

USING PROCESS SAFETY PEER REVIEW TO IDENTIFY BEST PRACTICES – A CASE STUDY

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The paper first summarises an earlier study which demonstrated that cross-sector peer review, developed by IOSH Hazardous Industries Group, could help to prevent major process incidents. This is followed by a case study of how National Grid – a major electricity and gas utility which operates across the UK and the north-eastern US – launched the process across all its major hazard business areas. It describes how the training materials, developed collaboratively by IOSH and National Grid, were delivered to ‘facilitators’ across the company, and then summarises typical best practices identified during the onsite peer reviews. From the outset, there was a serious concern from the personnel being trained as facilitators that peer review would have little credibility with site managers by looking too much like audit, so the decision was taken to focus on identifying best practices to share with other sites and business areas, limiting reports of ‘areas for improvement’ to each individual site and its responsible director. The fear that there would be too few best practices to share across different businesses in the same geographical region proved unfounded.

IOSH has included the Process Safety Peer Reviewer and Facilitator training courses developed with National Grid in its 2013 programme of Professional Development courses.

RISING TO THE CHALLENGE FROM HSE

A paper at Hazards XXI [Sellers, Mason & Hemming, 2009] described how IOSH Hazardous Industries Group was rising to a challenge from HSE Chair, Judith Hackett, to spread learning and good practice across all the major hazard industries, through a high level cross-sector practical peer review process.

A Stage 1 Pilot Study focussed on three control rooms in different safety-critical industries (nuclear, offshore gas storage and low pressure gas distribution) while a Stage 2 Pilot was of maintenance activities in another three different industries (gas processing and distribution, nuclear weapons, and submarine construction). The peer reviewers were all functional specialists – control room supervisors for the stage 1 study and maintenance managers for stage 2. For stage 1, the peer reviewers had a good understanding of ‘what makes a good control room’ but were able to bring a fresh perspective of best practices from their own industry sector; similarly for stage 2 with ‘what makes a good maintenance operation’. Both pilot studies were successful.

COULD CROSS-SECTOR PEER REVIEW HELP TO PREVENT MAJOR PROCESS INCIDENTS?

The intent from the HSE Chair in suggesting cross-sector peer review was to improve the ability of major hazard organisations to avoid major process incidents, which occur only rarely but have high consequences (we note that, although the process industry describes its management systems for avoiding high consequence incidents as ‘process safety’, similar systems in the nuclear industry

are called ‘nuclear safety’ and in the transportation industry ‘system safety’).

The emphasis in peer review is to observe what is really happening, rather than to spend a great deal of time reviewing the policies and procedures which specify what is meant to happen. Therefore cross-sector peer review could clearly identify the situations and behaviours that may lead to occupational safety incidents (ones that occur frequently and have relatively low consequences in that each incident affects only one person or a small number of people).

So the question has been asked, “Does cross-sector peer review have any role in identifying the infrequent situations and behaviours that may lead to process safety incidents?” A paper at Hazards XXII [Sellers, 2011] categorised the causes of 42 major process incidents [Atherton, 2008] against eight categories of issues [van Wijk, 2008] to identify which of the incidents might realistically have been prevented by cross-sector peer review. The analysis showed that cross-sector peer review could have identified the great majority of issues, the exception being where operating and maintenance teams were unaware of design deficiencies – for which technical peer review would be an appropriate tool. The paper concluded that cross-sector peer review is a powerful tool for improving process safety.

LAUNCHING CROSS-SECTOR PEER REVIEW AT NATIONAL GRID

In 2010 National Grid initiated a Major Accident Hazards (MAH) programme to ensure that the company had

identified all its major accident hazards and was managing them to reduce risks as low as reasonably practicable. As one of three participants in the IOSH Stage 1 Pilot Study, the company decided that cross-sector peer review should be included in its MAH programme. National Grid is a diverse company, operating electricity and gas utilities in the UK and the north-eastern United States, so it decided to launch peer review within its own operations.

Although National Grid operates both electricity and gas assets, only the gas assets fall within the scope of the UK Control of Major Accident Hazards Regulations (COMAH). So the initial peer reviews were limited to UK top-tier COMAH gas assets and equivalent US gas assets.

National Grid decided that six of its own staff should be trained as facilitators to provide an in-house capability. National Grid retained one of the authors (GS) to train its facilitators and assist them to launch the peer review process.

We will now discuss the steps in the launch, namely:

1. Develop training materials for use during the launch and in subsequent peer reviews.
2. Train National Grid's facilitators.
3. Conduct the first US and UK peer reviews.
4. Review the results and decide on future policy for peer review.

DEVELOPING PEER REVIEW TRAINING MATERIALS

The two IOSH pilot studies had relied on the facilitators to train their peer reviewers without formal materials, using their personal experience of leading various types of studies including Hazard & Operability Studies, Health & Safety Audits, Behavioural Safety and peer reviews of nuclear installations. But to provide consistency between multiple facilitators training their peer reviewers and to form the basis for an IOSH Continuing Professional Development course, it was clear that training materials needed to be developed. Based on experience from the pilot studies, the IOSH working party had decided there should be:

- A 2-day peer reviewer course; and
- A 1-day supplementary course for facilitators who had already attended a peer reviewer course.

The training materials were developed using a variety of sources:

- Personal experience of the IOSH Stage 1 Pilot Study and of on-site process safety studies; and
- Materials supplied by a retired nuclear safety expert who had led numerous peer reviews for the World Association of Nuclear Operators; and

The peer reviewer materials were produced as an interactive 80-slide PowerPoint presentation, which includes guidance notes for use by the trainer. The topics covered are:

- History of process safety peer review
- Defining excellence in process safety

- Observation techniques – seeing what safety-critical activities are actually happening
- Observation reports – facts not impressions
- Follow up to site visits – reporting back to senior management, issuing reports, action plans
- Arrangements for site visits – practical details
- Peer review compared with other management systems.

The facilitator materials are considerably shorter, at about 50 slides, and most importantly cover the coaching role of the facilitator, as well as the administrative tasks in setting up a successful process safety peer review.

Reporting is structured around National Grid's set of Risk Control Standards, which were developed by the company based on guidance from the UK Health & Safety Executive, the US Center for Chemical Plant Safety and standards from the gas and electricity industries, and aligned with the company's existing 12 process safety key performance indicators:

- RCS1 Leadership & Organisational Change
- RCS2 Asset Design, Modifications & Operational Readiness
- RCS3 Operating Procedures & Instructions
- RCS4 Workforce Competence
- RCS5 Human Factors
- RCS6 Emergency Arrangements
- RCS7 Protective Devices, Instrumentation & Alarms
- RCS8 Inspection & Maintenance
- RCS9 Permit to Work
- RCS10 Asset Records & Data Quality
- RCS11 3rd Party Activities
- RCS12 Audit, Review & Close Out

There are two versions of the materials – National Grid and IOSH – which are 95% identical. The development work was funded jointly by National Grid, IOSH and the trainer.

TRAINING NATIONAL GRID'S FACILITATORS

The six facilitators – three from US and three from UK – met at a National Grid training facility in Long Island, New York. They comprised a safety professional and five experienced engineers from gas transmission (high pressure), gas distribution (low pressure) and liquefied natural gas (LNG). The programme was two days of peer reviewer training, followed by one day of facilitator training, after which the UK facilitators departed, leaving the lead US facilitator to conduct his first peer review while being coached by the trainer.

The facilitators were very knowledgeable, experienced staff who were personally involved in process safety. As a result they were able to make numerous suggestions to tailor the training materials to National Grid and to improve them generally – which will of course benefit attendees of future IOSH courses.

A particular concern raised very early in the training by one of the authors (BW) was that site managers feel that

they had been ‘audited to death’ in recent years, so if peer review were to be given any credibility, it had to look very different from an audit. The decision was taken to:

- Review equipment, management systems and behaviours relevant to process safety, but also note any exceptional occupational safety issues which the team happened to observe while so doing.
- Focus on identifying ‘best practices,’ which would be described in the peer review report circulated to the participating sites and communicated more widely across the company for other sites and businesses to adopt if managers considered that they would add value to their operations.
- Report ‘areas for improvement’ only to the site manager concerned and the responsible director, who would be responsible for deciding which, if any, of them should be addressed and in what way.

These decisions proved very important and undoubtedly contributed to the positive way in which the participating sites cooperated with the peer reviewers and welcomed the findings. The same approach is proposed for cross-sector peer reviews with other organisations.

We were fortunate that a workshop class was taking place where graduate trainees were stripping down and reconnecting domestic gas meters. We were able to use this class to conduct observations and then write up the Observation Reports for the team to critique. This observation opportunity would not normally be available during peer reviewer training so we concluded that video clips are needed to practice observations and report them. We identified the US Chemical Safety Board’s animation of the BP Texas City disaster as an excellent source and, as the CSB has made its DVDs freely available for copying, we extracted five 15- to 30-second clips for use during peer reviewer training.

We comfortably managed the training in three days, including extensive discussions and fine tuning the materials. We concluded that:

- One day should be sufficient for a facilitator to deliver the training element of a live peer review, immediately after which the delegates will carry out the site visits, with coaching by the facilitator.
- But two days will be needed for a ‘stand-alone’ peer reviewer training course, where the delegates will need to spend time practising observation skills and report writing.
- In either case, facilitator training should take one additional day.

CONDUCTING THE FIRST US AND UK PEER REVIEWS

The first US peer review was carried out immediately after the facilitator training, it was conducted by the lead US facilitator assisted by one or both of the other two US facilitators; the trainer provided coaching. The scope of

the review was Control Rooms and three sites had been selected:

- An LNG storage plant;
- A gas- and oil-fired power plant; and
- The regional gas system operations center.

Three peer reviewers had been assigned – the LNG plant manager, the Power Plant Operations Engineering Director, and the Chief Gas System Operator – all very experienced and closely involved in day to day operations, thus the review was again a good opportunity to fine tune the training materials and the review process.

The schedule followed that adopted for the IOSH Stage 1 Pilot, namely:

- Day 1 – training peer reviewers and planning the review
- Day 2 – peer review: site 1
- Day 3 – peer review: site 2
- Day 4 – peer review: site 3
- Day 5 – drafting observations and reporting back to the responsible directors.

The training and planning day was critical, recognising that the peer reviewers had never done anything like this before; they were confident in their knowledge of their own control room but very apprehensive about their abilities to review a control room which was associated with very different plant equipment. So, after brief introductions, we began by brainstorming “What are the key features for an excellent control room in a safety-critical organisation?” and we came up with about three full flipcharts. Between them, the key features covered almost all of the 12 risk control standards.

This process by which the peer reviewers developed the key features, rather than having them handed to them, proved an important part of the training and increased the confidence of the team that they now knew what they should be looking for.

The training then emphasised that neither the key features nor the risk control standards were checklists to be taken into the control rooms, but reference documents for use prior to the review, at intermediate points and as a reporting structure. The peer review is based on *observing activities*, supplemented by discussions with the staff being observed and by checking relevant documents such as handover logs.

The core of the peer reviewer training was on how to write each observation as a ‘fact’, making clear whether it referred to an observed activity, an operator comment or an entry in a log. Facts are less likely to be disputed than opinions or assumptions and can be verified. This is based on a mantra developed by the facilitator for the IOSH Stage 2 Pilot for all his inspectors and assurance teams that “the advice we generate (good practice and opportunities to improve) is compelling because it is based in fact, it is targeted on business need and it is proportional to risk”. This is exactly what Peer Review aims to do.

We documented both outstanding ‘best practices’ to pass on to other organisations and ‘areas for improvement’

to feed back to each site and its director, but not normal good practices. To encourage openness, an important principle of peer review is that observation reports of improvement opportunities are confidential to the organisation being observed, with only anonymous summaries being published more widely.

We began each peer review with a kick off meeting with site management, to explain how we would carry out the review, and for them to give us a brief overview of the site and its activities. Then we spent the rest of the morning in the control room and in the plant, with the peer reviewers singly or in pairs observing activities, holding discussions with the operators and team leader, and looking at control room displays and logs. Each peer reviewer is instructed to write up his or her observations at each break and immediately present them to the rest of the team; as well as sharing information gathered, the facilitator highlights any reports which are unclear or based on opinion not fact, thus coaching the peer reviewers. We took care to observe the critical activity of shift handover, as well as gathering further data to back up any weak observations.

Towards the end of the afternoon, we met as a team to discuss the main ‘facts’ that we had observed – both best practices and improvement opportunities – and to prepare to report back to site management at a short close-out meeting. Good close-out meetings are an essential part of the peer review process and all led to site management agreeing that their peer reviewer would take a lead role in converting the report into an action plan for the site.

Day-3 and day-4 followed a similar pattern at the other two sites, then on day-5 we spent the morning writing up further observations, reviewing them as a team, and preparing an overview report for the responsible directors, covering both findings and our comments on the peer review process itself.

The trainer was concerned that, as the three sites were within about 20 miles of each other, they would all have similar management practices and there would be few best practices to pass on from one site to another. This proved not to be the case – as we have found in other organisations, best practices are often shared within a business sector but rarely between sectors.

The first UK peer review followed a few weeks later and followed a very similar pattern. This time the three selected sites were an LNG storage facility, a low-pressure gasholder station and a North Sea gas import terminal – with the first and last of the site being nearly 300 miles apart. An additional logistical complication was that the gasholder station was normally unmanned and operated from a control room 100 miles away, to which we felt a brief visit was necessary. So the travel times and the control room visit added an extra day to the schedule. The assigned peer reviewers were the LNG plant’s Operations Delivery Engineer, the Integrity Standards Manager for the Gas Distribution business, an assistant engineer from the gas terminal – and the Operations Supervisor from one of the company’s US LNG plants. This time the scope was Protective Devices, Instrumentation & Alarms.

Between them, the US and UK peer reviews identified almost 50 best practices, only one of which – shift handover – was excellent at each site. Some best practices stood out as more applicable for other areas and as having a greater potential significance for improving operational conditions, including:

- Joint training and semi-annual drills with local Fire Department.
- Process for tracking, logging and recording of plant inspections in centralized location.
- Management team discussion of all plant equipment and issues prior to the start of the day.
- Fatigue management training programme and counter measures.
- Table top contingency or “what if” drills to prepare for operational emergencies.
- Standard Operating Procedures for control of safety critical activities.
- A comprehensive alarm response database, giving the control room operator guidance on what action to take in the event of any alarm.
- Lagging is being removed and pipe recoated where necessary, with lagging only being replaced where necessary thus avoiding the potential for corrosion under any damaged lagging.
- Nylon support spacers being installed on pipe supports to remove metal to metal contact, again reducing the potential for corrosion.
- The use of temporary pipe supports being designed out where possible and new permanent supports introduced.
- Posts available in each area for displaying permits for work being carried out.

REVIEW

On the close-out days we asked a number of questions and below are examples of the answers:

WHAT PROFESSIONAL DEVELOPMENT DID THE FACILITATORS AND PEER REVIEWERS GAIN?

- “Opportunity to get out of my little world to see how other people are doing things”.
- “Experiencing the semi-formal approach to peer review, compared with formal inspections”.
- “Good way to connect other tools with process safety”.
- “I sat with two operators on a plant which is fed from my system and who asked me to explain why their service was sometimes interrupted – we now understand each other’s issues much better and I’ve now been invited to a managers’ meeting to share our understanding more widely”.
- “It was valuable for me to understand the alarm management projects in other parts of the business”.
- “I felt under pressure because I was unfamiliar with the complications of the observation reporting software, for the future I would use a simpler version”.

- ☒ “The idea of the peer reviews to promote best practice and sharing across the businesses is good. But the findings from two of the UK sites seemed fairly modest considering the time and effort put into peer reviews from key people in the business”.

WHAT DID EACH SITE GAIN FROM THE PEER REVIEWS?

- ☒ “Good career development by stretching one of my people and exposing him to other business areas”.
- ☒ “The best thing is that in one line of business you get tunnel vision, but peer review lets my unit see what others are doing and it opens up new ways of thinking for us”.
- ☒ “Creates a network of people we can call for advice on a major problem”.
- ☒ “Refreshing process, looking at positive issues, so more receptive at looking for best practices elsewhere”.

WHAT VALUE WILL PEER REVIEWS PROVIDE TO NATIONAL GRID?

- ☒ “Less formal or confrontational than audits which feel very negative, here you see best practices and have the opportunity to decide whether or not they are applicable to your business. It doesn’t have a life of its own, with endless discussions over many months”.
- ☒ “Conduit for top management to find out what is happening in the real world, not being watered down by passing through multiple layers of management”.

WITH HINDSIGHT, WHAT WENT WELL AND WHAT MIGHT WE HAVE DONE BETTER?

- ☒ When planning the peer reviews, we were worried that one day on each site would be insufficient to conduct the peer review in sufficient detail, but in fact that did not prove to be the case.
- ☒ The presence of a US staff member on the UK peer review added significant value both for the UK and the US.
- ☒ Provided better advance briefing so that each site manager understands what is expected of management, the site and especially the site’s nominated peer reviewer – on one UK site, the peer reviewer was unable to leave the site so was unable to participate in anything other than his own site review.
- ☒ Clarify the scope of each peer review – although the scope of the US review was on ‘Control Rooms’ and of the UK review on ‘Protective Devices, Instrumentation & Alarms’, in practice both reviews covered a wide range of operating and maintenance issues in the control room and out on the plant. It would have been clearer to define the scope as ‘Operations and

Maintenance’. On other occasions, the topic might be ‘Design, Construction and Commissioning’ or even ‘Decommissioning’.

FUTURE POLICY FOR PEER REVIEWS IN NATIONAL GRID

National Grid now intends to carry out regular peer reviews and best practice workshops, covering both UK and US assets, extending the scope more widely than COMAH top-tier sites to include linear assets such as pipelines and ‘lower hazard’ gas assets and electricity assets.

FUTURE PLANS FOR PEER REVIEW IN IOSH

IOSH has included the Process Safety Peer Reviewer and Facilitator training courses developed with National Grid in its 2013 programme of Professional Development courses. The courses are also available for delivery in-house to major organisations.

CONCLUSIONS

Cross-business (cross-sector) process safety peer review has been shown to be a powerful tool for improving process safety within diverse businesses in a single company.

ACKNOWLEDGEMENTS

We are grateful to the Cross-Sector Peer Review Working Party of the Institution of Occupational Safety and Health, Hazardous Industries Group, for taking the initiative to develop cross-sector peer review; to the team of National Grid facilitators for their input into the development of the training materials and delivery of the final package; and to National Grid plc for permission to publish this paper.

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