

COMAH COMPLIANCE FOR A FINE CHEMICALS & EXPLOSIVES FACILITY LOCATED WITHIN A SSSI

A Ennis[1] & RM Thomas[2]
[1]Haztech Consultants Ltd; Meridian House Business Centre, Winsford, Cheshire CW7 3QG
[2]Formerly with exchem organics; Great Oakley Works, Harwich Road, Great Oakley, Harwich, Essex, C012 5JW. Now with Haztech Consultants Ltd.

SUMMARY

This paper describes experiences in the preparation of the COMAH report for the exchem organics Harwich site. exchem organics is a small fine chemicals site which was not covered under the CIMAH regulations but fell into the top tier of COMAH and hence had to submit a full report in February 2002. The site combines manufacturing of fuel additives and fine chemicals with explosives handling facilities and is located in the middle of a Site of Special Scientific Interest (SSSI).

The particular mix of activities on the site combined with the location presented a number of challenges in the preparation of the COMAH report. Constraints were also experienced due to the relatively small management team and it was decided to seek expert assistance from an external consultant. The report was prepared by exchem organics personnel with specialist assistance provided by Haztech Consultants Ltd.

Consequence modelling was required for a wide variety of identified hazard scenarios including gas dispersion, fire, condensed phase explosion and vapour cloud explosions. Results of the consequence modelling along with risk were considered in the compliance with the HSE "As Low As Reasonably Practicable" (ALARP) criteria[1,2] for the site.

INTRODUCTION

The SSSI contains one of only two populations of Sea Hogs Fennel in the UK and is the only UK breeding ground for Fisher's Estuarine Moth. In addition the site is surrounded by environmentally sensitive salt marsh with a colony of Common and Grey Seals inhabiting the area. The area is also designated a RAMSAR site under the Convention of Wetlands of International Importance for its importance as a wetland bird habitat. The site is home to a variety of wildlife other than those mentioned above including several species of owl, hawk and butterfly. There is also a wide variety of important wildlife located around the creeks and mudflats on the other side of the sea wall adjacent to the site. Although not part of the SSSI it is an environmentally sensitive area which is regularly monitored.

The site is a top tier COMAH site due to the amount of Nitroglycerine compounds held which are classified by Risk Phrase as Very Toxic. The site also holds significant quantities of Oleum and Nitric Acid along with a product classified as "R51 dangerous for the environment".

SITE OVERVIEW

The site consists of three main process plants and the explosives handling and storage activities. The manufacturing operations are concentrated into a relatively small area and are surrounded by the SSSI and farmland. Much of the farmland is also owned by the company and total site area is about 1200 acres. A dock provides the capability to accept and despatch materials by sea. As an explosives site, there is already a high degree of licensing and regulation in place for the explosives handling activities.

Due to the nature of the exchem organics chemicals manufacturing operations a very wide range of chemical products can be manufactured on the site. This created difficulty in fulfilling the requirements of the "Descriptive" section of the Safety Report Assessment Manual (SRAM). Thus, a typical range of generic chemistries was described. These were cross referenced to the detailed safety and operational procedures to demonstrate that the process was safe and of low environmental risk prior to production commencing. To describe all of the potential processes in detail in the COMAH report would have made for a very bulky document and been extremely time consuming and hence this generic approach was essential. In addition, the explosives operations encompass a vast range of materials. In this case, typical explosive materials were used as exemplars and their hazards covered in detail in the report. The assumption was then made that the effects from a Major Accident, in terms of blast overpressure and toxic effects, would be directly comparable for other materials with a similar risk phrase thus reducing the amount of work required to an acceptable level. It is not known at the time of writing whether this approach is acceptable to the Competent Authority (CA).

COMAH RELATED INFORMATION ALREADY AVAILABLE

exchem organics already had a considerable amount of information available that could be used in the COMAH report. In particular, the company had extensive information on the environment surrounding the site going back many years.

exchem organics carry out Hazard Studies and Risk Assessments on all new chemical processes and products likely to be manufactured on the site. These assessments not only include process safety but also allow a detailed environmental risk assessment to be in place before any significant steps towards production are taken. Risk assessments are carried out generally in accordance with the guidance in Reference 3 and Hazard Studies in accordance with References 4 and 5. These procedures assisted significantly in the demonstrations required by the COMAH regulations. The records are available for all of these in the company's record keeping system. There is also extensive information available within the company on chemical hazards and COSHH assessments.

The company also has extensive safe operating, maintenance and emergency procedures, which are administered by a quality system including full document control. A computer based planned preventive maintenance system was also in the process of implementation at the time of writing the COMAH report.

The site is regulated under the Explosives act of 1875 and 1923 and a licence is granted for certain controlled operations within the site, these being to manufacture store, test and destroy explosives within defined areas of the site. This ensures a highly regulated operation and an appropriate level of safety procedures and documentation. The company also has a Safety Management System (SMS) that is generally compliant with the guidance in HSG65[6].

Whilst this information is all relevant to preparation of the COMAH report, it was, however, noted that certain information was lacking which would be needed e.g. detailed consequence modelling and analysis. Additionally it was felt that a site-wide review of Major Accident Hazards (MAHs) would be beneficial.

CHALLENGES IN THE PREPARATION OF THE COMAH REPORT

The main challenges faced in preparation of the COMAH report can be summarised as follows:

RESOURCE

The exchem organics management team is relatively small and there is little spare capacity for additional work to be taken on without compromising the day to day operation and safety of the site. It was not considered acceptable that operational efficiency and safety should be compromised to write the COMAH report. It was identified at an early stage that significant additional resource would be needed from outside the company to complete the report within the required timescale.

SPECIALIST KNOWLEDGE

Although exchem organics has a considerable level of expertise within the company it was clear that additional specialist knowledge was required in areas such as Risk Assessment, Hazard Review and Consequence Modelling and knowledge of COMAH legislation and safety case preparation.

CONSEQUENCE MODELLING

Consequence modelling requires the use of specialist tools and the expertise to interpret the results. Neither the tools nor expertise were available within the company. Consequence modelling is discussed further in the sections below.

REPORT STRUCTURE

Structure of the report was seen as an issue at an early stage. Consideration was initially given to constructing the report following the structure of the guidance document HSG190[2] but this was dismissed as it would have led to an extremely repetitive, lengthy and difficult to read report. It was also apparent that the time taken to construct an applicable report structure could be better spent in other areas.

COST

The cost of preparing the report was an issue from the onset when set against budgetary constraints. The cost of using a consultant has to be balanced against the savings and benefits from freeing up exchem organics management for other tasks.

SELECTION OF CONSULTANT

For the reasons discussed above, a decision was taken to seek outside assistance from a specialist safety consultancy. It was essential that the consultant selected had the complete range of appropriate skills available in house. Selection was made based on a combination of experience, cost and also interpersonal aspects (since exchem organics and the consultants would have to work closely together for an extended period this was considered important).

A decision was taken to use Haztech Consultants Ltd. based on a combination of price, experience and ability and the availability of a CD-ROM based COMAH report structure. Attendance at a Haztech IChemE approved COMAH course was a contributory factor in the decision since it provided an opportunity for exchem organics management to meet the personnel who would be working on the report and assess the expertise available.

APPROACH TAKEN TO REPORT WRITING

It was considered essential that exchem organics retained ownership of the report and the information contained therein. Hence, the process was led by a senior member of the exchem organics management team (the Site Operations Manager). Other members of the exchem organics management team were used as appropriate with personnel from Haztech Consultants Ltd providing specialist knowledge and backup. The whole report was reviewed by a joint exchem organics/Haztech team and a gap analysis carried out prior to the final draft being produced.

This approach allowed the majority of the exchem organics management team to continue with normal duties whilst facilitating completion of the COMAH report in the required timescale. If key site management personnel are withdrawn from normal activities then there are risks that personnel become isolated from normal business roles and production and day-to-day safety become neglected.

Due to the size and complexity of the report it was necessary to employ a quality revision control system in order to prevent confusion and duplication of effort. A simple colour coding system was used in the text. Only the exchem organics Site Operations Manager was allowed to finalise any parts of the document. Files were identified both by date and revision letter as a double check.

There was also a single point of contact for communications between Haztech and exchem organics in order to ensure that all communications were properly recorded and directed. The master copy of the document was held by exchem organics and various people were assigned to work on specific sections. A programme of work was also set up so that progress could be monitored against milestones and deliverables. A target date for completion of 24 December 2001 was set to allow for any last minute adjustments and the final two weeks before submission date for printing and binding. This date was, in fact, met and the report submitted three days before the deadline.

REPORT STRUCTURE USED

As stated previously, HSG190[2] was judged unsuitable to use as a template. A prefabricated template was supplied by Haztech based on EU guidance[7] which is more clearly structured.

In order to provide flexibility for future modifications e.g. new plants and processes the report was constructed as a "core" and a number of installations. The core consists of three sections:

- Descriptive
- Hazard & Risk Assessment
- Safety Management

The core of the report contains features that are common across the whole site and the installation sections deal with information specific to the installation referring back to the core report where necessary. Demonstrations and supporting information are placed in the appendices. This significantly reduces the amount of repetition. The format used also allows for easy amendment of individual sections.

Since the site handles explosives, there is a certain amount of highly confidential information which it was considered imprudent to allow into the public domain for security reasons. The confidential information was, therefore, placed in a special appendix in a separate folder thus allowing it to be withheld more easily. Advice was taken from the Security Services as to which information was considered sensitive.

HAZARD IDENTIFICATION & RISK ASSESSMENT

Hazard Identification and Risk Assessment (HAZID & RA) are a key part of the COMAH report and site safety in general. Although a variety of HAZID and RA methods are already used on the site it was considered beneficial to carry out a site-wide review to ensure that all MAHs were identified. This review was carried out using a guide word approach and using a small team comprising a study leader provided by Haztech and relevant personnel from the exchem organics management and operations teams.

The outcome of the Hazard Review was a set of Hazard Summary Sheets. These sheets provide linkage between: Hazard, Risk, Consequences, Preventive measures, Protection systems, Mitigation measures and Emergency response. The methodology used is similar to Hazard Study 2 and consistent as described in the widely known Hazard Study methodologies from the IChemE[4] and CIA[5] and therefore acceptable to the Competent Authority. The process was aligned towards Major Accident Hazards and thus minor incidents were filtered out thus reducing the number of scenarios to be modelled down to a reasonable level. Risk assessment was carried out for the identified Major Accident Hazard scenarios in order to judge compliance with the ALARP criteria (see below).

The Hazard Summary Sheets form a key part of the COMAH report and potential Major Accident Hazard scenarios can clearly be identified from them. Outstanding actions are recorded in the same manner as a hazard study and may be carried forward into the Site Improvement Plan. Identified potential MAH scenarios are screened prior to consequence modelling in order to (a) eliminate and scenarios that are not MAHs and (b) identify any common scenarios that can be used in several cases.

CONSEQUENCE MODELLING

The mix of activities on the site necessitated consequence modelling of gas dispersion, pool fire and both TNT (condensed phase) and TNO Multi-Energy (vapour cloud) explosions. PHAST Version 6.0[8] has all of these models available.

Consequence modelling was carried out by Haztech personnel and interpretation of the results discussed and agreed with exchem organics. It should be noted that interpretation of consequence modelling results requires specialist knowledge and training. Several issues were raised from the consequence modelling which were then examined in further detail:

- It was possible to eliminate some Major Accident Hazard scenarios completely due to the low level of consequences
- Some events which were potential Major Accident Hazards were discovered not to be as large as originally estimated during the Hazard & Risk Assessment
- A few events were identified which had more severe consequences than originally thought

These events and their consequences were given consideration against the potential safety improvements that could be made and recommendations fed into the Site Improvement Plan.

GAS DISPERSION

The PHAST Unified Dispersion Model was considered appropriate for the gas dispersion cases being considered in the consequence modelling as it has been widely validated[9] and was known to be available within the HSE. Other gas dispersion models and modelling programs were considered[10] but on examination did not offer any advantage over using PHAST.

Some gas dispersion modelling had been done several years previously for a limited number of cases by another consultant. This was, however, judged to be not of use for the COMAH case as the events and source terms were not clearly defined and therefore could not be clearly linked to the identified Major Accident Hazard scenarios. A representative set of consequence modelling scenarios was, therefore, defined based on those in the Hazard Summary Sheets. Accurate source terms are essential for consequence modelling and hence considerable care was taken to ensure that the source terms used were appropriate for the particular scenario being modelled.

For gas dispersion modelling detailed wind and weather data were obtained from a local weather station and these were used to define two representative weather conditions to be used in the modelling, these being Pasquill-Gifford categories D5 (atmospheric stability class D with 5m/s wind speed) and F2 (stability F with 2m/s wind). D5 represents the most commonly found conditions on the site occurring >65% of the time and F2 a worst case for gas dispersion (stable conditions with low wind speed)[11]. There were no other cases that would benefit from being modelled since there was no warehouse fire Major Accident Hazard scenario which would have meant dispersion modelling for weather conditions D10 and D15. A degree of sensitivity modelling was used for each of the scenarios e.g. for a leak of Oleum, the model was run for 6mm, 12mm, 25mm and 50mm hole sizes as well as a catastrophic tank rupture. Both side views and cloud footprints were considered in order to obtain an estimate of the release consequences. Possible limitations of the dispersion model were also considered when assessing consequences.

For modelling of Oleum gas dispersion, the guidance in References 10 and 12 were taken into account. From this it was apparent that the release of Oleum in dry conditions did not pose a significant hazard but a release in wet conditions would result in the rapid evolution of H_2SO_4 fumes[18]. This is a particular problem for two reasons (a) H_2SO_4 is highly toxic and (b) the cloud disperses relatively slowly.

The Dangerous Toxic Load for H_2SO_4 is: DTL = 1.30×10^4 ppm^2.min and hence a concentration as low as 114ppm for 1 minute may potentially be fatal. This compared to the DTL for SO_3 which is: DTL = 4.655×10^6 ppm^2.min i.e. DTL for 1 minute exposure is 2158ppm. Thus it can be seen that any release of Oleum in wet conditions could cause a major incident and, since the Oleum tanks are located in a bunded area there was potential for the evolution of a sizeable cloud of H_2SO_4 with a relatively small depth of rainwater in the bund. For an instantaneous release e.g. catastrophic rupture, the cloud moves downwind in the form of a hemisphere. This can be seen on Graphs 1 and 2 showing the cloud centre line concentration after 1 minute and 2 minutes.

The size and concentration for this scenario caused potential problems both on- and off-site. The works restaurant and plant managers' offices were particularly vulnerable being located only 80m from the source with a potential total of 25 people present. The persistence of the cloud indicated that it could drift off-site under certain weather conditions and, although unlikely to cause fatality or serious injury, could potentially cause distress to members of the public. This was taken extremely seriously by the company and potential reductions in hazard and risk put in hand in the site Improvement Plan. For smaller hole sizes, H_2SO_4 is evolved over a period and hence can be modelled as a continuous release. At these lower release rates the cloud size is much smaller and the effects do not go off-site however there is still potential for injury or fatality to personnel on-site. A concentration versus distance diagram for this case can be seen in Graph 3.

The net result of this is that consideration of the process from the aspect of inherent safety has indicated a route by which the requirement to store Oleum on the site may potentially be eliminated completely and this is being pursued.

POOL FIRE

The site contains several bulk storage tanks containing principally Methanol or Methanolic liquors and also one or two other flammable liquids. These are contained in a bunded area located adjacent to one of the plants. The radiation due to a pool fire in the bunded area was calculated in order to assess the potential impact on the adjacent plant. The radiation versus distance curve for this case can be seen in Graph 4. It was concluded that this case did not pose any significant hazard to plant since all adjacent tanks were protected by safety relief valves and other plant was located a sufficient distance from the source so as not to be affected.

TNT EXPLOSION

Although consequence zones are set on the explosives license these are not sufficient for the purposes of COMAH and hence the explosion modelling had to be revisited for the explosives handling facilities.

The site has a number of magazines and explosives handling facilities including burning grounds and loading facilities. These are protected to a degree by their construction and external earth mounds with safety distances and maximum quantities set by the explosives license. This means that explosives handling facilities are located well away from other activities carried out on the site and consequences of any incident are therefore reduced. Nevertheless, there are several points at which an explosion could occur outside of the protected areas e.g. offloading from ship and road transport to magazines.

The TNT explosion model is well established in the literature[13,14,15] and although generally discredited for modelling of vapour cloud explosions[16,17], it can be seen that it is appropriate for modelling point source, condensed phase events. A number of explosives are, however, significantly more powerful than TNT (e.g. TNT/RDX mixtures, Nitroglycerine) and hence this must be taken account of in the model.

Explosion overpressure graphs were produced for a several quantities of explosives to provide sensitivity analysis. Typical overpressure radii can be seen in graph 5.

VAPOUR CLOUD EXPLOSIONS (VCE)

Vapour cloud explosions were modelled using the TNO Multi-energy model[21,22] which is the most widely used in Europe and is considered to be the most appropriate. The alternative Baker-Strehlow model[23,24] is mainly used in the USA and was not judged to offer any significant advantage over the TNO model. As stated above the TNT model has been discredited for VCE modelling. With all consequence modelling, it is essential that the source term should accurately reflect the potential hazard situation and here again considerable effort was expended in obtaining the correct parameters for use in the PHAST model.

The particular event identified was the loss of containment of a flammable solvent above its' flashpoint inside one of the process buildings. Since the process being carried out involves a period of operation at reflux it was considered that there was potential for a significant release of flammable vapour within the building.

The degree of uncertainty in the TNO model stems principally from the estimate of the volume of gas in the congested area and the degree of congestion. Thus, conservative estimates of both the volume and degree of congestion were used in order to ensure that the worst case scenario was used. Additionally, the TNO model assumes implicitly that the whole of the congested volume is at the stoichiometric concentration i.e. the worst case in terms of explosion violence and hence is again conservative since in a real world situation the mixture is extremely unlikely to be homogeneous within a compartment. A typical curve for overpressure versus distance is shown in Graph 6.

In order to provide some degree of sensitivity analysis two cases were run, one with 100% volume fill of the compartment (absolute worst case) and the other with a 10% fill (more credible case). As above, the explosion effects were assessed based on references 3, 11, 12 & 21. The results of the analysis indicated that other than the process plant itself, the site canteen and plant managers' offices were potentially at risk. A number of actions were raised for the Improvement Plan in order to reduce both the hazard and risk from this process.

COMMENTS ON CONSEQUENCE MODELLING

Interpretation of the effects of overpressure was made using the guidance in References 11, 18, 19. Damage criteria for various overpressures can also be found in these references. Potential for damage to buildings took into consideration the vulnerability of the various structures on the site and the guidance in Reference 20. There is a diverse mix of buildings on the site ranging from "blast-proof" structures specifically designed for explosives manufacture (one of the plant control rooms) to wood frame and prefabricated buildings (e.g. offices and amenities buildings) hence, vulnerabilities varied widely. The explosives license manages safety by setting separation distances and hence it was found that occupied buildings were generally at minimal hazard from condensed phase explosions.

The use of PHAST allowed for rapid modelling of the various potential Major Accident Hazard scenarios identified. Although much of the modelling could have been done by manual methods or other computer programs, the speed and output features of PHAST significantly reduced the time and cost of the exercise. The major disadvantages being (a) the first cost of PHAST and (b) the requirement of specialised knowledge to use to program effectively and interpret the results. As with many complex computer programs garbage in will inevitably result in garbage out.

The consequence modelling and analysis exercise proved very useful in the COMAH report to demonstrate that the consequences of the particular Major Accident Hazards were fully understood by the company and the results used in a positive manner to improve the safety of the site. It should be noted that consequence analysis was carried out against safety, health and environmental[25] criteria.

ENVIRONMENTAL ASPECTS

exchem manage all activities with due regard for the environmental sensitivities of the site and can demonstrate a year-on-year environmental improvement in the quality of the SSSI and surrounding area based on regular reports by English Nature and other environmental bodies. The company has also won a number of environmental improvement awards over a ten-year period. Whilst this information was useful in demonstrating the companys commitment to the environment, the potential for Major Accidents To The Environment (MATTEs) still had to be considered carefully against the criteria in Reference 25 using Source, Pathway, Receptor methodology. A considerable amount of time was spent on the environmental aspects of the COMAH report due to the sensitive nature of the site environs.

The potential to cause damage to the SSSI and surrounding areas was noted from the Hazard review process which identified a number of events that could potentially impact on areas of the SSSI. The potential hazard for a MATTE was, however, estimated as limited due to a combination of the location of hazardous material storage, and the relatively large area of the SSSI in relation to the damage potential of the identified Major Accident Hazards. Gas dispersion modelling was carried out to determine potential effects due to a release of Oleum and this indicated that both the limited plume size and duration would result in minimal impact on the environment in general. Difficulty in deciding appropriate harm criteria to the SSSI and other wildlife was experienced due to the lack of available, applicable scientific data. In particular there are no data relating to the effects of toxic gases on Fishers Estuarine Moth.

The low-lying nature of the site means that drainage is achieved by a number of dykes and ditches. In the event of a loss of containment of liquid, these can be isolated by means of a set of sluice gates to prevent contamination spreading by this pathway. There was also some debate on the effectiveness of some of the protective measures, in particular the risk of flooding and potential since the site is protected by a sea wall designed for a once in 200 year event. The sea wall is designed, constructed and maintained by the Environment Agency.

The Risk of a MATTE was estimated as being very low due to a combination of good engineering design of equipment, secondary containment and mitigation measures in place.

DEMONSTRATION OF ALARP

One of the major problems of interpretation in the COMAH guidance is the definition of the phrases “As Low As Reasonably Practical” and “All Measures Necessary” and their implementation in the COMAH report. It was originally stated that compliance with applicable standards or guidance would be sufficient to demonstrate that risks had been controlled to an ALARP level. In later versions of the HSE Safety Report Assessment Manual it became apparent that ALARP had been expanded to mean examination of all possible options, even if the options were not covered by current industry best practice or economically feasible.

Fortunately this did not have a great impact on the site since most major risks were already adequately controlled. Where risks were found that could potentially be reduced these measures were put into the site Improvement Plan for further consideration. Due consideration was made of ALARP criteria using the guidance in the HSE Safety Report Assessment Manual on the HSE web site. In particular a matrix approach was used to balance hazard and risk[26].

One example of this was the Oleum tanks which were located outside in bunded areas. Gas dispersion showed that there were potential off-site effects from larger releases where the release mixed with water (e.g. rainwater in the bund) as well as potentially severe effects for a number of occupied buildings on-site. This had not previously been thought to be a problem due to the size of the site and location of the tanks. Consideration against ALARP criteria indicated that this was potentially unacceptable to the company purely in terms of hazard even though the risk was relatively low and hence an action was raised in the site Improvement Plan to consider potential improvements. This particular item was given the highest priority as it was judged to be the worst Major Accident Hazard identified.

COST/BENEFIT

The cost of COMAH compliance has been considerably higher than originally estimated from HSE figures in Reference 27. This must be considered as both quantifiable, in terms of the direct costs of compliance (HSE charges, consultancy fees etc.) and non-quantifiable being the costs of removing staff from other, equally important safety work or direct manufacturing duties. Directly quantifiable benefits from the COMAH process have, so far, been negligible. Overall, the cost/benefit analysis of COMAH must be questioned given the high cost of compliance compared against the good safety record of the company and the UK chemical industry in general.

SITE IMPROVEMENT PLAN

A site improvement plan was developed based on the actions raised from the Hazard Summary Sheets and consequence modelling. All actions were rated based on safety, health and environmental criteria, consideration being given to reducing both Hazard and Risk. The potential benefit of the improvements was considered against the available capital budget in order to make the most effective use of the available money. All actions have also been given target completion dates based on projected available finances. The Improvement Plan is a live document covered by the site Quality System and will be reviewed and updated periodically to account for changes in priorities, plants and financial constraints.

One example of this was the Oleum tanks as described above, the action being to prevent water entering the area under the tanks, or otherwise prevent a release from mixing with water. Potential solutions include roofing over the area or double skinned tanks. The best solution, of course, being removal of the tanks from the site altogether and replacement with a less hazardous feedstock, this latter being the long-term objective.

CONCLUSIONS

It was identified at an early stage that given the financial cost of COMAH compliance it was essential that maximum value was obtained from the exercise. The benefits from COMAH can be summarised as:

- Focus of attention specifically on the prevention of Major Accident Hazards as distinct from “slips, trips and falls” safety
- Reclassification and prioritisation of some hazards on the site on the basis of
- Improvement of Emergency Planning by clarification of the consequences of the identified MAHs and improved consequence modelling and assessment
- Better communications with Local Authorities and the public from the consultation process and Emergency Planning exercise
- Clarification of some aspects of the SMS and better understanding of how the it links together as a result of having to describe and write down the process
- Potential long-term improvement in site safety from concentration on MAHs and rationalised priority list

As a direct result of writing the COMAH report a number of the hazards on the site were re-classified and a number of identified improvements already have been carried out. Others, however, remain long-term projects due to financial constraints.

Particular problems encountered during the report writing process were:

- A significant amount of time was spent by all of the exchem organics management team in preparation of the COMAH report thus taking them away from routine activities. It was apparent that there was an increase in pressure on certain key members of the staff during this period.
- It is difficult for a small company to have the level of expertise available to complete a COMAH report which will stand up to scrutiny by the experts within the CA, thus there is additional cost in the support needed from external consultants. There was also some difficulty in interpreting what proportionality actually meant for exchem organics.
- Uncertainty with regard to the CAs actual requirements due to regular changes in the SRAM and a lack of other public-domain guidance. Although the SRAM is intended for HSE assessor use, it is the only really useful source of information on the HSEs expectations in the COMAH report. Other guidance e.g. Safety Report Assessment Guides has appeared too late to be used in writing the COMAH report. Compliance with the key ALARP requirement was made difficult by changes in the guidance on the subject which were very difficult to track on the web site.
- Cost of COMAH report preparation both in financial and temporal terms may have a potentially adverse short-term effect on safety. The cost of preparing the COMAH report for this site is estimated at approximately £180,000 to date, taking into account consultancy costs, management costs etc. but not including CA fees which currently stand at £20,000. This represents a large portion of the companys annual profits. The cost of additional work required in order to fulfil the additional detail required after preliminary assessment has not yet been quantified.

SUMMARY

COMAH compliance produced a unique set of challenges for a small site with diverse business interests. It would not have been possible to produce the report without the assistance of outside consultants. The COMAH process has been financially extremely expensive for the site and also placed a lot of additional stress on the site management. Additional problems in compliance have been caused by the continuous changes in the HSE SRAM and difficulty in interpreting the HSEs exact requirements for COMAH compliance.

Consequence modelling was an important part of the COMAH process which proved valuable in identifying the main hazards on the site. Analysis of the output provided some surprising results for a number of identified Major Accident Hazard scenarios.

The actual value of COMAH in improving safety is yet to be confirmed but given the recent good record of the British chemical industry in respect of fatalities or injuries to members of the public it will probably take a considerable time for benefits to become apparent. A cost/benefit analysis on the cost of COMAH to the British chemical industry against the improvement in terms of the reduction in safety and environmental incidents would prove interesting as would a direct comparison with COMAH costs and implementation in other EU countries.

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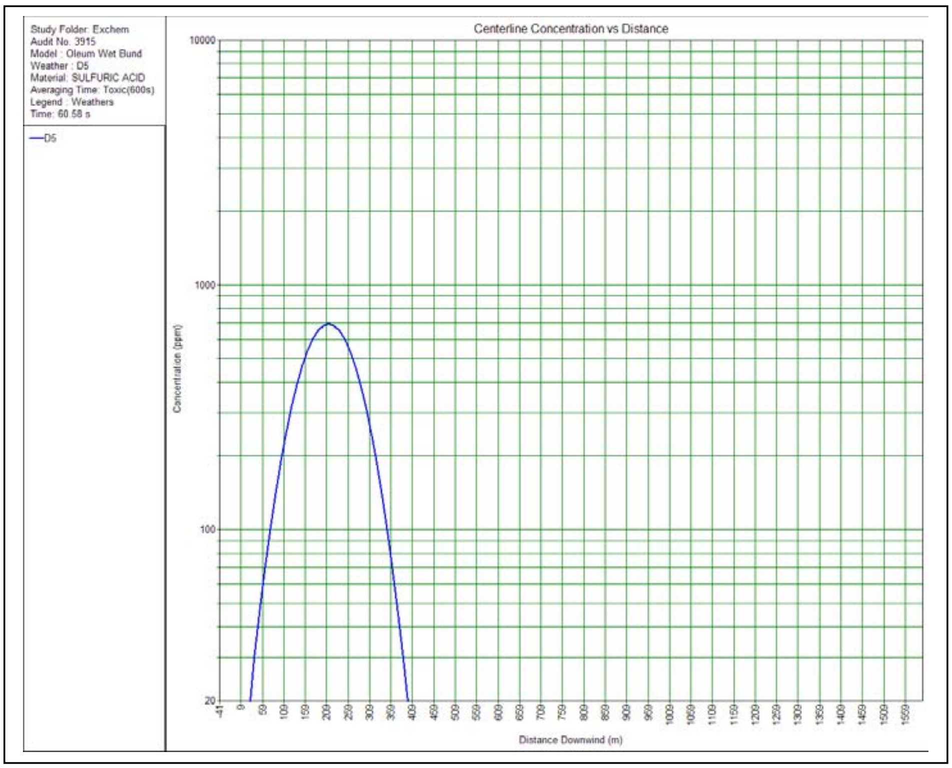
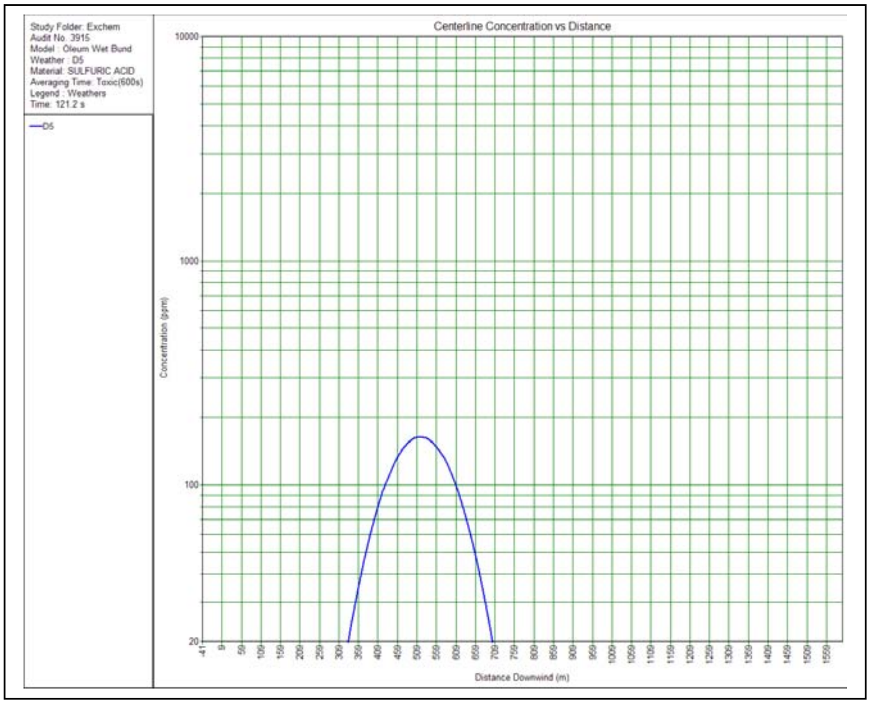
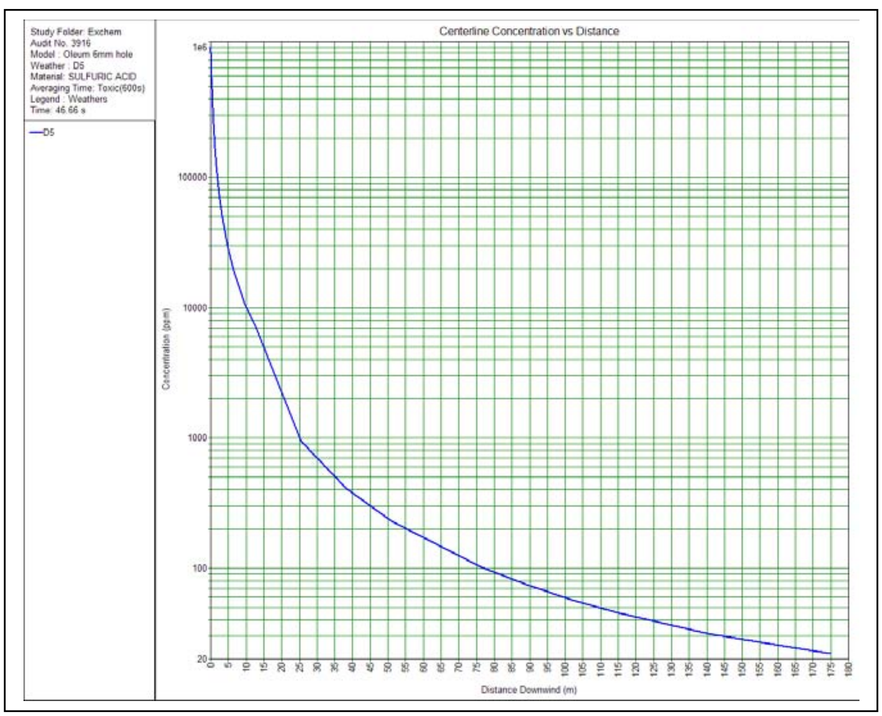


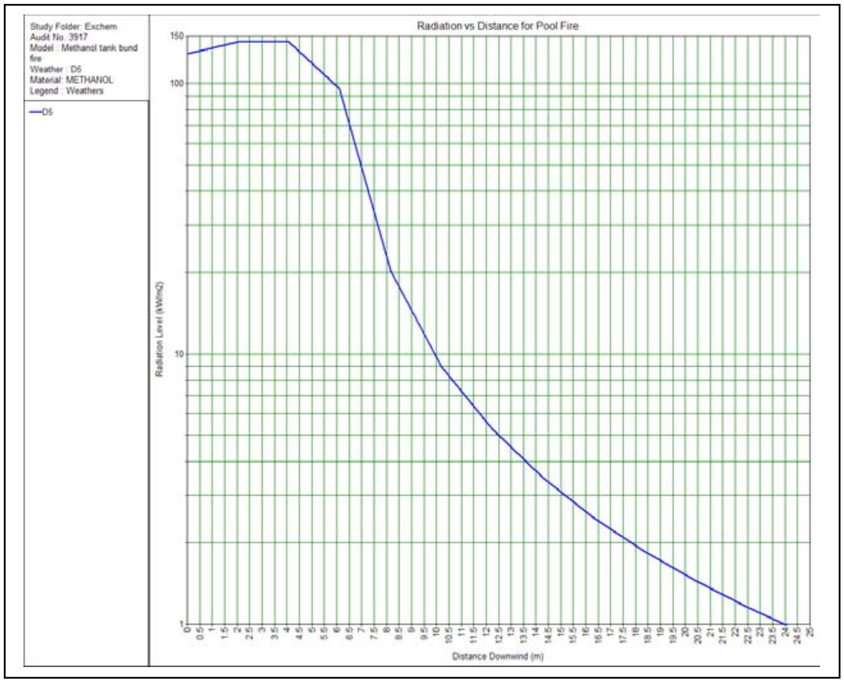
Graph 1. H_2SO_4 instantaneous release after 1 minute



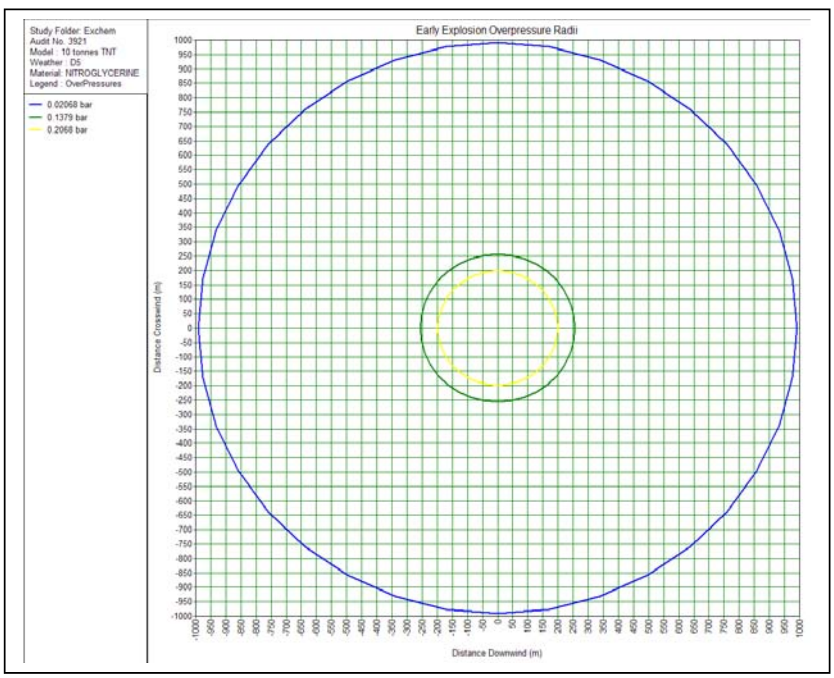
Graph 2. H_2SO_4 instantaneous release after 2 minutes



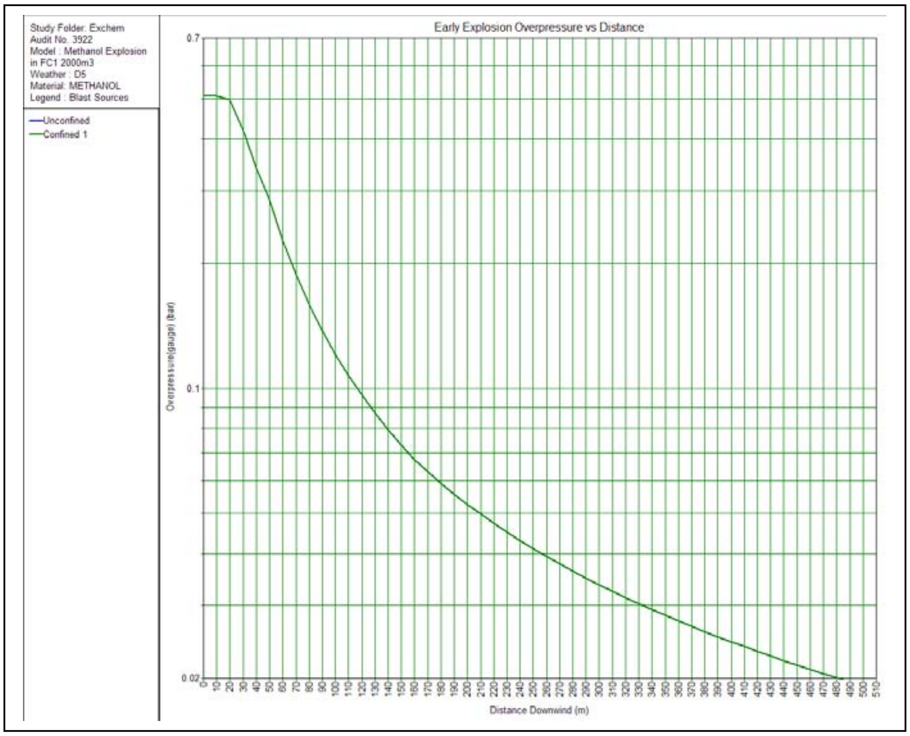
Graph 3. Centreline concentration versus distance for H_2SO_4 continuous release



Graph 4. Thermal radiation vs distance curve



Graph 5. Overpressure radii for 10 tonnes of TNT



Graph 6. TNO explosion overpressure versus distance