

## **POSITIVE AND NEGATIVE EXPERIENCE WITH THE NEW COMAH REGIME IN THE SPECIALITY CHEMICALS INDUSTRY**

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Ciba Water and Paper Treatments operate two 'top tier' COMAH sites in the UK. A COMAH Safety Report was issued for both sites in 2000 - one covered about 50 plants and storage areas and was submitted in three phases; the other covered 4 plants and storage areas and was submitted as an integrated report. A team from Ciba have been working on these reports for two years and the Competent Authority has been assessing these reports over the last year. Experience has been gained in a wide range of areas : administration of the COMAH regime, impacts of COMAH on running the business, technical issues, sitewide issues, integrating safety and environmental risk assessments, making the COMAH demonstration and demonstrating ALARP. This paper discusses the positive and negative impacts that COMAH has produced.

COMAH, major hazards, risk assessment

### **1. INTRODUCTION.**

#### **1.1 Overview Of Ciba Water And Paper Treatments UK Operations.**

Ciba Specialty Chemicals operate an integrated chemical manufacturing site at Bradford, UK and a smaller manufacturing site at Grimsby, UK within the Water and Paper Treatments business. The Bradford site consists of about twenty tank farms for bulk chemical storage and about twenty production areas, some inside buildings and others in outdoor areas. These production areas are supported by two power stations and a number of warehouse units. The Grimsby site is much smaller and consists of bulk and packaged raw material storage areas, a production building and a warehouse.

The sites handle a wide range of hazardous chemicals with the potential for fire, explosion, toxic and environmental impact damage as a result of an accident. The production plants use a range of batch, semi-batch and continuous processes, mainly based around acrylate chemistry.

Historically, both sites have fallen within the 'Top Tier' requirements of the CIMAH Regulations (CIMAH, 1984) and have had to produce a number of CIMAH Safety Reports covering different areas of the site. Both sites now fall within the 'Top Tier' requirements of the COMAH Regulations (COMAH, 1999) and full COMAH Safety Reports have been submitted for each site.

As the Bradford site is complex, the COMAH Safety Report was submitted as a 'core' report and two 'part ' reports. The Grimsby site is much simpler, so the COMAH Safety Report was submitted as a single integrated report.

## 1.2 Overview Of COMAH Regime.

The COMAH Regulations are complicated and this paper is not intended to describe the details of the regulations. These details can be found in publications such as (HSE, 1999a), (HSE, 1999b) and (EA, 1999).

It is important to understand that there are some key differences between the COMAH Regulations (COMAH, 1999) and the CIMAH Regulations (CIMAH, 1984) which pre-dated the COMAH Regulations, particularly :

- The scope of COMAH is more wide ranging, covering generic categories of chemicals, chemicals categorised with the R50, R51 and R53 ‘dangerous to the environment’ risk phrases, process as well as storage activities and establishments rather than individual installations. Furthermore, individual smaller quantities of hazardous chemicals which are individually below the COMAH threshold inventory but together exceed the threshold inventory must be aggregated under the COMAH Regulations.
- The Competent Authority has a duty to prohibit activities if he considers that ‘serious deficiencies’ exist at the installation.
- There is an increased emphasis on safety management systems (SMS) and a requirement to have a Major Accident Prevention Policy (MAPP) in place to ensure that the SMS specifically addresses major accidents to man and the environment.
- Equal emphasis is placed on the environmental and safety aspects of major accident hazard risks.
- The operator must demonstrate that ‘all means necessary’ (interpreted in the UK using the ALARP (As Low As Reasonably Practicable) principle) have been taken to eliminate, control and mitigate major hazard risks at the site.

## 1.3 Aims Of Paper.

This paper summarises practical experience that has been gained with the COMAH regime for two very different chemical manufacturing sites. This experience includes preparing and submitting the Safety Reports as well as feedback from the Competent Authority and is summarised under the following three categories :

- Benefits of the COMAH regime (**Section 3**).
- Problems associated with the COMAH regime (**Section 4**).
- Difficulties encountered with COMAH implementation (**Section 5**).

Important factors which have to be addressed when planning a COMAH Safety Report are also summarised (**Section 2**) together with those factors which were considered to be critical for producing the Safety Report (**Section 6**).

## 2. IMPORTANT FACTORS FOR PLANNING THE COMAH SAFETY REPORT.

The following eight factors have been found to be particularly important when planning a COMAH Safety Report :

- Assessing the extent of information gathering which is required for a complex site.
- Deciding the level of detail which is required for different sections of the report, particularly for process area risk assessment.
- Getting the balance right between allocating staff to prepare the report and to continue running the business.
- Structuring the report as a phased report or an integrated report.
- Identifying areas where a sitewide approach should be taken rather than a plant-by-plant approach.
- Deciding the amount of consequence modelling that is required.
- Using a qualitative, semi-quantitative or fully quantitative approach for risk assessment within the report.
- Involving the Competent Authority in the planning process or presenting a ‘fait accompli’.

### 2.1 Extent Of Information Gathering.

It is very difficult to accurately assess the amount of time and effort which is required for producing the report, particularly if it is the first report that the company has produced. COMAH differs significantly from CIMAH (as described in **Section 1.2**) and some of these differences have a major impact on the workload that is required for producing the Safety Report. Three areas in particular have been found to be particularly resource intensive : assessing the risks associated with process (as opposed to storage) areas, integrating environmental and safety risk assessment and making the COMAH demonstration.

It is important that these problems are identified early in the report production process as additional or specialist resources may be required to complete the work.

### 2.2 Level Of Detail In Report.

A balance has to be struck between producing a usable document and producing a document that is so massive that it is impossible to understand. This implies that different aspects of the report will contain different levels of detail. A sensible approach would be to present more detail where risks are assessed as being highest or risk controls most critical.

Particular care is required when assessing process areas as batch plants are likely to produce wide ranges and large numbers of different chemicals. It would be impractical to describe the risks associated with each process, so some form of generic approach is required, linking with existing reports and processes that the site uses.

As the Safety Report will be in the public domain, it is essential that the team preparing the report constantly consider some key questions : will the published information give away commercially confidential information? And will the information be a potential security risk? There are mechanisms for excluding some information from the public domain if these criteria

are likely to be breached, but it would often be less risky to exclude the information completely.

Under the old CIMAH regime, operators could confidently submit layout drawings, plans, process and instrumentation (P&iD) drawings mass and energy balances, safe in the knowledge that it would not be in the public domain and that it mainly concerned the less commercially sensitive areas of the operations, namely storage. Process information is potentially much more valuable and it is important that this is not accidentally published in the COMAH Safety Report when it is commercially sensitive.

### **2.3 Resource Allocation Of Key Staff.**

The report production process is likely to require intensive efforts from environmental and safety specialists in the company over a six month (straightforward report) to two year (complicated site report) time frame. There is a real risk that key staff will become isolated from their normal business roles and the quality of other activities (new projects, auditing, safety initiatives etc) may suffer. A careful balance has to be struck in this area. Positive benefits can, however, flow from the COMAH Safety Report if it is of high quality, making it easier to make decisions about major hazards in the site's future.

### **2.4 Phased Or Integrated Report Structure.**

Integrated sites which were covered by the 'top tier' requirements of the CIMAH Regulations were given the opportunity to submit one integrated COMAH Safety Report or a first 'core' report supplemented by additional detailed reports over a longer timeframe.

The benefits of producing an integrated report are :

- Completing the report within a shorter timeframe so key staff can move to other projects.
- The Competent Authority can obtain an early view of the whole major hazards risk profile for the site.
- A reduction in duplication of information within the report, depending on how the report is structured.
- Paying lower fees to the Competent Authority under the charging arrangements as they should be able to assess an integrated report more efficiently.

The main disadvantage with the integrated approach is the pressure it can place on key safety and environmental staff during the report production process.

### **2.5 Areas Where A Sitewide Approach Is Useful.**

Where an activity is carried out consistently across the site, time and effort can be saved and clarity can be improved by describing that aspect of the safety report on a sitewide basis. This will typically apply to areas such as safety management systems, emergency response, some parts of maintenance, risk assessment methodology and the engineering design process.

It is useful to identify those areas where a sitewide approach will be beneficial early in the report production process.

## 2.6 Extent Of Consequence Modelling.

Consequence assessment can be performed in a number of ways, depending on the hazard which is being assessed. Quantitative modelling is very useful for objectively assessing certain types of hazard but can be time consuming. Some hazards are difficult to model accurately and practically in a quantitative manner and are best assessed qualitatively (eg. using expert judgement or reviewing the impacts of previous similar accidents in the industry).

It is important to define the ground rules for consequence modelling early in the project so that the amount of modelling is manageable and does not obscure the key facts in the safety report. Areas which can be difficult to model include the effects of chemical runaway reactions, internal fires in vessels, combustion and by-products and dust explosions.

## 2.7 Risk Assessment Methodology.

If the safety report is to be useful as a living document, it is important that :

- It can be updated easily and the risk assessment techniques used within the report are clearly understood by site staff.
- It uses a risk assessment methodology which is consistent with other site risk assessment processes, whether these are qualitative, semi-quantitative or fully quantitative.
- It uses a risk assessment methodology which is consistent with other site major hazard risk assessment methodologies, such as those used for assessing the risks to people in occupied buildings.
- Frequency assessments provide a consistent and objective framework for assessing and ranking risks rather than a distraction for discussing the significance of minor differences between the absolute values of very small numbers.

It is therefore important to agree the frequency and risk assessment methodologies early in the report production process, ensuring that information is presented in a consistent and comparable format throughout the report.

## 2.8 Involvement Of Competent Authority.

The introduction of new legislation is a learning process for the regulator and the regulated alike. When the legislation is complex, such as the COMAH Regulations, it is very useful for both parties to understand the problems, anticipated solutions and plans of the other party. This can often be achieved by holding regular meetings with the Competent Authority to ensure that the following types of issue are covered :

- The rules of engagement are agreed for the charging regime : when is an activity chargeable? How will the Competent Authority provide notification that the activity is chargeable? To whom will invoices be submitted? Will the operator be charged when inexperienced staff are used on the Competent Authority's team?
- The operator understands the availability of existing and planned guidance on the new legislation.

- Areas where problems are anticipated are identified eg. modelling the effects of batch reactions.
- Planned report structures and timescales for submission (operator) and assessment (regulator).

Regular meetings will probably be required because much of this information is dynamic, subject to change over time.

**Table 1** summarises these key factors.

### **3. BENEFITS OF THE COMAH REGIME.**

The COMAH legislation covers a broader spectrum of a company's major hazard risks than the previous CIMAH legislation covered and therefore forms a more logical basis for risk management. A major flaw with the old CIMAH legislation was that it often divided manufacturing sites into a complex and illogical number of CIMAH and non-CIMAH areas.

In practice, this meant that most attention was often focused on the wrong areas because of legal scoping definitions. For example, acrylamide bulk storage tanks were included within the scope of CIMAH but extremely flammable methyl chloride and tri-methylamine tanks were excluded. Accidents involving acrylamide only had the potential to affect areas which were local to the tank because of the physical and toxicological properties of the liquid. Methyl chloride and tri-methylamine storage vessels had the potential to BLEVE (Boiling Liquid Expanding Vapour Explosion) which would cause significant damage within hundreds of metres of the vessels. All of these chemicals will be covered within the scope of COMAH.

The benefits gained from COMAH will depend on whether operating companies view COMAH as an administrative burden or as an opportunity to improve corporate risk management. By taking a positive attitude to the new legislation, the following benefits can be gained :

- improved involvement of people throughout the organisation in controlling major accident hazard risks.
- better communication of hazards and risks within and outside the organisation.
- more effective corporate risk management.

**Table 1 Key Factors For Compiling the COMAH Safety Report**

Ref	Key Factor	Difficult Areas		
2.1	Extent of information gathering.	Assessing process risks	Integrating safety and environmental risk assessments	Making the COMAH demonstration
2.2	Level of detail in report.	Batch plants	Commercial confidentiality issues (P&IDs, mass / energy balances)	Security concerns (plans, layouts)
2.3	Resource allocation for key staff.	Neglecting normal jobs	Pressure on EHS staff	Assuring safety report quality
2.4	Phased or integrated report structure.	Efficiency of assessment by Competent Authority	Compliance cost	Resources required for integrated reports
2.5	Areas where a sitewide approach is useful.	Reducing duplication within the safety report	Identifying areas where consistent approaches are used	Clarity of presentation of information
2.6	Extent of consequence modelling.	Complexity and practicality of modelling technique	Availability of generic data	Clarity of presentation of information
2.7	Risk assessment methodology.	Ease of updating safety report	Consistency with sitewide risk assessment techniques	Consistency with other risk assessment initiatives (eg. occupied buildings)
2.8	Involvement of Competent Authority.	Administrative arrangements	Report structures and timescales	Interpretation of legislative requirements

### 3.1 Involvement Of People Throughout The Organisation In Controlling Risks.

As operating companies and the Regulatory Authorities gain more experience with the COMAH regime, so companies will have to ensure that staff at all levels within the organisation are involved in risk management. This will help to ensure that senior management adopt realistic and operable systems of work that take account of the real issues that are relevant on the shop floor as well as the strategic issues that the company has to address.

There are often widely different perceptions of risk within an organisation. Operators may have ignored or trivialised certain risks; management may just assume that all risks are well understood; safety specialists may have developed an overly theoretical view of risk levels. The COMAH Safety Report can be a useful tool for developing a common understanding of risk levels within a company if it is clearly written and people throughout the organisation are involved in preparing and understanding the report.

It is also possible to use the data and summaries within the Safety Report as a basis for safety and environmental training programmes. This can improve team-working as different people become more aware of the role that they and their colleagues play in minimising risk levels in the organisation as a whole.

### 3.2 Improved Risk Communication.

If the COMAH Safety Report is well written, it should summarise a wide range of complex data about major accident hazards in a clear form. This will help staff throughout the organisation to have a better understanding of risk levels and how they adversely or positively affect these risks.

Nowadays, risk levels have to be communicated to a wide range of interested groups : corporate head office departments, insurers, auditors, Regulatory Authorities, neighbouring communities and the media. Risk communication to these groups will be facilitated by having clear and comprehensive summary data available.

### 3.3 More Effective Risk Management.

Information about major accident hazard risks tends to be spread throughout the organisation and is often presented in different formats in each area. It can be difficult to obtain an accurate sitewide view of the company's risks. Some areas where risk management has been improved include :

- **Highlighting gaps in available information** for some older plants and peripheral activities such as fuel storage.
- **Identification of areas where risk controls are inadequate** such as maintenance activities for safety critical functions which are not being performed properly.
- **Prioritising areas where additional risk reduction measures are required** such as older plants which no longer meet new plant design standards.



- **Assessing the effectiveness, completeness and practicality of the emergency plan.**
- **Defining a basis for planning future site development** taking account of the effect of this development on existing and predicted future risk levels.

#### **4. PROBLEMS ASSOCIATED WITH THE COMAH REGIME.**

Some of the potential problems associated with the COMAH regime have been discussed in **Section 2**. Particular problems have been encountered in the following areas :

- Publication of information that may prejudice site security.
- Publication of information that may prejudice commercial confidentiality.
- Cost of compliance with COMAH.
- Consultation distances and hazardous substances consent.
- Different attitudes to implementation of Seveso II directive across Europe.

##### **4.1 Site Security.**

COMAH Safety Reports will be made available to the public to satisfy governmental commitments to increase public access to environmental information. This should help to increase the public's confidence about risks associated with neighbouring major hazards installations and lead to public pressure to improve those installations whose performance does not meet acceptable standards.

It is, however, possible that the information could be used maliciously by arsonists or terrorist groups. The COMAH Safety Report is likely to contain a lot of detailed information about the most vulnerable areas within chemical plants. Older sites often have major hazard tank farms, tanker loading / offloading facilities and plants close to the site boundary and most sites will have vulnerable gas lines and warehouses close to the site boundary.

The operating company has to assess escalation risks (where accidents start in one area of the site and spread to affect adjacent areas). This can only meaningfully be completed with reference to the specific location of equipment within the site. This information would be very useful to a potential arsonist or saboteur.

Major accident hazard frequencies are historically low, even on high risk plants. Great care must be taken to ensure that arson and sabotage do not start to contribute significantly to these risk levels because of the publication of major accident hazard data in the public domain.

It is possible to apply for confidentiality for some sections of the report on the grounds that publication poses a threat to national security or on the advice of the local Police Authority. In reality, many sites will not pose a threat to national security and many local Police Authorities will be unfamiliar with COMAH and the chemical industry.

Furthermore, confidence in the Safety Report may be undermined if sections of the report are unavailable and confidential. There may be a perception that the chemical company has something to hide. This means that the operating company has to be very careful about the way that information is presented in the Safety Report, particularly where (i) layouts and plans are presented and (ii) activities are close to the site boundary and vulnerable to attack.

#### **4.2 Commercial Confidentiality.**

Under the CIMAH regime, the operating company could provide sensitive information to the Regulatory Authorities with confidence because it would be treated confidentially. A large amount of information has to be presented in the COMAH Safety Report and operating companies may inadvertently disclose sensitive commercial information about their processes and operations.

This is particularly important for layout drawings, plans, process and instrumentation (P&iD) drawings and mass and energy balances.

#### **4.3 Cost Of Compliance.**

The UK Competent Authorities will be charging operating companies for assessment work associated with COMAH. No such charges were levied under the previous CIMAH regime. Five particular issues cause concern to operating companies :

- The high hourly fee rate that will be charged for assessment, which is significantly higher than the rate that many top safety consultancies would charge for similar work.
- Fears that operating companies may have to pay these high rates for junior staff from the Competent Authority.
- Difficulties in budgeting for future assessment work by the Competent Authority due to the lack of a pre-agreed scope for the work to be carried out.
- Diverting management time to control the costs which are being charged for assessment by the Competent Authority. This is particularly difficult when the invoices for such work are vague and do not clearly relate to specific activities.
- Fears that these additional costs will erode the international competitiveness of European chemical companies.

#### **4.4 Consultation Distances And Hazardous Substances Consent.**

Many operating companies were initially assigned very large Public Information Zones (PIZ) around their sites because of the methodology that the Competent Authority used for calculating these zones. The operating company has to provide defined information to people living within these zones under the COMAH Regulations.

The problem arose because the Competent Authority chose to calculate the PIZ's from the relatively limited information which was submitted by operating companies in their Hazardous Substances Consent applications rather than the detailed information that was submitted to the same Competent Authority in the COMAH Safety Reports. This caused problems to some companies because their PIZ's suddenly grew by factors of 5 to 10 as a result of the change from CIMAH to COMAH.

This caused an additional bureaucratic burden on the companies which were affected but the problem was solvable by making the Hazardous Substances Consent form more detailed.

#### **4.5 European Implementation Of Seveso II Directive.**

There are real concerns that the competitiveness of the UK process and manufacturing industries is being eroded because :

- The legislation has been enacted more quickly in the UK compared to some other European countries.
- The legislation is being implemented more thoroughly in the UK compared to some other European countries.

#### **5. DIFFICULTIES WITH IMPLEMENTATION OF THE COMAH REGULATIONS.**

This section discusses some of the difficult areas that have been identified in producing COMAH Safety Reports.

##### **5.1 Human Factors And People Issues.**

Many older onshore plants were designed before human factors issues were given prominence in plant design. These older plants are therefore often not designed to effectively address human factors issues. Similarly, many procedures and operator competence assurance programmes did not use the latest techniques and few management of change procedures directly assessed the people issues associated with planned changes. This makes it very difficult to make the required human factors COMAH demonstrations for this type of plant. Some of the issues can, however, be addressed by improvement plans but will require many years of work.

##### **5.2 Major Accident Prevention Policy (MAPP).**

This may appear to duplicate elements of many company's existing Safety Management Systems (SMS) and operating companies may feel that a MAPP can be created simply by changing the word 'hazard' to 'major accident hazard' where it appears in their existing systems.

Many elements of the SMS are aimed at controlling operational safety and environmental risks. The MAPP is intended to extend these systems to ensure that they also address low frequency / high consequence major accident hazards. The practicalities of introducing and operating an effective MAPP within the framework of COMAH are still unclear to many companies.

##### **5.3 Interpretation Of 'All Means Necessary'.**

At first sight, this phrase suggests that risk removal or reduction measures should always be implemented regardless of cost contradicting the well established UK concept of ALARP (As Low As Reasonably Practicable). The UK Regulatory Authorities have indicated that they will be interpreting 'all means necessary' using the ALARP principle. Alternative interpretations of the concept could start to threaten the commercial performance of European chemical companies whilst achieving very low real reductions in risk.

#### **5.4 Demonstration That Risks Are ‘ALARP’.**

There are a number of demonstrations which are required in the COMAH safety report. One of these requires the operator to demonstrate through a risk assessment process that risk levels are As Low As Reasonably Practicable (ALARP). In some industries, such as the offshore oil and gas industry, there are well established methodologies for making this type of demonstration. These methodologies are often less well suited to the onshore process industries where the range of hazards is often more diverse, the potential risk reduction measures less obvious and the cost drivers more wide ranging.

The following techniques are available, but all of them have disadvantages in an onshore context :

- Quantitative risk analysis, option analysis and formal cost benefit analysis. This would be expensive to implement practically and accurately in many onshore situations and does not easily address the range of cost drivers (safety, environmental, commercial, insurance etc) that exist using a consistent framework.
- Risk matrix analysis focusing on the most significant risks that are identified within the matrix. This is often a workable method but suffers from a lack of objectivity and still leaves a large range of hazards to be assessed for a complex site.
- Code compliance. This is how many decisions, particularly for engineering issues, are and have been made. Although this method is easy to apply, it suffers from a lack of a formal assessment of different options, some codes have a higher status than other codes and there are often grey areas within codes and standards.

As more experience is gained within the onshore industries, more efficient and satisfactory methods may evolve for addressing this issue.

#### **5.5 Demonstration For Older Plants.**

These plants were often built when design, legislative and documentation standards were lower than they are today. It is often very difficult to make a coherent COMAH demonstration for this type of plant without doing a lot of additional work. In some cases, companies may even choose to close down some plants as this additional work would make the plant's operations uneconomic.

#### **5.6 Inherent Safety.**

Inherent safety opportunities have to be considered under the COMAH regime. It will only be practical to maximise the opportunities for inherent safety at a very early stage in a plant's lifecycle when fundamental decisions are to be made. Inherent safety opportunities will be limited for existing older plants.

### **5.7 Batch Reactions.**

Some plants may be used for producing a wide range of different products using batch reactions. Describing and assessing every batch reaction will be impractical and it will be necessary in many cases to group reactions into generic categories eg. Nitrations.

### **5.8 Environmental Risk Assessment.**

Environmental risk assessment is a technique which is still in its infancy compared to the approaches which are used for safety risk assessments. Many operating companies have limited skills in this area and will struggle to produce assessments to the required standard.

The safety and environmental risk assessments have to be integrated within the COMAH Safety Report. In many accident scenarios, one of safety or environment will dominate the consequences of the accident. It is important to avoid excessive detail when assessing environmental risks when the scenarios are clearly not going to constitute a MATTE (Major Accident To The Environment). On the other hand, sufficient detail has to be provided to demonstrate that environmental risks have been assessed in an integrated approach with safety risks.

### **5.9 Consequence Modelling.**

Accepted techniques exist for modelling the consequences of many of the accidents associated with the bulk storage of hazardous chemicals. This is not the case for many process accidents such as reactor runaways and dust explosions. Simplifying assumptions can often be made but this will affect the accuracy of the modelling.

It is also very difficult to assess the consequences of releases of combustion products from a fire and by-products from an uncontrolled chemical reaction. This is because :

- It is difficult to assess the source term defining exactly which chemical species have been released. Some of the released chemicals are often formed when plastic packaging materials burn and react with burning chemicals.
- The energy associated with the release just prior to loss of containment cannot be calculated accurately.
- Dispersion modelling techniques do not accurately model the interaction between the intense energy of a fire and the energy of the released vapour cloud.

### **5.10 Occupied Buildings.**

A major initiative was started by the UK Health & Safety Executive to ensure that the risks to onsite personnel in occupied buildings on chemical sites were acceptable. For many companies, significant efforts were required to produce these occupied buildings risk assessments. Unfortunately, this initiative clashed with the COMAH implementation timescales making it very difficult for companies to resource the compliance requirements for both initiatives.

## **6. CRITICAL FACTORS FOR PRODUCING A COMAH SAFETY REPORT.**

Based on the experience gained at these two UK sites, the following process appears to be effective for producing a COMAH Safety Report :

1. List the requirements of the COMAH Regulations using a checklist format.
2. Identify information gaps covering plant descriptions, material properties, hazard identification, risk assessment and safety management systems by comparing existing available information with the COMAH checklist.
3. Decide which gaps can be filled using internal resources and competencies and produce a programme for filling all of the gaps using internal and specialist external resources where required.
4. Produce the report and ensure that key personnel in the organisation 'buy in' to the report where it affects their areas.
5. Produce and implement a prioritised action plan for addressing any deficiencies in risk management encompassing technical, management systems and human factors aspects.
6. Assess future plant changes against the information contained within the COMAH Safety Report.

## **7. CONCLUSIONS.**

Depending on the attitude of operating companies and the Regulatory Authorities, the COMAH Safety Report will either be an expensive administrative burden or a useful tool which can improve corporate risk management.

There are still many uncertainties about the details of producing and maintaining the Safety Report but, over time, many of these issues are likely to be clarified as organisations gain more experience.

Two objective measures of the success of the COMAH Regulations could, however, be used but will only be revealed in future years : 'have the normalised UK major accident safety and environmental accident statistics improved?' and 'have companies moved production facilities to other parts of the world where compliance costs are lower'.

## **8. REFERENCES.**

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