 

# EVALUATING THE IMPACT OF THE COMAH REGIME ON CHEMICAL MANUFACTURING SITES TO IDENTIFY THE KEY ISSUES FOR THE NEXT ROUND OF SAFETY REPORT SUBMISSIONS

Christopher J. Beale (MIChemE)
Ciba Specialty Chemicals, Water & Paper Treatments, PO Box 38, Bradford, West Yorkshire, BD12 0JZ, UK.

Ciba Water & Paper Treatments operate two 'top tier' COMAH sites in the UK – one covering about 50 plants and storage areas and the other covering 4 plants and storage areas. Significant resources have been devoted to preparing and maintaining the COMAH Safety Cases for both sites. This paper evaluates how the COMAH regime has influenced the business in areas such as EHS performance, international competitiveness and capital investment. Based on 6 years of operation under the COMAH regime, key issues are identified for people, systems and hardware. Particular emphasis is placed on training needs and awareness, filling in gaps in management processes in areas where COMAH and corporate requirements differ and improving hardware to ensure that risks are ALARP (As Low As Reasonably Practicable). The administration of the COMAH regime is then reviewed, highlighting potential problem areas such as: assessing significant changes under Regulation 8; managing the Competent Authority inspection and audit plans; obtaining Hazardous Substances Consent under pCOMAH; responding to incidents; and using electronic rather than paper based submissions. The paper concludes by identifying the key learning points for the two sites for improving major hazard management.

KEYWORDS: COMAH.

## IMPROVING PEOPLE'S MAJOR HAZARD AWARENESS

### ARE WE IGNORING THE OPERATOR?

Much of the early planning work for COMAH was focused on plant hardware rather than people issues. Major hazard knowledge was collected, assessed, summarised and presented in a detailed and logical manner in the Safety Report. A small number of specialist, mainly managerial staff became very knowledgeable about the theoretical major hazard risks around the site and how to prevent them from being realised.

It was not practical to issue paper copies of the Safety Report to all departments because each copy was so large and it is very difficult to manage change control when revisions or important correspondence are typically issued every month. The current report was stored electronically on the site intranet but very few staff accessed the electronic files.

This had the effect of focusing major hazard management resources on technical hardware measures at the expense of human software issues. This created a number of issues for the business, such as:

– Ensuring that all staff use the correct procedures and act in compliance with the COMAH Regulations.
– Ensuring that operators understand that they have a key role to play in controlling major hazards and that by their actions in properly following procedures, they will be playing their part in ensuring that plant risks are ALARP.
– Developing tools to identify, assess and minimise the potential for human error in major accident hazard situations.
– Allowing project managers to supervise external contractors consistently with site standards.
– Taking account of major hazard impacts when making strategic decisions about working practices, manning levels and departmental structures.

Additional staff training was clearly required. Different staff groups had different training needs, so it was decided to set up several targeted COMAH training courses aimed at specific groups of people. Figure 1 illustrates the different training needs of

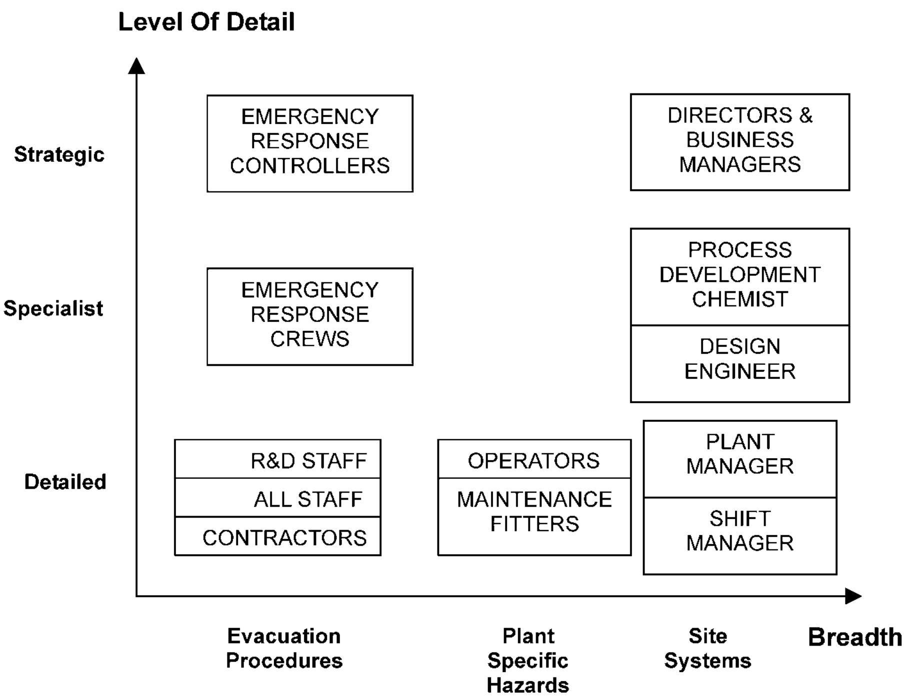


**Figure 1.** Staff training requirements

these groups according to the breadth of training required and the level of detail required in the training.

## THE COST OF COMAH TRAINING

A significant amount of resources have been committed to these COMAH training courses. Thirty one plant specific courses have been developed. Eight modules have been developed for strategic, systems and specialist training packages. One course has been developed for emergency response controllers. Emergency response crew and general staff induction training are based on minor changes to existing CIMAH training packages.

Each plant specific and general module training package typically took one manday to prepare using specialist staff and common training course formats. About £20,000 was therefore spent on course preparation. 1200 staff then required training in groups of five to fifteen with two specialist trainers per course. About £120,000 was therefore spent on course tutors. Most courses were of half a day's duration. The overtime cost of this training was about £180,000. The total cost of the training is therefore estimated at about £320,000.

The training program is about 90% complete for production operators and 50% complete for other staff. It has proven to be difficult to obtain 100% attendance because each course requires specialist trainers who have limited availability and other responsibilities. Staff often cancel courses at short notice in response to production and engineering deadlines, sickness of colleagues and changed shift patterns.

Each course includes an element of assessment using a combination of formal questions, group discussions, case studies and problem solving activities. The feedback from the training courses has been generally positive. Some staff have commented that the engineering course is too intense and would benefit from being extended from one to two days. Group discussions focused on real site incidents are popular. Plant staff tend to prefer hands on training rather than formal classroom sessions.

## OTHER MAJOR HAZARDS TRAINING NEEDS

The training courses aim to provide an overview of important major hazard issues, explaining the links with other important subjects. For example, the engineering course explains how techniques such as fault tree analysis and standards such as IEC61508 (functional safety of automation systems (IEC61508, 1998)) support the management of major hazards. Plant specific training courses will explain why a fire protection system has been installed but will not provide detailed training as to how to use the system. COMAH training therefore still needs to be supported by a compliance assessment program linking identified critical procedures to specific major accident hazard scenarios. Operators must understand that if they follow procedures properly, they are personally contributing to the control of major hazards, ensuring that plant risk levels are ALARP.

### ON THE JOB LEARNING

Major hazard competence can also be developed in other informal ways. Staff gain insights into how their plant works safely by participating in hazop and risk analysis studies. Plant commissioning provides an opportunity to discuss plant operations with the design engineers and process experts. Key messages can then be re-inforced by providing training and plant manuals in the control rooms where they are easily accessible to operators. On the job learning has been shown to be a valid and useful way of building operator competence but experience has shown that it must be managed formally and recorded as training in order to provide the required COMAH demonstration.

### BARRIERS TO LEARNING

Most delegates commented that it is very important to use simple messages and avoid unnecessary jargon and concepts. They have to relate to the vocabulary and jargon in order to build understanding. As an example, it is unlikely to be productive to include detailed discussions on the theory of ALARP, the treatment of uncertainty and quantitative risk assessment when carrying out plant specific training for operators.

## INTEGRATING CRITICAL MANAGEMENT PROCESSES

The site and company EHS management systems tended to focus on operational issues rather than on major hazard issues before the COMAH regime was introduced. New management processes were required to:

- Administer site activities in compliance with the COMAH Regulations.
- Notify changes to the Competent Authority in compliance with Regulation 8.
- Provide a demonstration that major hazards were being managed.

### COMAH COMPLIANCE PROCEDURES

Shortly after the COMAH Regulations were introduced, it became apparent that the sites did not have a systematic method for assessing the COMAH impacts of planned changes. Changes were occurring in the following areas:

- New capital investment projects.
- Plant and process modifications.
- Working practices, departmental structures and personnel.
- Completion of risk reduction projects from the site COMAH improvement plan.
- Suppliers, road tanker designs and weighbridge procedures.

It was clear that these changes all fell within the scope of one of three systems:

- Capital projects, managed using structured hazard studies.
- Modifications, managed using management of change checklist procedures. And

– Maintenance procedures, managed using standard procedures or the permit to work system.

Figure 2 summarises the systems which are used for managing change.

By inserting guidewords for 'COMAH' and 'hazardous substances consent' into the structured hazard studies and modifications checklists, it was possible to identify all COMAH issues for the site as long as staff used the safety management system and had been trained on the COMAH Regulations. These changes are now discussed with the site COMAH specialists to identify the COMAH issues for each planned change. In the early days of COMAH, these discussions were minuted and unstructured. This made it very difficult to demonstrate to the Competent Authority that consistent decisions were being made around the sites. A COMAH Change Procedure was therefore introduced three years ago using a checklist to provide an audit trail of the decision making process for the change.

## NOTIFICATION OF SIGNIFICANT CHANGES UNDER REGULATION 8

The operating company has a duty to review and revise the COMAH Safety Report under Regulation 8 (COMAH, 1999) when:

– New facts or technical knowledge about safety matters arise, including changes in chemical classification under the CHIP Regulations (CHIP3, 2002).

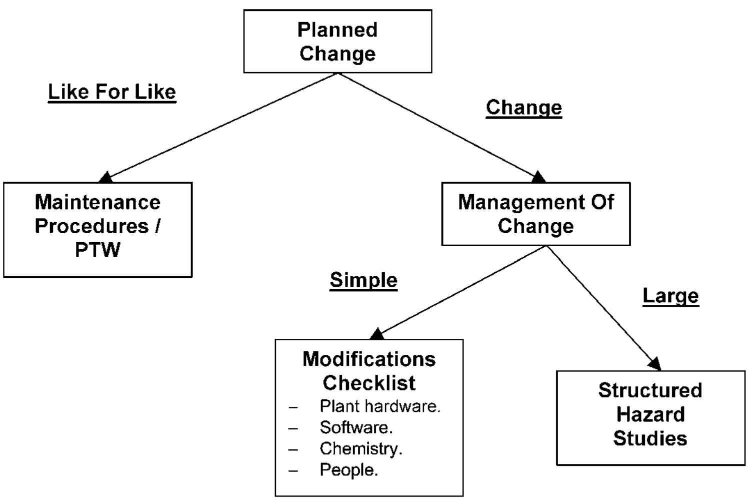


**Figure 2.** Change management systems

– Modifications are planned to the site which involve changes in the site, the process or the nature and quantity of dangerous substances if these could have significant repercussions for the prevention of major accidents or limiting their consequences.
– Significant changes to the Safety Management System, management structure, delayering, staff headcount reduction, the use of contractors and takeovers/high level changes of management control.
– At least every 5 years.

The conclusions and output from the review and revision must be provided to the Competent Authority before any significant change is made. Operating companies are advised to seek the views of the Competent Authority before the change is made.

Regulation 8 causes the following problems to operating companies:

1. A decision making framework is required to decide whether a change is 'significant' within the context of Regulation 8. 'Significant' is defined in a subjective way that is open to different interpretations by the operating company and the Competent Authority. The two Ciba sites use a checklist to make these decisions. Large projects are normally discussed with the Competent Authority well before they are implemented. This allows an agreement to be made about key project timescales, including those for Regulation 8 submissions. Small projects are normally assessed internally. The operating company may come to a different conclusion than the Competent Authority about this type of project.
2. The Competent Authority will not normally provide a letter stating that the Regulation 8 notification has been assessed and that the project can proceed. If correspondence has not been received by the operating company before the planned start date in the Regulation 8 notification, the project can proceed. Additional clarity would be provided if a formal letter was sent by the Competent Authority.
3. There is no specific guidance about the notification period for a planned change. The Competent Authority requires sufficient time to assess the change and the operating company requires certainty about the impact of the assessment on project timescales. From a pragmatic perspective, Ciba have agreed timescales with the local Competent Authority to allow efficient project planning. Different types of project have different notification periods as shown in Table 1.
4. Some changes (mainly people related) are often made at a high level in multinational companies and are implemented quickly at a local level. The decision making unit will often use different procedures to those which are used locally. People related changes are therefore often difficult to communicate to the Competent Authority using Regulation 8.
5. Different staff to those who assessed the core Safety Reports from the Competent Authority are sometimes used to assess Regulation 8 notifications. This is a very inefficient way of assessing the change as it is difficult to assess the planned change in the context of the existing site infrastructure and systems.

**Table 1.** Agreed regulation 8 notification periods For local sites

| Type of change | Examples | Management process | Notification period |
|---|---|---|---|
| Brand new installation. | Tank farm, building, road tanker facility. | Hazard studies | 6 months |
| Significant refurbishment or modification to existing facility. | Plant upgrade, tank farm re-organisation. | Hazard studies | 3 months |
| Change in dangerous substance. | Additional storage, storage of new DS. | MOC, mod. | 3 months (may require HSC) |
| New process or process change. | Batch to continuous, new product, new control system. | MOC, mod. | 1 month |
| New building. | Control room or location changed. | MOC, mod. | 1 month (may require PP) |
| Modification of existing building. | Control room extended. | MOC, mod. | 1 month |
| SMS/manning/ restructuring. | Redundancies, contractors. | MOC, mod, Mancom. | 1 month |
| Takeover. | Change of high level control. | N/A | 1 day |

**Key**
MOC = Management of change procedure.
mod = Modification checklist.
HSC = Hazardous substances consent.
PP = Planning permission.
Mancom = Management committee meetings.

Regulation 8 notifications have been made for the Bradford and Grimsby sites for the changes listed in Table 2.

## MANAGEMENT PROCESSES TO PROVIDE A COMAH DEMONSTRATION

Four key aspects of major hazard management were controlled using team based expert judgement or fragmented systems not specifically aimed at the control of major hazards: (1) selecting risk control measures to ensure that risks are ALARP; (2) managing major hazards risks strategically across all plants on a complex site and allocating EHS related capital expenditure where risks are considered to be greatest. (3) managing change associated with people and (4) ensuring that human factors are properly considered in new projects and when controlling existing plants.

**Table 2.** Regulation 8 notifications for the Ciba Bradford and Grimsby sites

| Type of change | Details of change | Safety report re-issued? | Complexity |
|---|---|---|---|
| Restructuring | High level corporate restructuring. | Yes | Trivial |
| Change in dangerous substance | Removal of dangerous substances from site as part of COMAH improvement plan. | Yes | Simple |
| Safety Management System | Restructuring to reflect high level changes and changes to Ciba SMS. | Yes | Complex |
| Significant modification to existing facility | Shutdown of old plant area and transfer of production to unused area of main site. | Yes | Complex |
| New process or process change | Automated solvent run-off facility built to replace manual system. | Yes | Simple |
| Changes in chemical classification under CHIP3 | Three bulk raw materials re-classified as dangerous for the environment. | Yes | Medium |
| New process or process change | Conversion of bulk non-toxic tank to store toxic chemicals. | Yes | Simple |
| New process or process change | Reactor and basis of safety modifications. | Yes | Simple |
| Changes in chemical classification under CHIP3 | One bulk raw material re-classified as dangerous for the environment. | Yes | Simple |
| Change in dangerous substance | Increase in inventory of packaged dangerous substances. | Yes | Simple |

Within Ciba, it was considered that these important aspects of major hazard management could be controlled cost effectively and appropriately without introducing new management processes and procedures. Unfortunately, using this fragmented approach, it was not easy to deliver the demonstration that major hazards were being adequately controlled under the UK COMAH Regulations (COMAH, 1999). New formal management processes were required.

## MAKING THE ALARP DEMONSTRATION USING OPTION ANALYSIS

In common with many other large European chemical companies, Ciba use a lifecycle capital project design process with tiered stages of project approval at concept design, detailed design and handover. Risk analysis is used to develop a basis of safety for each identified hazard based on a thorough laboratory analysis of chemical hazards, including fire, explosion, thermal instability, toxic and ecotoxic properties.

The level of detail of the risk analysis increases as the project progresses. Major hazards are identified early in the project using a Hazard Study 2 (IChemE, 2000) at the Bradford and Grimsby sites. The risk analysis teams constantly make decisions and explore opportunities for removing, controlling and mitigating identified hazards. These discussions are not normally documented as this would be very disruptive to the flow of the risk analysis. The Competent Authority have taken the view that this approach does not deliver an adequate demonstration as a written audit trail of the decision making process does not exist.

All projects are also subject to peer review and approval. The larger the project, the greater the number of reviews. These reviews are minuted and include senior EHS managers, often from other parts of the organisation. In some cases, risk controls will be altered or removed: in other cases, they will be added.

Overall, Ciba view this ‘project challenging’ process as a critical aspect of project management, providing a means of achieving common standards of risk control across all worldwide manufacturing plants.

The internal experienced risk analysis leaders are generally not in favour of adding a hazop/risk analysis requirement to document all rejected options within each study as they fear that this will slow the pace of the study, lose focus within the study and cause participants to lose interest in the study. For these reasons, the additional ‘safety requirements’ could actually serve to reduce safety levels by lowering the quality and commitment shown in the risk analysis.

Another major concern is centred on the complexity of the site safety management systems. Discussions with staff at different levels within the organisation have revealed that a major barrier to having an effective safety management system is excessive bureaucracy, duplicated procedures and use of jargon. They feel that a simple focussed system is easier to understand and is much more likely to be implemented. Adding new procedures and processes that were not perceived as being relevant is therefore likely to lead to some people losing confidence in the safety management system.

The most likely way of resolving this problem is likely to involve either adding a short option analysis summary chapter to the end of the risk analysis report when the team reviews the risk analysis or documenting the option analysis for ALARP region risks in the Safety Report but not in the risk analysis. The current indications are that this approach does not fully satisfy the demonstration requirements of the Competent Authority.

## STRATEGIC MAJOR HAZARDS MANAGEMENT

When the first COMAH Safety Reports were issued in 2000 and 2001, there was no systematic method for strategically identifying areas of the site where capital projects were required to reduce risk levels. Projects tended to be generated in response to risk analysis studies, internal audits, discussions with insurance companies and to comply with the narrower focus of the CIMAH Regulations (CIMAH, 1984).

In practice, this was delivering fragmented risk management. A more holistic approach was required. Any deficiencies identified in the COMAH Safety Report were collated into the site COMAH improvement plan. In some cases, specific procedural or hardware (new interlocks, fire systems, relief system designs etc) improvements were required. In other cases, further investigations were required. With some older plants, it was decided that short term improvements were required based on ‘quick wins’ (relatively inexpensive improvements with significant risk reduction benefits) and a commitment to fundamentally review the future of that part of the business. In this way, Ciba were able to progress a range of strategic projects aimed at the end point of 100% completion and a site risk level that was ALARP in Ciba’s view.

The main problems with this approach were: (i) capex had to be obtained based on an ALARP argument from a European headquarters organisation in a country where the law did not recognise the concept of ALARP. Acceptable safety was achieved purely by code compliance; (ii) it was difficult to specify exact timescales due to uncertainty in the exact scope of work for older plants. An apparently simple problem had a habit of turning into a very complex and messy problem when detailed design work had been completed and (iii) some of the upgrades which appeared to be theoretically achievable often proved to be impractical in practice. Interlocks could not always be installed because vessels had inadequate numbers of connections. Gas detectors sometimes did not work because they were becoming contaminated with other chemicals around the plant, giving false readings. The risks to installation fitters was sometimes felt to be greater than the benefits that would flow from the upgraded plant.

The experience gained in developing and implementing the COMAH improvement plan has now been used within the wider world of Ciba to produce a corporate standard for major hazards management known as the ‘risk portfolio’.

The risk portfolio for the Bradford and Grimsby sites is taken directly from the COMAH Safety Report major hazard scenarios and their associated risk assessments. It has provided a clear link between the identified scenarios and the worldwide capex and insurance management system. Sites can now base EHS major hazards related capex submissions on common criteria that can be compared relatively across sites in different countries by senior managers.

A 'clash of matrices' has now developed in the UK. Routine EHS decisions are made using a 3 × 3 frequency/consequence risk matrix using team judgement to allocate low, medium and high categories. The COMAH reports use a standard 5 × 5 frequency/consequence risk matrix linked to UK risk criteria. Corporate Ciba use a 4 × 4 control/consequence risk matrix. These apparently inconsistent matrices can cause confusion but they are compatible as long as the correct risk category definitions are used in each matrix. This is a practical example of how clashes can occur between the UK COMAH and corporate elements of a multinational company's safety management system.

## MANAGING CHANGE ASSOCIATED WITH PEOPLE

These changes were viewed as an operational or human resources management issue before the COMAH Regulations were introduced. The most important decisions (redundancy, delayering, operating practices) are often made at a high level in the company outside the immediate control of the operating unit. These changes are often planned in confidential meetings as they are by their nature sensitive to individual people. Under the COMAH Regulations, these changes have to be planned and risk assessed from a major hazards perspective.

Theoretically, these changes fall within the scope of the site management of change checklist procedures. In reality, the guidewords almost always relate to hardware and chemistry rather than organisational and people related parameters. A new 'people related management of change' procedure was therefore developed with the human resources department to provide a framework for assessing this type of change based on an analysis of issues such as manning levels, competence, training requirements, fatigue and human factors. The new procedure can be used for managing simpler as well as complex changes. Training and handover requirements can be developed when staff move positions, are promoted within the company or start to work in a new area of the site.

The procedure has been used succesfully to plan people related changes but is viewed in some areas as overly bureaucratic. Some staff believe that the outcome from the management of change assessment can be derived much more quickly based on informal assessments and meetings. Experience from the wider chemical industry, however, shows that robust planning for people related changes has not always been carried out.

## INCORPORATING HUMAN FACTORS INTO NEW PLANT DESIGNS AND OPERATIONAL CONTROL

Knowledge about human factors varies greatly around the site from a few staff having a good understanding of the subject who are able to guide and advise other people to many people who have vaguely heard about the subject to a few people who have never heard about human factors.

Human factors have been identified as a contributor to almost all of the incidents and near misses that have been investigated at the two sites during the lifetime of the COMAH

Regulations. It could easily be argued that site risk reduction efforts would be much more effective if they targeted areas of human factors rather than hardware capital investment.

Five key issues have been identified:

1. Managing the human factors impacts of planned high level changes in the organisation, planning for the changes and ensuring that any human factors issues such as shift patterns, supervision, manning levels, culture, training, competence and procedures are identified and managed.
2. Incorporating human factors into the design process for new projects and modifications, ensuring that all staff are properly trained and aware of any planned changes before they go live on the plant.
3. Systematically assessing the potential for human error associated with identified major accident hazard scenarios if human factors risks have not been assessed in detail in the risk assessment for a new project.
4. Optimising human performance on existing plant, ensuring that all staff understand how their plants work, adhere to procedures and are able to deal with abnormal conditions safely.
5. Ensuring that maintenance fitters and supervisers follow procedures, work safely within the Permit To Work system and do not make critical errors.

High level changes are now managed using a new 'people related management of change' procedure. This uses a checklist approach to plan and assess the change and has been shown to be a useful tool for change management. Problems tend to occur if staff fail to use the system or if they have already made a decision and are using the risk assessment to justify the decision rather than to influence it.

New projects follow one of the systems shown in Figure 2. These systems can address human factors if used by staff with knowledge in this specialist area. Weaknesses in the systems exist because they include rather loose guidewords such as 'human factors' or 'procedures'. These issues are often not assessed thoroughly by staff who do not have a deeper understanding of human factors. Where there are about 40 guidewords and prompts for hardware and process errors, there are typically one or two for human factors software issues. Improvements are currently being considered in two main areas: providing general human factors training for key staff and expanding the existing risk analysis, structured hazard study and modifications systems to provide additional human factors guidewords.

Procedural compliance problems have occurred in production and maintenance areas for a range of reasons including: inadequate personal knowledge, failure of supervision, actual plant procedures being different from the theoretical written procedures, ineffective training and difficulties in accessing up-to-date plant data. Efforts are ongoing in this area in co-operation with the site Trades Union to improve operator competence through training, checking and supervision and by creating plant dossiers, containing key EHS and operational information for each plant.

## DEMONSTRATING THAT HARDWARE RISKS ARE ALARP

Significant resources have been devoted to making a demonstration of ALARP that is acceptable to the Competent Authority. It is very unsatisfactory from a manufacturing company viewpoint not to reach an agreed end point where site risks can be agreed to be ALARP based on an assessment by the operating company which has been reviewed by the Competent Authority. This would allow the operating company to progress an agreed action plan and devote resources with confidence to making real risk reduction benefits.

The core concepts of option analysis, cost benefit analysis, addressing uncertainty, carrying out sensitivity analysis and directing proportionately more resources at the worst consequence accidents are reasonable requirements. The problems tend to occur with the overly theoretical methods which are being proposed for carrying out the ALARP analysis. Many of the methods assume implicitly that a site uses Quantitative Risk Assessment (QRA). This may be true for some sites but is not true for many speciality chemical companies.

Perfectly sound decisions can be made using a more practically based qualitative or semi-quantitative approach that is understood by a greater proportion of staff within the organisation. EHS performance would naturally improve if the focus of ALARP demonstration moved on from the process of demonstration to the installation of real risk reduction measures (hardware and software) where they are required.

ALARP analysis is also only likely to be effective in real organisations if it can be set within a broad business framework where many factors contribute to the decision making process: societal risk, environmental risk, routine environmental emissions, health protection, insurance requirements, customer requirements and business performance.

The Bradford site has suffered at least one chemical release over the last four years in which a failure to complete a practical ALARP assessment contributed significantly to the loss. The original ALARP assessment had been completed at a very high level and generated a multi-million pound capital investment project aimed at removing intermediate holding vessels, reducing solvent storage inventories, improving vessel integrity, installing new instrumentation and interlocks on the high risk plant areas and building new fixed fire protection systems.

There was, however, an inadequate ALARP assessment at the practical 'hazop' level. The hazop team had accepted a series of risk reduction measures for one hazard which were largely procedural. The hazard was one of the lower consequence events on the plant. The chemical release could have been prevented by:

- Inherent safety, reducing a maximum pump pressure.
- Vessel design, changing the location of a sight glass.
- Improving instrumentation to provide additional operator alarms.
- Reconfiguring existing interlocks.

All of these measures would have been relatively cheap to install in the context of the wider project. This shows that it is very easy to lose sight of the real practical problems if ALARP assessments are carried out at too high a theoretical level. A robust ALARP assessment must work at a high level and at a practical level.

## DECOMMISSIONING COMAH PLANT

A key concept of the COMAH Regulations is the 'lifecycle' concept where EHS risks have to be managed throughout the plant's lifecycle of concept, design, installation, commissioning, operation and de-commissioning. It was very difficult to envisage how the de-commissioning aspects of the lifecycle approach should be addressed, other than in the very rare occasions when a new greenfield plant is built. Problems do occur with real plant because they are expanded over the years to the point where the original equipment may not be recoverable later in it's life. Some pipes and plant effectively become boxed in.

De-commissioning was therefore viewed as a rather theoretical and impractical area of the Safety Report. As a result of safety audits and inspections, it has now become clear that practical problems do exist when '*de-commissioning the software*' rather than 'de-commissioning the hardware'. This includes issues such as:

- Tanks and vessels clearly marked 'not in use'.
- All signs updated and/or removed.
- Plant manuals.
- Emergency plans.
- Engineering drawings including Engineering Line Drawings and Control Logic documents.
- Atex documentation and signage (DSEAR, 2002).
- Procedures and training.
- Risk analysis reports.
- Maintenance records and plans.
- Statutory permits and legal documents revised.

## COMAH ADMINISTRATION AND THE COMPETENT AUTHORITY

The timing of guidance documents has represented a significant problem for many COMAH sites. There is a long lead time to prepare for a COMAH submission. It may therefore be impractical to implement the requirements of new guidance unless it is issued well before COMAH submissions are due. Guidance which has a significant impact on the structure of the report really needs to be issued at least six months before COMAH submissions are due.

In the initial phase of COMAH submission, electronic Safety Reports were not encouraged. Eighteen copies of the Bradford Safety Report had to be issued, each consisting of five large volumes. Most of the users of the Safety Report could easily have used an electronic report. By making a greater use of CD's, it will be much easier to manage the report distribution process.

The COMAH regime has proven to be complex for many sites. Competent Authority staff have to climb a steep learning curve. Staff continuity is therefore desirable for efficient regulation. If this does not occur, operating company time is often wasted answering similar questions that have already been raised, linking the new issues to the 'core' Safety Report and providing background information about how a site and it's systems work. When staff changes are required, it is also important that a quality handover occurs within the Competent Authority. It is particularly important that new staff are provided with a clear explanation of the key risk management issues that the operating company and Competent Authority have identified prior to the handover.

The following factors help to provide value to the operating company with their risk management activities:

- Developing a shared understanding of the key risk management priorities for the site.
- Focusing on the identified key risk management priorities and ensuring that resources are not allocated using a scattergun approach.
- Taking a strategic approach as well as resolving detailed issues.
- Planning audits and inspections so that they are spread over the five year assessment cycle rather than causing peaks in workload at the front end of the assessment period.
- Communicating openly to solve emerging problems.
- Holding regular meetings so that less reliance is placed on the Safety Report and more emphasis in placed on discussing relevant site based activities with the operating company.
- Providing experts for Competent Authority interventions.

Three big challenges still have to be overcome in order to integrate the Safety Case into business management practices:

- Focusing the Safety Case on a defined end point so that resources can be devoted to completing an agreed risk reduction plan, for example, to achieve ALARP.
- Ensuring that the Safety Case assessment is consistent with the business climate and issues affecting the operating company.
- Promoting a partnership approach to risk management, working jointly with the operating company to resolve problems, understanding the constraints faced by the operating company and communicating the constraints under which the Competent Authority must operate.

## LEARNING POINTS AND CHALLENGES

Based on the experience to date, the following five areas are considered to be particularly critical for improving major hazard performance:

1. Improving operator awareness of the major hazards of their plants in normal and abnormal operation by communication, training and on-the-job learning.
2. Ensuring that all staff clearly understand their roles and responsibilities for preventing major hazards.
3. Creating a clear understanding of the priority major hazard risks for the site using clear risk management processes.
4. Completing and monitoring agreed risk reduction plans to ensure that risks are ALARP.

5. Ensuring that major hazards are managed using a systematic approach supported by audit trails explaining how key decisions were made.

The main challenges for the next round of COMAH submissions are considered to be:

– Developing an efficient semi-quantitative process for option analysis to demonstrate ALARP.
– Improving people's knowledge about human factors and developing working practices and business processes which enhance human performance.

## COMAH BUSINESS IMPACTS

### OPPORTUNITY COST

It is estimated that Ciba have used two EHS specialists to prepare the Safety Report and administer the COMAH regime for the two sites over the period 1999–2004. Most of these resources have been devoted to the Bradford site. Four man months have also been used to obtain four hazardous substances consents.

Monies are also allocated for Competent Authority charges, consultancy costs and assistance from other internal departments. Overall, it is estimated that about £300,000 has been spent on these activities on average per year. Table 3 summarises key elements of these costs.

The skilled resources used for managing the COMAH regime could have been deployed in other areas. Over 5 years, it is estimated that these staff could have completed 400 internal EHS audits, hazard studies, fault trees or safety reviews. The redeployment of this scale of internal EHS resource must have had an impact on the extent of internal EHS activity and monitoring on the sites.

**Table 3.** Cost of COMAH 1999–2004

| Compliance Cost Measure | Bradford Cost Estimate | Grimsby Cost Estimate |
|---|---|---|
| Specialist staff — man years spent on COMAH | 9 | 1 |
| Financial cost of COMAH over 5 years | £1.35 million | £150,000 |
| Specialist staff — man years spent on hazardous substances consent | 0.2 | 0.1 |
| Financial cost of hazardous substances consent over 5 years | £15,000 | £5,000 |

Note: BRADFORD site is large with 50 COMAH areas. GRIMSBY site is small with 4 COMAH areas.

Hazardous substances consent applications provide no direct EHS benefit to a company when they are associated with changes in the administration of the system caused by the increased use of generic categories of hazardous chemicals. These applications have cost 14 internal EHS audits.

The cost of COMAH (£1.5 M) could have been used to significantly upgrade the hardware on a major hazard plant, provide six automated fire detection and protection systems for high hazard plants and storage areas or provide about 800 new control/protection system interlocks. It is therefore essential that real benefits flow from the COMAH regime to offset these high opportunity costs.

## INTERNATIONAL COMPETITIVENESS

Different countries use a wide range of different Safety Case and major hazard control legislation. If the legislation in one country is considered to be overly bureaucratic or causes avoidable project risks, investment is likely to flow to other countries. Bureaucracy increases the cost base but good loss control reduces the cost base. COMAH costs and a site's EHS performance are therefore both likely to influence capital expenditure.

There is no evidence that specific projects have been moved to overseas locations as a direct result of the COMAH regime but there is concern at a corporate level overseas about the current use of ALARP (compared to requirements to comply with defined

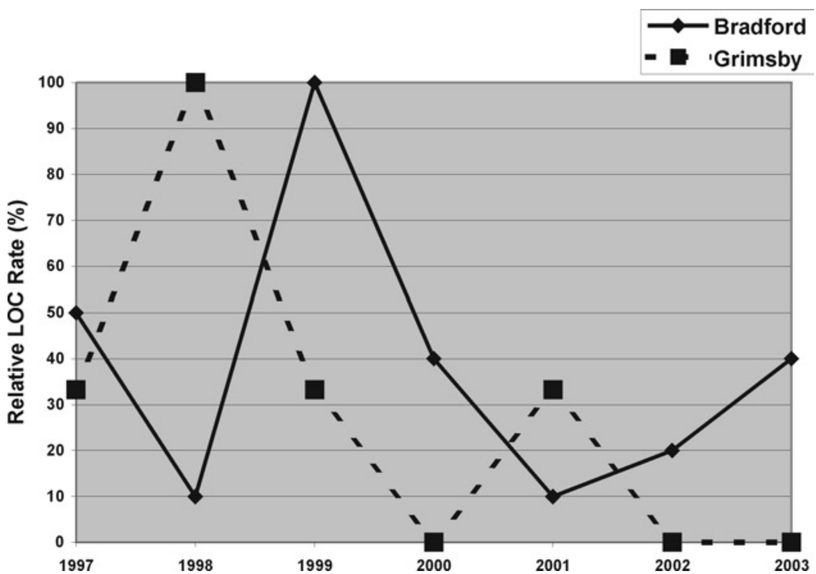


**Figure 3.** Relative dangerous substance spillage rates for two sites 1997–2003

 

standards) and the potential delays and uncertainties that could occur as a result of the COMAH regime. To date, no projects have been delayed at either site purely as a result of COMAH or hazardous substances consent. This suggests that careful planning can produce efficient compliance.

## EHS MAJOR HAZARDS PERFORMANCE

Figure 3 shows how relative dangerous substance spillage rates have varied for the two sites over the period 1997–2003 based on a synthesis of near miss and incident reports. This shows that the relative Bradford spill rate was greatest in 1999 and then dropped to 2001 before rising to 2003. There does not appear to be a pattern to the Grimsby data.

The Bradford spillage rate was therefore highest as the COMAH regulations were being implemented and then dropped steadily as COMAH was implemented before rising.

There are, however, many other factors which could have influenced the data such as redundancy programs, staff morale, business climate, financial performance, changes in technology on plants and staff changes. All of these factors could have influenced the spillage rate. The data is also only presented over a short time frame in major hazards terms. It is therefore considered that the link between major hazard performance and the introduction of the COMAH Regulations has not been made based on this limited data.

## REFERENCES

1. (CHIP3, 2002), Chemicals (Hazard Information And Packaging For Supply) Regulations, 2002.
2. (CIMAH, 1984), The Control Of Industrial Major Accident Hazards Regulations, 1984.
3. (COMAH, 1999), The Control Of Major Accident Hazards Regulations, 1999.
4. (DSEAR, 2002), Dangerous Substances And Explosive Atmospheres Regulations, 2002.
5. (IChemE, 2000), ‘Hazop guide to best practice’, Institution of Chemical Engineers, 2000.
6. (IEC61508, 1998), Functional Safety Of Electrical/Electronic/Programmable Electronic Safety Related Systems, Parts 1 to 7, 1998 (also published as BS EN 61508).