

## Internal auditing of process safety

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Following an EPSC report on process safety auditing in 2012, further research was conducted on the related topic of internal auditing of process safety during the course of 2014. The research was in partial fulfilment of an MSc undertaken by the author and its scope included a literature review of the state of the art with respect to the audit of process safety across the major hazard industries.

In addition an online survey was conducted on current policies, standards and work practices associated with the internal audit of process safety and in particular evidence of continuous improvement throughout the audit cycle.

The aims of the work were to examine the barriers to effective process safety auditing and identify audit best practices which foster the audit process and enhance auditing outcomes. Another task was to identify the indicators of performance for process for process safety auditing currently in use across the major hazards industry. Broader aims included assessing the likely direction of travel for process safety auditing within broader corporate process safety assurance regimes and recommending areas for future research in the field of process safety auditing.

The paper studies the potentially contrasting points of view towards audits ranging from the role of audit programme manager through audit team leaders and team members to that of “the audited” primarily from the stand point of multinational corporations. Themes explored are the facts and opinions surrounding dedicated and general SHE audits, the motives and triggers for process safety audits and audit team composition. The business practices relating to pre-audit, onsite audit and post- audit activities are also examined.

Keywords : process safety auditing

### Background

The background to this particular research is that EPSC members have a commonly held interest in the audit of process safety which extends back to 2001 when the Centre commissioned a member report titled SHE auditing practice in the process industries. The report included a small survey on member auditing practices. In 2011 this report re- titled Process Safety Auditing was revised and included again a modest survey on member practices as well as a more detailed account of individual member approaches to auditing.

In a broader context there are other reasons as to why auditing is a focus amongst process safety practitioners. The first is that major accident performance across industry is popularly believed to have stagnated in recent years especially in comparison to that of personal safety which in the same period has seen a dramatic reduction in accident rates. The second reason for interest is that as a result of the continuing occurrence of major accidents the effectiveness of auditing itself has come under scrutiny from regulators, investigators and commentators. Furthermore auditing is an activity which is commonly conducted by the safety community and whose popularity is confirmed in a study by NAEM (2012) which lists the activity of auditing as in the top five of all activities undertaken by EHS professionals. If auditing is ineffective then a lot of effort would appear to be wasted.

The criticism of process auditing is well documented, Blewett and O’Keefe (2011) and NOHSC (2001) but it is rare to hear opinions expressed from those at the frontline who are engaged in the activity of auditing. This research provides an opportunity for a section of the process safety community working in industry to offer their views on a process in which many are intimately involved.

### Introduction

The objectives of the research were to explore the facts and opinion on the internal auditing of process safety from the perspective of process safety practitioners who play a role in the auditing of process safety. Specific objectives were to

- Survey current policies, standards, practices and opinion associated with the internal audit of process safety
- Examine the barriers to effective process safety auditing
- Identify areas for future research in the field of process safety auditing

The web survey was compiled with the use of commercial survey software. In the order of 300 personalised invitations selected from a database of process safety practitioners were distributed from 21-28 August 2014 and at the close of the survey on the 30 September 2014 the survey had attracted 82 respondents which represents a response rate of about 27%. As with many surveys of this nature not all respondents fully completed the survey although partially completed surveys were included in the overall results.

The survey population comprised audit programme managers (17%), audit team leaders (23%) audit team members (34%) and auditees (10%) as well as other roles associated with auditing including technical specialist and management oversight roles. The majority of respondents (95%) saw themselves as working for multinational companies.

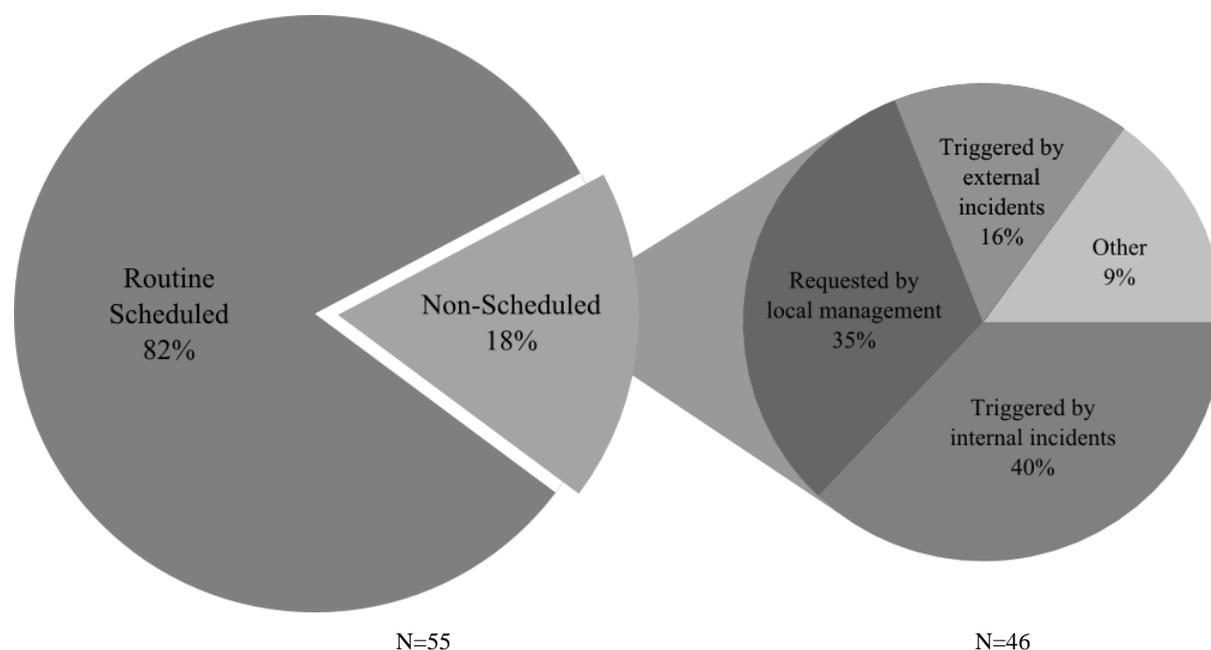
## Audit Motives

The first section of the survey invited respondents to answer questions on how their business organised its process safety audits. The survey highlighted that about 75% of respondents conducted dedicated process safety audits as opposed to the remainder that cover process safety elements as part of their general SHE audit. The rationale for dedicated process safety audits were not explored but the assumption is that the respondents who operate a dedicated programme for the auditing of process safety do so because they consider their major risk profile demands this degree of attention and focus. One of the downsides to this approach is that for a business it can impose an increased audit load on its major hazards sites for overall workplace safety.

Those respondents who declared that their business conducted dedicated process safety audits were then invited to state the underlying motives for their audits. The majority of respondents (82%) stated that their audits could be described as routine scheduled audits as illustrated below in Fig 1. Although not shown about a third of all respondents reported that all of their process safety audits within the business are routinely scheduled and at the other end of the spectrum a little over ten per cent of respondents declared that routinely scheduled audits amounted to fifty per cent or less of their total process safety audits.

Safety auditing is commonly described as an example of pro-active monitoring of safety performance. However when reported levels of audit scheduling are low then audits with some justification can be described as a form of reactive monitoring of safety performance. Of those audits that are not routinely scheduled Fig 1 shows that about 40% are triggered by internal incidents. These incidents of either actual or potential high impact (near misses) may initiate audits which focus on identified systemic shortcomings in specific elements of the process safety management system. An audit team member made the valid point that such visits would not be designated as audits within their business which indicates a widely varying use of terminology across different companies. Interestingly some audits are requested by local management often with a view to establishing a baseline of process safety performance for a particular facility.

**Fig 1 Motives for dedicated process safety audits**

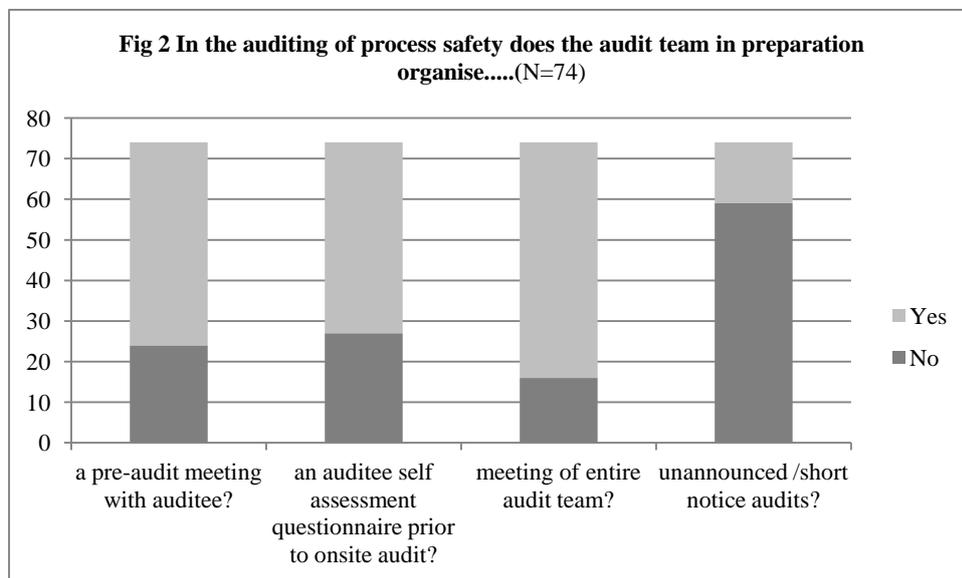


## Pre-Audit

The planning and preparation of an audit is a necessary condition towards the satisfactory conduct of an audit. This section of the survey explored various aspects of preparing for the audit such as degree of interaction between the audit team and the audited site and amongst the audit team itself. The results show in Fig 2 about two thirds of audit teams hold a pre-audit meeting with the auditee and a similar number request that the auditee completes a self-assessment questionnaire. The survey did not explore the correlation between audit performance and self-assessment scores but anecdotal evidence presented at an EPSC meeting suggests that those sites which score themselves highly tend to perform less well during the

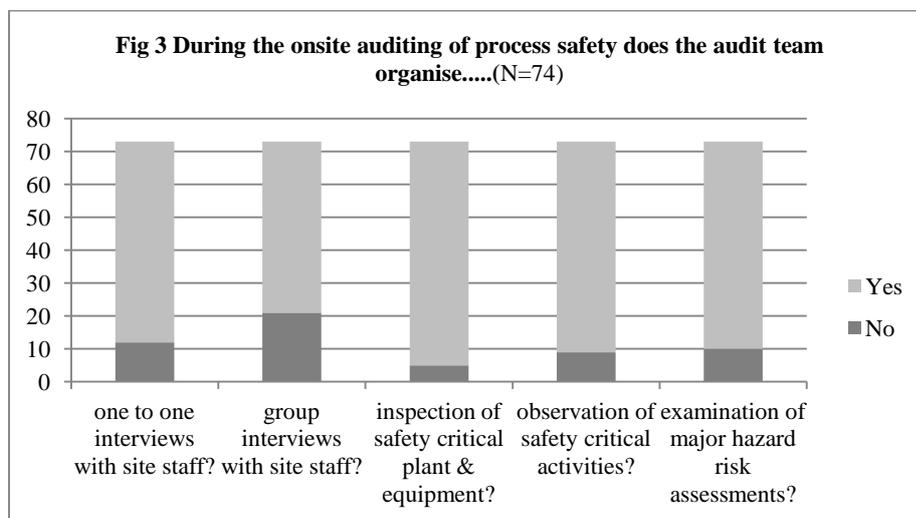
audit than those whose assessment is less glowing. About three quarters of the respondents stated that they hold a meeting of the entire audit team prior to the audit visit. This meeting may be a virtual rather than a physical meeting due to team members having their home base on different sites and in different regions and therefore offering a degree of independence to the site under audit.

A less common practice was to organise unannounced or short notice audits which no doubt would be less welcome than those where sites receive notice of some months or at least several weeks. The advantage of surprise audits is that they provide an opportunity to observe a site operating under its usual, normal working conditions. The drawbacks are that key staff may not be available or part of the plant may not be functioning at the time of the visit.



### Onsite Audit

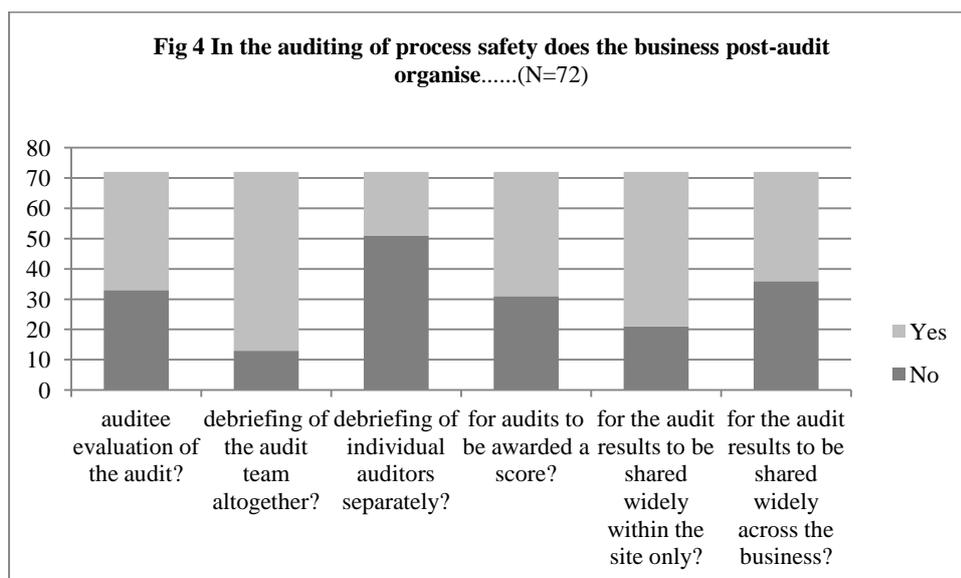
This section of the survey explored the practices associated with onsite activities such as gathering audit evidence. Gathering audit evidence ostensibly comprises three modes which are the visual such as observation and inspection, the verbal such as interview and the written such as records and documentation. From Fig 3 a sizeable majority of respondents stated that their business conducts inspection of safety critical equipment, observation of safety critical activity and examination of major hazard risk assessments. The survey posed further questions about the conduct of staff interviews be they group or one to one interviews. Each has its pros and cons with group interviews offering the competent auditor the opportunity for site interaction and one to one interviews the opportunity for candid disclosure of personal views. With respect to process safety each mode of gathering audit evidence has its strengths and weaknesses and an audit team may choose to weight its approach on an audit by audit basis. For example a team faced with a plant with an ageing profile may decide to spend the majority of its time on field inspection. For a plant where human error is a large contributor to major accident causation the team may elect to spend the majority of its time interviewing staff.



Inspection of documentation and records represents the most efficient mode for gathering of audit evidence but its overuse can encourage audited sites to generate paperwork for the sake of the audit in order to keep the audit team content.

## Post-Audit

The section covers a broad range of practices and activities after the onsite audit, some of which may lie outside the normal remit of the audit team. Post-audit activities can offer learning opportunities for the audit team and wider business. The survey posed several questions related to debriefing /evaluation of the onsite audit from the perspective of the audit team and auditee. Over 80% of respondents stated that they conduct debriefings with the entire audit team post-audit. An advantage with this approach is that collective feedback can result in several suggestions for improvement. In contrast about 30% of respondents reported members of the audit being interviewed separately post-audit. An advantage of separate interviews is that they may well flush to the surface any concerns that an individual auditor may have with respect to the presence of any biases or lack of impartiality as exhibited by the audit team during the conduct of the audit. Audit teams may also opt to gather opinion on the audit from the point of view of the auditee which may seem appropriate given that the site may be the greatest benefactor of the audit.

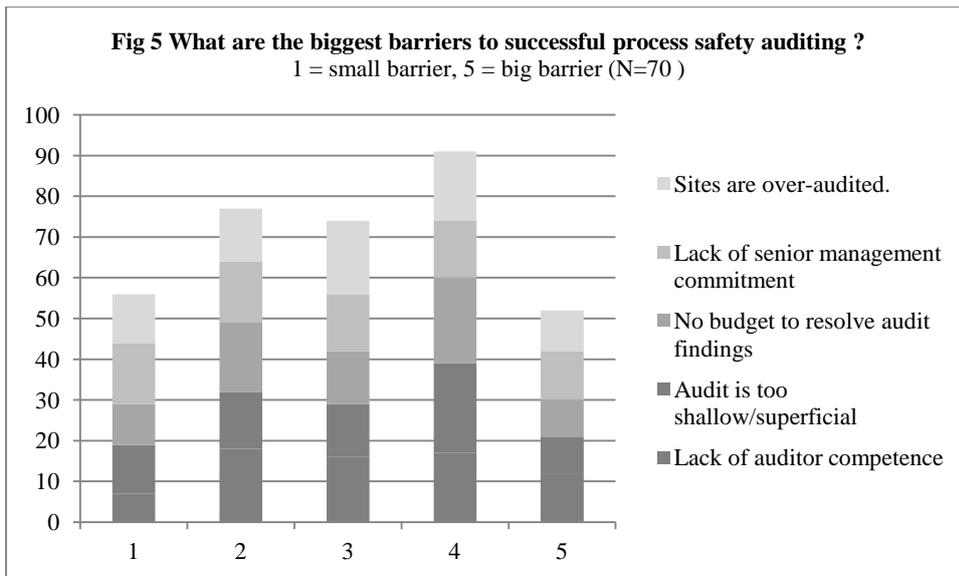


Post-audit several questions were posed regarding the sharing and publication of audit results. These served as a surrogate measure of employee engagement which is considered to be essential to successful auditing outcomes and as identified in the literature review. Feedback on audit results to site workers, some of whom would have had contact time with the audit team, would seem a sensible way to encourage employee engagement. About 70% of respondents said that they shared audit results within the site and 50% respondents stated that they shared audit results across the business which can in some instances result in the business compiling league tables of performance and publishing these across the business.

About 57% of respondents declared that their business scored audits. Scoring audits offers the advantages of tracking audit performance over time for the same site and also benchmarking across sites. The downsides appear to be that scoring audits can diminish the audit to a bottom line score or several headline scores which can be misleading especially when taking into account changing or different risk profiles and the scoring of major and minor deficiencies. In a general SHE audit for instance the major hazard risks are in danger of being masked by scoring when their critical nature would be best elevated.

## Auditing Barriers

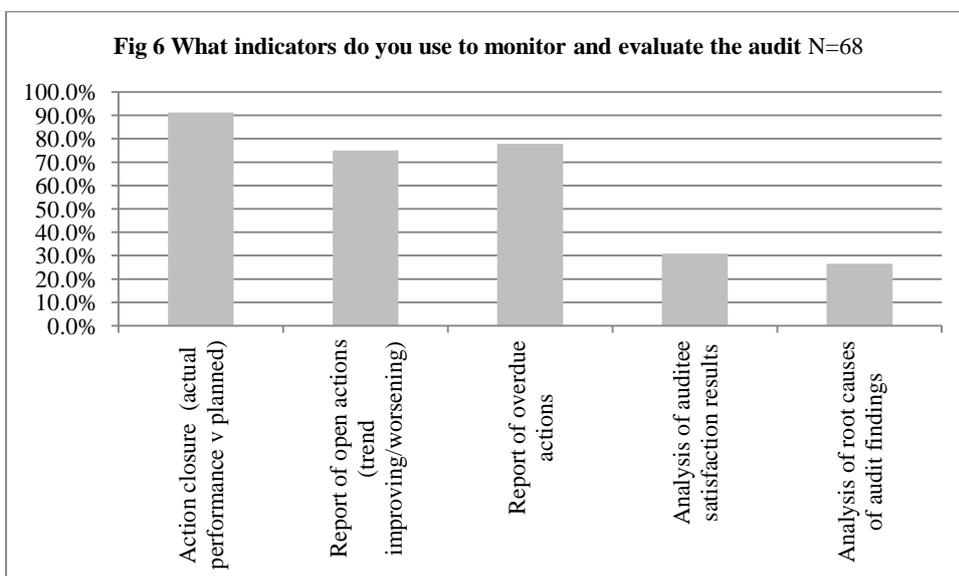
This section invited respondents to offer their personal opinion as to the biggest barriers to successful process safety auditing. Respondents were invited to score several suggested barriers to successful process safety auditing and a breakdown of those which attracted the highest scores are shown in Fig 5. In the biggest possible barrier category, the most commonly assigned barriers were lack of senior management commitment, lack of auditor competence, sites are over audited, audit is too shallow and no budget to resolve findings.



Several respected sources view auditor competence and senior management commitment as necessary ingredients to successful auditing and these two aspects it would appear are perennial hotspots in the audit process. That audits are too shallow or superficial reflects in part auditor competence, audit criteria and wider purposes of the audit programme. Audits are designed to be probing and searching assessments of site performance but the level of depth may be limited by considerations such as audit scope and auditor time available on site. No budget to resolve findings has a particular relevance to process safety audits where a serious shortcoming which has arisen could prove costly to resolve for example the loss of documentation to the specification and design of safety critical equipment. Resolution essentially lies with the sponsor of the audit programme who having commissioned the audit needs to then address the follow up actions which may involve capital funding.

**Audit programme indicators**

The section invites the respondent to answer questions with respect to the monitoring of the audit programme. The results shown in Fig 6 indicate that a sizeable majority of respondents track action closure, report of open actions, and report of overdue actions by action owner. Action closure helps to determine the realism of the agreed target dates whilst a report of open actions establishes a trend which can be monitored for improvement or decline which will help to determine whether adequate resources are being used to address issue. The fact that a majority of respondents track and steward the completion of audit follow up actions demonstrates how critical the closure of actions are to the success and credibility of an audit. About 30% of respondents reported that their business both analyses the results of auditee satisfaction and root cause findings. Root cause findings can also be used to identify themes for future audits.



## Future Research

The final section of the survey invited respondents to propose one question which they would have liked to have seen answered by their peers in a future survey. The proposed questions have been organised into the following topic areas.

1. Audit Organisation & Rationale
2. Auditor Competence & Motivation
3. Audit Intensity
4. Audit Content
5. Audit Results
6. Audit Benefit & Success

Audit organisation concerns the strategic considerations relating to the organisation's choice of audit as an assurance tool particularly at different levels of the business and how these audit programmes relate to each other. One interesting question is whether an audit for a multinational business adopts a common approach throughout the business or tailors the audit takes into the risk profile of a particular operation.

Auditor competence relates primarily to the formal qualifications for members of the audit team and the incentives for becoming an auditor in the first place. It is often overlooked that auditing places a load not only on the audited site but also on the auditor. Full time auditors can travel extensively within their territories and part time auditors return to their home workplaces and their "day jobs" after conducting an audit. The question is what rewards and incentives exist for a part time auditor to engage in taxing extracurricular activity such as auditing

Audit intensity describes to the audit frequency and effort associated with the internal auditing of process safety. One interesting question is more related to lack of intensity and concerns the freedom of the audited site to postpone or cancel scheduled audits and the circumstances surrounding a decision. Audits can be disruptive but can also identify major accident vulnerabilities in such extenuating circumstances.

Audit content comprises questions regarding the selection of audit topics including those that are identified through near miss analysis and the scientific basis for that choice stemming from an assessment of safety barrier quality.

Audit results describe issues relate to the escalation process for close out of audit actions and the involvement of senior management in the audit follow up. The timely closure of agreed actions is vital to audit effectiveness. Nevertheless it is recognised that from time to time audit actions will not be addressed within the agreed timescales. This may due to any number of factors such as lack of resource, change of business priorities, recognition of need, etc.

The final topic area of audit benefit and success concerns questions about auditing cost benefits, definitions of auditing success and the correlation between internal audit scores and EHS performance.

## Conclusion

There is growing concern with respect to the effectiveness of auditing of process safety management systems as undertaken by major hazard operators and especially in relation to the prior role of audit in several major incidents. Investigations into these major accidents have revealed flaws in process safety management systems and more specifically shortcomings in the audit process itself which is designed to maintain and improve the system.

The subject of this research was the internal auditing of process safety from the viewpoint of those process safety practitioners who play a role in that process. The initial research dealt with the facts and opinions concerning the approaches to auditing of process safety through use of dedicated or general safety, health and environment audits and the motives and triggers for initiating dedicated process safety audits. The research then explored practices associated with the conventional audit phases of pre-audit, on-site and post-audit activities. Finally the survey recorded respondent opinion on the barriers and future research area to auditing of process safety.

The key findings are that the majority of respondents reported that their business operated dedicated process safety audits as opposed to those who reported that their business audited process safety as part of a general SHE audit. Those who reported that their business conducted dedicated process safety audits stated for the most part that their process safety audits were routinely scheduled as opposed to ad hoc audits. Those audits that can be described as non routine were triggered mainly by internal incidents and requests by local management.

As far as audit implementation the majority of respondents reported in the pre-audit phase that they met with the auditee and convened a meeting with the entire audit team. There is widespread use of an auditee self assessment prior to the onsite audit. A less common practice is the organisation of unannounced or short noticed audits. For the onsite audit most respondents reported that they gathered audit evidence through the conventional modes of the visual, the verbal and the written. For interviews of staff most respondents conduct one to one and group interviews with site personnel which is in line with good auditing practice to use a variety of means to gather audit evidence.

Post audit a sizeable majority of respondents reported that their business debriefs the entire audit team on the onsite activities. Fewer respondents but still in the majority stated that they conducted auditee evaluation and only a minority of respondents reported that they debriefed individual auditors. Only a modest majority of respondents declared that they scored audits, which reflects that a single audit score or series of scores can cause the auditee to be pre-occupied with the bottom line number at the expense of a broader understanding of how audit scores are arrived at. Disclosure and sharing of audit results offers an opportunity to engage the workforce of the site under audit in the auditing process. The majority of respondents reported that they publicise audit results within the audited site and less commonly that they publicise the audit results across the business.

The biggest barriers for successful auditing was believed to be lack of senior management commitment, lack of auditor competence, sites are over audited, audit is too shallow and no budget to resolve findings. The first two barriers confirm many criticisms echoed in the literature by regulators and commentators alike. It is worth noting that even for the biggest auditing barriers many respondents still saw these as relatively minor impediments to successful auditing. Respondents reported the use of several indicators in monitoring the audit programme.

Many survey respondents proposed future research questions in the area of process safety auditing which suggests that whilst those involved in process safety auditing do not see the exercise as offering a false sense of security that at the same time there is significant industry interest in improving the audit process.

Several respondents elaborated their survey responses with comments which in the main indicated a sense of confidence in the effectiveness of internal audits although it is clear that an audit which at best is both a snapshot and sample offers no guarantee to prevention of a major accident..

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