The process safety audit – a corporate comfort blanket?

Lee Allford, European Process Safety Centre, Davis Building, Rugby CV21 3HQ

Investigations into major accidents in recent years have revealed flaws in PSM systems and more specifically shortcomings in the audit process itself which is designed to maintain and improve the system. Explicit criticisms of auditing have been voiced in the aftermath of major disasters such as that in 2005 at Texas City, one of the worst post war industrial accidents in the US and again later in the same year, the fire at Buncefield in the UK which has been described as the largest of its kind in peace time Europe.

Across Europe the system of safety auditing is well established in the high hazards industries but prompted by the publication of the Independent Panel Safety Review in the aftermath of the Texas City accident in 2005, and the changing nature of process safety auditing in recent years, the European Process Safety Centre (EPSC) convened a working group in 2009 to consider its earlier report on SHE auditing practice for the process industries.

This paper covers the major highlights from a revised report on the topic published in 2012 including the results of a survey of member practice on process safety auditing as well as drawing on personal accounts on the critical success factors for auditing including auditor related aspects such as competence, independence and bias and process related aspects such as sampling, audit scoring, and audit follow up.

Keywords: Process safety, audit

Introduction

A safety audit according to European Process Safety Centre (EPSC) is a

Process of independent, systematic examination to assess the extent of conformance with defined standards and recognised good practice, to thereby identify opportunities for improvement. (EPSC) (2001, p.7)

Later in the same report a safety audit is described in glowing terms as a

Positive and helpful force for improvement, owned and welcomed by management and conducted on a planned and regular basis. EPSC (2001, p.11)

It is the aim of this paper to explore these descriptions from the perspective of first party or self auditing performed by a major hazards operator or in other words the process safety management (PSM) system owner.

The task of audit is an integral element to systems of PSM and is common place in the activities of major hazard operators; in high-level frameworks and tools published by bodies such as the Energy Institute (2011) and Organisation for Economic Co-operation and Development (2013) and requirements laid out by national regulators such as the Occupational Safety and Health Administration (2000) and Health and Safety Executive (HSE) (2007).

Audit failings in major accidents

Investigations into major accidents in recent years have revealed flaws in PSM systems and more specifically shortcomings in the audit process itself which is designed to maintain and improve the system. The irony of flawed audit assurance is not lost on Sutton (2009) who warns that one of the early signs of a degraded process safety culture is that of ineffective auditing. This shows itself in the softening of bad news to senior managers, a failure to find root causes of deficiencies, and an inadequate follow up to audit findings.

In the aftermath of Texas City the BP U.S. Refineries Independent Safety Review Panel (known informally as the Baker Panel) expressed its concern that

The principal focus of audits was with compliance and verifying that required management systems were in place to satisfy legal requirements. It does not appear, however, that BP used the audits to ensure that the management systems were delivering the desired safety performance or to assess a site's performance against industry best practices. (2007, p. xv)

In one of its ten key recommendations the Baker Panel made explicit reference to process safety auditing and proposed that BP should establish and implement an effective system to audit process safety performance at its US refineries.

In a similar vein, the HSE found that at Buncefield that

Auditing and monitoring arrangements focused on whether a system was in place; the audits did not test the quality of the systems and, most importantly, did not check whether they were being used or were effective (2011, p. 5)

In the same report, HSE was careful to state that there are key aspects of a PSM which have a greater priority than that of audit. These are clear understanding throughout an organisation of both major accident risks and the safety critical equipment and systems designed to control them and equally, the presence of systems and culture which detect warning

signals of failure. Moreover, HSE urged that a high hazards business should make the time and resources available for process safety. The essential message is that for a process safety audit to be effective that the organisation itself needs to be in a state of maturity and readiness in order to benefit from that audit.

Published criticism of safety auditing

The universal perception that process safety performance lags behind that of personal safety across industry in the developed world has implications for the effectiveness of PSM systems and in turn for PSM auditing. Nevertheless the role of audit in workplace safety management systems (SMS) in general has not escaped public scrutiny and comment.

The National Occupational Health and Safety Commission (2001) whilst recognising several benefits of safety audit tools observed that they can act as a barrier to the effectiveness of a SMS. The Commission lists several shortcomings with audit tools which include their "one size fits all" approach and their inability to assess the elements which are pre-conditions for an effective SMS such as senior management commitment and employee involvement in the planning, implementation and review of a SMS. Tellingly, the Commission believes that audit tools lead to strong focus on tangible hazards to the exclusion of latent, long term health risks; risks that bear comparison to the latent process safety risks associated with major accident causation.

The theme of audit frailty is further developed by Blewett and O'Keefe (2011) who identify several weaknesses related to the auditing of SMS which include paperwork for its own sake (so called tick box auditing), inherent problems associated with scoring an audit and lack of auditor independence and competence. The scoring of an audit often attracts more heat than light as individual and site performance rewards reflect audit outcomes. Safety performance is often not black and white and reducing audits to single scores can be counter- productive for an organisation that wishes to learn.

Several commentators suggest that the audit of SMS far has become ritualised and subject to corporate choreography rather than a means to improving workplace safety. This point is further emphasised in papers by the same author, Bunker (2004a and 2004b) who offers advice on audit tactics from the perspectives of both the audited entity and the auditor, which is not always in a spirit of mutual trust and learning and in marked contrast to the positive description of audit offered at the start of this paper.

EPSC member auditing practices

Across Europe the system of safety auditing is well established in the high hazards industries but prompted by the changing nature of process safety auditing, EPSC convened a working group in 2009 to consider its earlier report on SHE auditing practice for the process industries and published the revised report in 2012. An outcome of the working group was a survey of member practices with respect to process safety auditing. The respondents without exception were large multinational organisations.

Bigelow and Robson (2006) identified two key factors which could affect the reliability and validity of safety audits which are

Auditor-related factors include issues of competence, bias and independence of the individuals carrying out the audit.

Process-related factors include: the theoretical basis for the audit; the existence of a coherent and comprehensive audit framework; the existence of clear standards for comparison; the use of multiple information sources; the choice of who to speak to and where to look when auditing a workplace; the weighting of various audit components; quality control issues; and details about procedures and objectivity.

A key question raised by the survey was how was the auditing of process safety organised within members companies with the results shown in Figure 1. Auditing process safety within general SHE audits implies a degree of full or partial integration of the PSM system into a single management system which has several advantages for the operating site not least the reduced audit load.

Figure 1   The organisation of process safety audits

■ Process safety part of SHE Audits
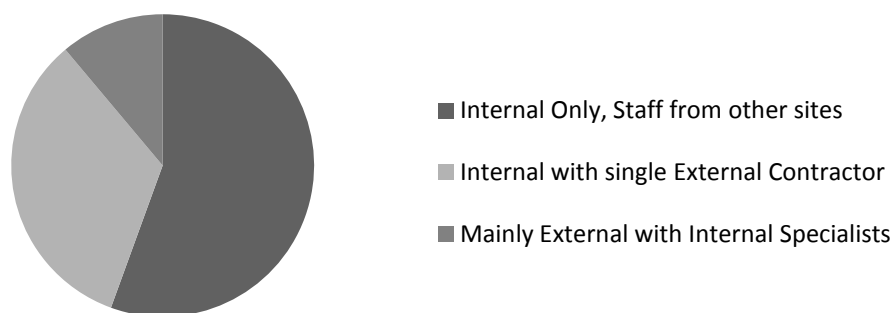
■ Dedicated process safety audits
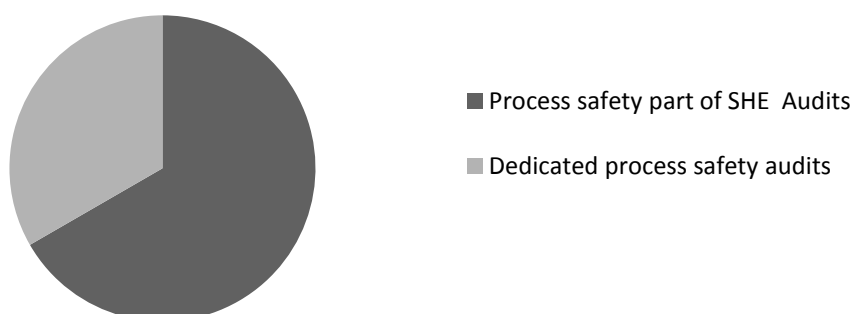
Two thirds of members incorporate process safety auditing within their general SHE audits whilst the remaining respondents organise dedicated process safety audits.

One of the bigger obstacles to auditing an integrated system is finding auditors with sufficient knowledge and experience in auditing multiple systems, especially simultaneously. Identifying auditors with both knowledge and an applied understanding of the different management system standards involved can be challenging.

Following member discussion regarding both outsourcing and in-sourcing of the auditing function a question on the make-up of internal auditing team as illustrated in Figure 2.

Figure 2   Audit team composition

■ Internal Only, Staff from other sites

■ Internal with single External Contractor

■ Mainly External with Internal Specialists

All companies use internal staff to varying degrees within their auditing teams with over half of the respondents using auditors solely from locations within the same business and independent of the audited facility. The next most popular approach was to use predominantly internal auditors supplemented by an external auditor. One respondent used mainly external auditors with internal specialists.

The advantages of using internal auditors is that they are likely to know where to look for potential hotspots, and the act of auditing can help disseminate best practice as a result of exposure to the practices of another site within their own organisation. In this arrangement the auditor when they return to their own places of work will have a greater appreciation of the process when they find themselves audited by internal members.

The main disadvantage of relying entirely on internal auditors is that it removes resource from their own place of work both for audits and the necessary training. Internal auditors may also be liable to an over-identification with the audited facility, prone to the same flaws and generally disposed to insularity.

The survey also invited members to share how they go about seeking audit evidence. Audit evidence is gathered conventionally from studying documents, observing activity/ inspecting plant, and interviewing staff as Figure 3 illustrates.

Figure 3   Methods of gathering audit evidence

■ Documentation, observation

■ Documentation, observation, interview
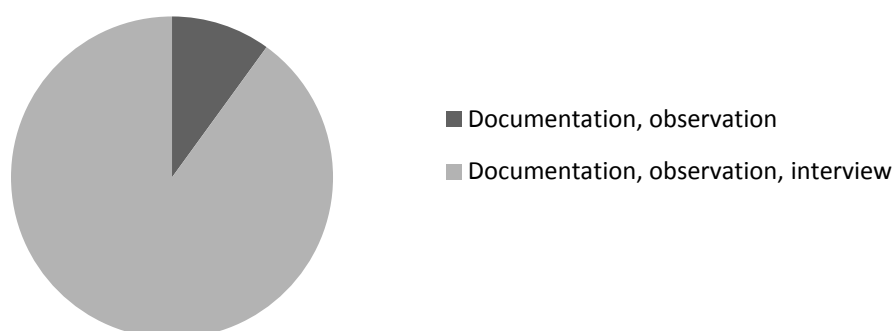
All respondents use the three conventional methods apart from one member who chooses not to interview staff. The reasons for choosing not to interview lie in the cultural challenges. Strongly linked to the question of culture is language, a fundamental source of problems in cross cultural transactions. The safety auditor faces the language issue on two fronts in dealing with staff of the audited entity and in communicating with other members of a multinational audit team. Both can present significant barriers to common understanding.

One challenge presented to the international auditor is auditing compliance to local regulation. Although some audit teams will have a member who speaks the local language proper verification of compliance involves matching up practice with the law which is problematic when filtered through several personnel speaking different languages.

The survey indicated that all respondents employed a risk based approach at a high level. At a tactical level there appears to be differences in how inspection of plant, observation of activity and selection of staff to be interviewed is conducted. Figure 4 indicates that the majority of respondents would leave the decision to the discretion of the audit team; some would confine auditors within a pre-defined sampling plan, whilst the remaining respondents indicated that sampling would be on a purely random basis. The practical issue with respect to audit sampling is that rarely is the audited site ordered for the convenience of the auditor particularly with respect to availability of plant, infrequent but high risk activities such as plant start ups and shut downs and access to shift personnel.

Figure 4   Sampling choices

■ Auditors Choice

■ Structured Choice

■ Random Selection
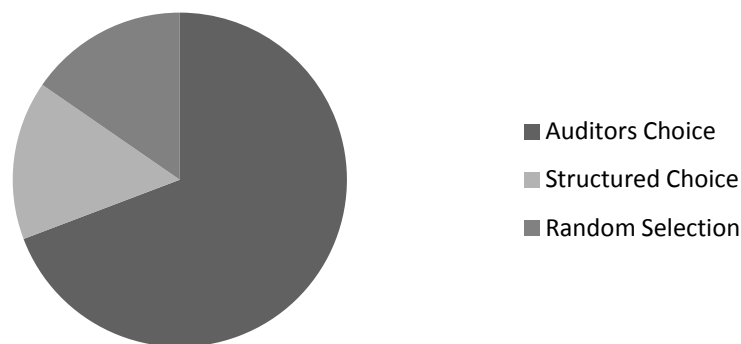
One interesting question posed by the survey related to benchmarking of audit processes with peers. Figure 5 shows that just over half of the respondents conduct formal benchmarking of their auditing processes with the remaining members engaging in informal or no benchmarking with peers.

Figure 5   Benchmarking safety audit processes with peers

■ Formal benchmarking with peer companies

■ Benchmarking informal or not implemented
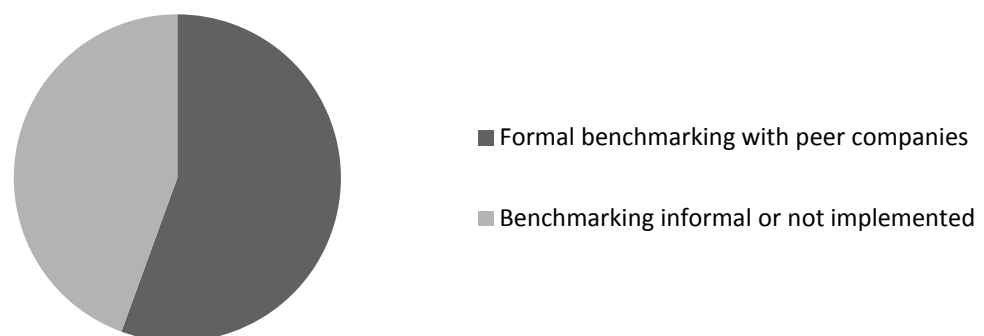
One member engages with a third party to evaluate its corporate auditing programme against criteria including external expectations set by organisations with standing in the SHE audit community and generally accepted audit practices in comparable companies. Bench marking audit processes with peers may offer an antidote to the potential insularity of auditing programmes which exclusively use internal personnel.

Since the publication of the revised report in 2012 further information has been shared between EPSC members on the size of audit teams as shown in Figure 6.

Fundamentally the audit team size will reflect the risk profile, complexity and number of staff working at the audited operation.

Figure 6　Audit team size range
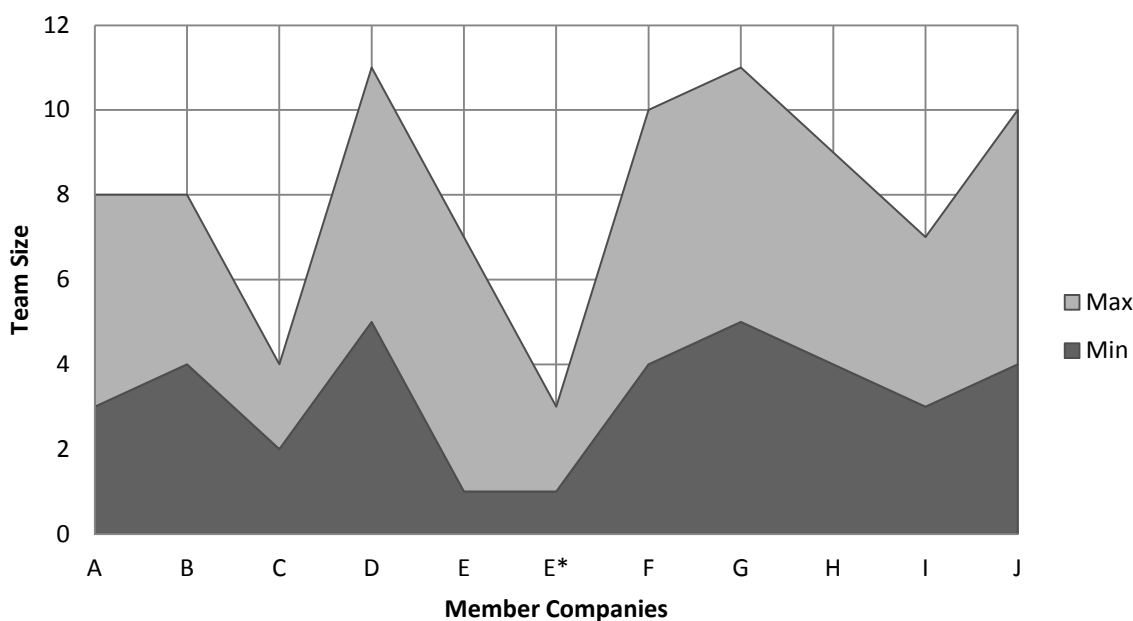
E* refers to the practice of company E to conduct unannounced audits i.e. 24 hours notice.

In contrast to the notion that audits are conducted on a centrally planned and regular basis it is worth pointing out that there appears to be a growing tendency for site managers new into position to call forward for an audit of their facility which may well act as their personal performance baseline. It is also noteworthy that safety auditing with the exception of company E is a team rather than a solo activity. This may be for reasons of bias, such as frequency and selectivity bias.

Frequency bias refers to the tendency to over (or under) estimate the probability of occurrence of a particular event when the evaluation is based solely on reference to personal experience and the assumption that such experience is universal. For example, a safety auditor may focus attention on a particular series of questions in the protocol knowing that other audited sites have previously demonstrated weaknesses in these areas.

Selectivity bias describes the tendency to select items based on a restricted set of facts and to ignore those facts that do not fit into the expected pattern. For instance, a safety auditor may focus attention on physically important or obvious characteristics (e.g. loud, bright, recent, centrally visible, easy to interpret) and ignore critical cues that might provide more relevant information about the nature of the situation.

Findings

EPSC members share the view that the bedrock of auditing is in fact ongoing self assessment from the audited facility and unless this occurs it is unlikely that the act of auditing independent to the site will achieve much value in the long term.

There are signs that high hazard operators are changing up and improving their auditing operations in for instance unannounced or short notice audits, use of specific means of gathering audit evidence and benchmarking auditing processes with peer companies.

New requirements and new sites (especially those that are acquired) also present challenges as to how they are treated and integrated into a corporate audit programme.

EPSC members also expressed the view that audit as a term is loaded with meaning which may prove unhelpful to an evaluation of safety performance. Safety assessment would seem more appropriate.

Conclusions

There is increasing concern from regulators and investigators with respect to the effectiveness of auditing of PSM systems as undertaken by major hazard operators and especially in relation to the prior role of audit in several recent major accidents. Their commonly held view is that there is a pre-occupation with compliance at the expense of assessing the effectiveness of PSM systems. In other words operators are more disposed to check that the audited reality matches with what they say they do rather than what they should do.

Several commentators within the process safety community, Eames (2013), Sepeda (2009) continue to see a role for audit albeit re-purposed or else as a complement to other assessment tools. This is in contrast to several observers outside of the process safety community that see deep rooted problems with auditing often related to inadequate PSM system implementation. Nevertheless there are few signs that audit based assurance is about to be reformed or replaced soon by more searching and reliable tools.

Future work

Future direction of travel is for EPSC to

- Survey current policies, standards and practices associated with the internal audit of process safety and in particular continuous improvement through the audit cycle

- Examine both the barriers to effective process safety auditing and audit best practices which foster the audit process and enhance auditing outcomes

- Identify the indicators of performance for process safety auditing currently in use across the major hazards industry

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