: Audit evidence to substantiate findings.  
• Status of compliance confirmed. |
| Evaluate and summarize audit findings. | • Review data collected.  
• Ensure factual accuracy of findings.  
• Integrate findings with those of other team members.  
• Identify trends in the data.  
• Determine root causes.  
• Provide evidence to support findings.  
• List exceptions and observations.  
• Attend daily debrief meetings.  
• Attend close-out meetings. | • Draft findings.  
• Accuracy of findings confirmed.  
• Potential root causes identified.  
• Early, clear, consistent communication of findings to facility.  
• Understanding of facility concerns.  
• Preliminary draft report. |
| Report findings. | • Review working papers.  
• Prepare draft report.  
• Respond to comments and challenges on findings.  
• Prepare final report. | • Draft report summarizing audit process and findings.  
• Final report. |

*Source: “BPXA Assessment Program Audit Process Report.”*
When identifying which systems elements to review during audits, it is best to select them based on priorities and audit the most critical to the least critical. Here, the structure of the audit team is important. Management systems audit teams typically consist of a team leader from operations, a coordinator from corporate SH&E audit staff, a legal advisor, an outside expert and a staff member from operations to serve as a liaison between the team and site management [ISO 14011; Greeno, et al(b); CCPS; Arthur D. Little].

A distinct protocol should be used to address SH&E management systems in any facility or business (Bowman; ISO 14010; ISO 14011; ISO 14012; CCPS). Applicable codes and standards are a good starting point for this process; these include the Responsible Care program from the American Chemistry Council (formerly the Chemical Manufacturers Assn.); the European Community’s Eco-Management and Audit Scheme; British Standard 7750; and ISO 14000. Facility managers should find management systems assessments meaningful and valuable. These assessments offer a systematic approach for identifying a problem, analyzing exceptions or root causes, grouping those exceptions/findings, examining them as groups and developing corrective actions to improve the management systems (Bowman; ISO 14010; ISO 14011; ISO 14012; Greeno and Wilson; Arthur D. Little). The result is an overall root-cause analysis aimed at eliminating recurring problems by making systems improvements.

Evolution of SH&E Auditing

Audit programs have become more sophisticated. Their primary focus has shifted from identifying problems to confirming compliance to assessing the level of implementation of management systems (Greeno and Wilson; Arthur D. Little). Management systems are fast becoming a global initiative. Many believe that such systems help drive compliance and improve SH&E performance and, therefore, many are building them into audit program objectives (Figure 7) (ISO 14011; ISO 14012; Bird and Germain; CCPS; Arthur D. Little). To seamlessly integrate these areas, one must first determine what management systems elements to cover. Then, one must look beyond the design of the systems to assess the detailed implementation. However, care must be taken to not focus on management systems to the exclusion of compliance, since compliance results can help measure how effectively management systems are working [Bird and Germain; Greeno, et al(a); Arthur D. Little].

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This method can also show where a facility is setting a high threshold and meeting its goals; this allows a corporation to single out top-performing facilities and those managers who show innovation and SH&E leadership [Greeno, et al(a), (b); Arthur D. Little]. The best approach is to identify which management systems elements to cover. Then, one must look beyond the design of the systems to assess the detailed implementation. However, care must be taken to not focus on management systems to the exclusion of compliance, since compliance results can help measure how effectively management systems are working [Bird and Germain; Greeno, et al(a); Arthur D. Little].

Effective audit programs integrate management systems into the audit process in various ways (CCPS). For example, auditors evaluating hazardous waste activities would assess training, procedures, recordkeeping and physical controls (Bowman; Krieger, et al; Arthur D. Little). Others may look at management systems that cut across functional areas which may affect overall SH&E performance, such as line responsibility, SH&E awareness and training, regulatory tracking and risk assessment/risk management. In both approaches, the value gained from integrating the two systems is significant (CCPS).
Measuring SH&E Audit Performance

Communicating audit findings is a continual challenge. The value of the audit program depends on effective and timely communication of results to upper management and stakeholders [Greeno, et al(b); ILCI; Arthur D. Little]. To be most effective, the audit program should be viewed as a tool to measure performance and its improvement. Audits provide management with a measure of SH&E performance across all facilities. While measurement systems have inherent difficulties (e.g., subjectivity of the “scoring” process, pressures to give a “good grade,” possible grade inflation over time), they provide a means of measuring performance [Greeno, et al(b); Arthur D. Little].

The ability to defend an audit program and communicate both the approach and results effectively to upper management determines the support the program will receive. Management will typically provide more support once it understands the program’s ability to measure safety performance and to meet audit program goals [Greeno, et al(a), (b); ILCI; Arthur D. Little].

At some companies, facility performance is communicated to the board of directors; at others, managers’ bonuses are tied to audit grades. Because of the significance placed on the audit score, quality assurance mechanisms can be developed to maintain the integrity of the scoring process (Greeno and Wilson; Arthur D. Little). Such mechanisms include formal procedures for developing the “opinion”; quality review of that opinion by the audit program manager; and an external review. Despite some inherent pitfalls in such a system, it provides some obvious benefits to management. Auditors can provide grades in the form of a performance classification (Figure 8) [Greeno, et al(b); Arthur D. Little]. The classification system can contribute to the pressure on lagging facilities to improve SH&E performance, yet is complimentary to facilities and managers who have worked continuously to enhance performance.

To better meet the needs of internal customers, a four-tier prioritization model can be implemented; essentially, this is a two-by-three matrix (three levels of risk or potential impact on the facility and two levels of control—Figure 9) [Greeno, et al(a); ILCI; Arthur D. Little]. All audit findings are mapped against the grid and any finding in the “high impact, no controls” box is classified an “A” finding, which requires immediate attention. SH&E professionals can use these findings to set action plan priorities and to identify what issues to convey to upper management. This combination of management systems assessments and prioritization of findings helps the audit program effectively communicate results to facility managers.

Once complete, all involved in the close-out meeting, including facility representatives, must know where the problems are and where to focus attention. Periodic updates should be conveyed to upper cor-
To be most effective, audit results should be reported to the board of directors at least once a year, perhaps even quarterly. The discussion should go beyond findings to provide a clear picture of the general state of the organization’s SH&E performance. This is where a quantitative measurement approach is helpful. Trend charts should provide a sense of how the program is progressing and should indicate the status of action items. In addition, a semiannual trend analysis can offer a clear and comprehensive update on how the audit program is proceeding, which is typically of high interest to these stakeholders.

**Conclusion**

To build and maintain quality and effectiveness through all aspects of the audit program, those involved must:

- focus on all dimensions of the program, including site selection and its impact on coverage and scope, and the roles for individual auditor, team leader and the team as a whole;
- use audit feedback—from auditees, auditors and team leader—to evaluate and improve the program;
- communicate results by first understanding their context and true meaning, then sharing them in a way that is understandable to facility and upper management [Greeno and Wilson; Greeno, et al(a), (b); CCPS; Arthur D. Little].

The auditing process is evolving. It is the focus of much external activity in the form of industry codes such as Responsible Care and ISO standards. The ability of audit programs to extend the effectiveness of management systems is growing as well.

It is helpful to examine different aspects of a company’s activities on a threeter tiered basis: threshold, performance and growth (Greeno and Wilson; Arthur D. Little). Certain aspects of a program are basic (threshold). Typically, companies want to perform these activities well because they are necessary simply to be a player in the market. After a certain point, however, more and
better threshold activities do not boost stakeholders’ level of satisfaction. Performance activities distinguish a company in the eyes of stakeholders, while growth factors are how a company truly differentiates itself from its competitors. Over time, growth factors become performance factors, and may even move down to threshold-level activities.

The sophistication of an audit program is linked to the sophistication of what is being audited and how well it is being managed. Once it is clear what an audit program can contribute to the bottom line, those involved can infuse innovation and vision into the audit process while driving performance improvement. What more could you ask?

References


Audit Opinion Classification Scheme

Meets Requirements
This opinion applies when, based on the auditor’s review, the facility is judged to be in compliance with all (or virtually all) of the applicable requirements included in the audit scope. For those few requirements where isolated exceptions are noted, these departures are determined to be occasional, anomalous and inconsequential in comparison to the overall level of compliance achieved. It is intended for locations that are found to be in full compliance with applicable requirements.

Substantially Meets Requirements
This opinion is given when audit results substantiate a high degree of compliance. It applies when, based on the auditor’s review, the facility is in compliance with most of the applicable requirements reviewed, yet a few requirements are not satisfied. These departures are considered to represent isolated exceptions in an otherwise effective compliance program.

Generally Meets Requirements, Except as Noted
This opinion applies when, based on the auditor’s review, a number of exceptions to applicable requirements are noted. These exceptions are more than isolated anomalies and reflect weakness in the design and/or implementation of compliance programs.

Requires Improvement to Meet Requirements
This opinion applies when, based on the auditor’s review, several exceptions to applicable requirements are noted and some of the exceptions reflect the absence of required programs, significant departures from established criteria or lapses in program implementation.

Requires Significant Improvement to Meet Requirements
This opinion applies when, based on the auditor’s review, many exceptions to applicable requirements are noted, including several significant departures from established criteria, the absence of several required programs, or prolonged inattention to the resolution of previously identified compliance or liability issues.

Source: Greeno, et al(a), (b); ILCI; Arthur D. Little.

Priority Rating Chart

Source: Greeno, et al(a); ILCI; Arthur D. Little.