Major Accident Hazards

European Initiatives in Accident Prevention, Mitigation, and Response

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ABSTRACT

This presentation first outlines the history of initiatives undertaken by the European Community in the area of the control and mitigation of major hazards, and then describes in detail the activities of the group recently officially named the Major Accident Hazards Bureau of the European Commission, namely:

- the Major Accident Reporting System
- the Community Documentation Centre on Industrial Risk
- Seminars arranged for the National Authorities
- Technical Working Groups on specific subjects
- Lessons Learnt from response to chemical accidents.

The changes which the new Seveso Directive can be expected to bring in are then discussed; initiatives in the area of Civil Protection are then briefly described; and some conclusions are drawn about the nature of the "European experience".

THE HISTORY OF EUROPEAN INITIATIVES

The title of this talk is very wide, so let me start off by narrowing it down somewhat to provide a focus for the main part of my talk: this focus lies on European activities in the prevention and mitigation of chemical accidents, mainly from fixed installations - that is, chemical and petrochemical production and storage plant.

Later on I shall also discuss briefly European co-operation in the domain of response to accidents, whether these arise from human activities - including transport as well as fixed installations - or from natural causes.

So let me start off by discussing European activities in the area of prevention and mitigation of chemical accidents; and I should clear here what I mean by that: I mean the activities of or organised by or through the European Community, more recently re-baptised the European Union.

The first question which comes to mind is "Why European"? Indeed, when we look at the question from the side of the Authorities, the primary focus point for all the activities I am going to discuss is national, or even regional or local: there are no European inspectors of chemical plant, there are no pan-European regulations as such. However the whole development of the control of major hazard within Western Europe has been bound up with the activities of the European Community.

The reason for this link essentially goes back to the famous accident of Seveso, 20 years ago. This accident you have surely heard of, and I don't intend to describe it here. It brought a number of important questions into public discussion, but perhaps the profoundest effect within Europe was the realisation not merely that the local Authorities and local community did not know what was going on within the factory, but that there was no reason why they should have known; that Italy, like other countries of the European Community, did not have a systematic way of ensuring that activities presenting a possibility of a major accident were monitored and controlled.

And of course, there were special psychological factors which magnified the effect of the Seveso accident on the public consciousness: the insidious nature of the poisoning, the very visible skin diseases it caused, the fear of serious long-term health effects on a sizeable population, and the continuing scandal linked with the disposal of contaminated material from the site all contributed to the political fall-out.

And the end result - I say "end" because it took six years after the Seveso accident - was the Council Directive - officially Directive 82/501/EEC[1], on "The major-accident hazards of certain industrial activities" but always known as the Seveso Directive. This Directive addresses the prevention of major accidents from industrial activities (with certain exceptions, of which the most important are nuclear and military installations, explosive

manufacture and storage, waste disposal and mining); it defines the installations concerned in terms of the presence of certain threshold quantities of hazardous substances; and it makes a distinction between production and storage.

There are two points to be noted about this Directive, especially for those who are unfamiliar with the rather complex mechanisms of the European Community. Firstly, what is a Directive - after all you will recall that I said that there are no pan-European regulations? A Directive represents an agreement between the Member States as to what should be implemented within their particular legal systems. It is therefore binding only on the Member States, who having agreed to pass laws which will achieve a certain effect have to do so. In this case, as in many others, there is nothing to prevent a Member State from having tighter controls than those laid down. In practice there has been a wide variety of approaches adopted in drawing up the national legislation, ranging from simply repeating the phrases and the substance thresholds of the Directive to completely separate legislation with lists of substances and thresholds for them which are much more restrictive than the Directive requires.

The second point to note about this Directive is that it represents a unanimous agreement between the Member States. It doesn't therefore make much sense - however much it may be convenient at times for politicians who wish to cover their tracks - to think of political developments like those I'm describing as involving conflict between a European level and a national level; especially when all the implementation measures are carried out in and by the Member States. Nevertheless, some political developments are essentially national, and others have a Community dimension, and there can be little doubt that the Community dimension has for most of the last 20 years been an essential part of the philosophy of the development of major hazard control within Western Europe.

The most important expression of that dimension, other than the Seveso Directive itself, is the Major Accident Hazards Bureau. This Bureau, located at Ispra in the North of Italy, was officially established this year[2], but in practice the group concerned had already spent many years carrying out the work I'm going to describe today. The greater part of the work is related in one way or another to the Seveso Directive, and therefore addresses directly only the technical domains covered by that Directive - in other words, fixed installations, excluding nuclear and military ones. Some exceptions to this rule will come up in the course

of this presentation, but the fact remains that fixed installations - essentially chemical and petrochemical plant - are the core of the Bureau's work.

I shall now present briefly the various activities undertaken by the Major Accident Hazards Bureau; I shall then describe other activities of the European Union relevant to this domain, and finally I shall draw some conclusions.

THE MAJOR ACCIDENT REPORTING SYSTEM

The Seveso Directive requires the Member States of the European Community to report to the Commission major accidents involving hazardous substances. The accidents thus reported are collected in the Major Accident Reporting System (MARS), and analysed in order to:

a) classify the accidents according to various parameters, in particular the type of activity, the substances involved, the consequences, and the causative factors;

b) extract the lessons learnt from the accidents to prevent the recurrence of similar accidents and to mitigate the consequences of accidents which do occur.

The number of accidents reported is - fortunately - not very large - there are currently 230 accidents in the database - but what makes MARS unusual among accident databases is the level of detail, which is usually sufficient to establish the detailed causes of the accident, both the immediate causes and the underlying ones.

The accident reports are received in confidence from the Member State Authorities, and so the database itself is not in the public domain; but the lessons learnt are published.[3,4] These lessons learnt are varied, but perhaps the most significant concerns the importance of safety management systems; Drogaris's analysis[3] showed that some 90% of the accidents in MARS can be attributed at least partly to failings in the Safety Management System. One result of this analysis that the Seveso 2 Directive, which I discuss later, has put a new emphasis on Safety Management Systems.

THE COMMUNITY DOCUMENTATION CENTRE ON INDUSTRIAL RISK

Given the parallel development in many Member States of the philosophy and system of major hazard control, one of the first problems faced was how to avoid "re-inventing the wheel". This meant having access to a common library covering all the technical domains involved, including for example:

- qualitative and quantitative risk assessment
- specification and design of safety devices
- design and implementation of safety management systems
- planning for response to chemical emergencies
- risk communication
- accident investigation.

In some cases there was published literature already available; in others the material, while not in principle restricted, was not "published" in the conventional sense of the term; and in some areas studies simply didn't exist. The Community Documentation Centre on Industrial Risk (CDCIR) was therefore established with three modes of operation corresponding to these three areas. Published books and magazines are acquired conventionally from publishers, like any library. Unpublished material comes from National Authorities, Universities and companies, and includes codes of practice, accident investigations, laws and regulations, company reports, theses and academic monographs, and examples of risk communication material such as leaflets distributed to the public or descriptions of publicity campaigns. And in certain areas the CDCIR has commissioned and published studies, for example the series of "Lessons Learnt from Emergencies after Accidents involving Dangerous Substances" (see below).

This material of course comes in different languages; to ensure wide availability, an English-language abstract is prepared, and these abstracts are published in regular bulletins[5], now also available on diskette along with a simple search mechanism.

SEMINARS FOR NATIONAL AUTHORITIES

You will realise by now that enabling communication among the Seveso Directive Authorities has been a key activity of the Bureau. To this end a series of inter-Authority seminars have been organised. Most of the early seminars were primarily oriented around a single country, and discussed the experience and problems of implementing the Seveso Directive in that country. As more experience was gained in the implementation of the Directive, it became clear that more thematic seminars would be useful, and accordingly for the last few years the seminars have been defined around particular themes of importance. Here I shall discuss very briefly the last four of these seminars. References to earlier thematic seminars can be found in the bibliography[6,7,8].

An interesting feature of all four of these seminars is that industry representatives were invited to participate in the seminar. The overall assessment of their contribution has been very positive; indeed, one of the striking features of European discussions concerning major hazard control has been the non-confrontational relationship between industry representatives and Authorities. I am told that this is often not the case in other parts of the world; all I can say is that that is unfortunate - if a relationship can be built up which does not lead to confrontation, the contribution that industry representatives make can be extremely useful. Not merely do they come with a different point of view, but in many cases industry representatives have direct experience of a type which an Authority representative cannot acquire. While in principle you might expect industry representatives to be concerned to paint everything in the best possible light and insist that all is well in industry, we find that they are usually very well informed as to the diversity of safety performance between different companies - and at least as concerned as Authorities about the matter!

Safety Management Systems

I mentioned earlier that the experience of the Major Accident Reporting System had shown the importance of Safety Management Systems. But what is a Safety Management System? Many large companies described themselves as having one, but it was not clear from first principles that they always meant the same thing, particularly as sometimes these systems were defined as part of larger systems, usually "Safety, Health and Environmental

Management Systems". And small and medium-sized enterprises (SMEs) often said they were willing enough to have a Safety Management System, but they would like to know what that meant and what was involved in implementing one.

In 1993 a seminar was organised for the National Authorities (the first to include industry representatives) a large measure of agreement was found. Among the key points identified[9] were:

- SMSs should be goal-setting and non-prescriptive;
- the SMS should be part of an integrated approach, and consistent of company and local culture;
- worker involvement is essential;
- key issues for the SMS include risk assessment, emergency preparedness, maintenance, management of change and training.

Two significant outstanding questions were also identified: how to enable SMEs to introduce SMSs, and how to measure safety performance.

The work of this seminar was then carried forward in a Technical Working Group, which is now close to issuing guidance on the subject in the form of a short document defining the essential elements of a Safety Management System for major hazard control.

Runaway Reactions

"Runaway Reactions" represent a significant major hazard. Following concern in several Member States, and following the issue of German guidance documents on the subject, a seminar was held in 1994 covering the questions of assessment and control of runaway reaction hazards[10]. The seminar discussed a variety of techniques used to predict and contain runaway reaction hazard; there was reasonable agreement as to which techniques were most appropriate under which circumstances, but it was clear that there remains a continuing need to ensure awareness of the possibility of runaway reactions.

Accident Scenarios and Emergency Response

Last year's seminar addressed the questions of accident scenarios and emergency response, and was held in conjunction with Civil Protection Authorities (for the States where these are distinct from Seveso Directive Authorities). This followed concern, expressed for example at one of the early Seveso Directive conferences (Varese, 1987)[6], that there was a need to establishing clearly the relationship between the "probable" or "worst case" scenarios defined in a Safety Report and the planning of emergency response. The difficulty arises from the fact that the industrialist, and his licensing Authority, establish the scenarios of interest for a Safety Report for purposes which are different from those of the emergency planning Authority; nevertheless the two must be linked, especially since the information needed for emergency planning must in the end come from the industrialist.

While the seminar did not come to a final decision on the use of "worst case" scenarios, it identified areas in which further work was needed, and defined - not the mechanisms of co-ordination, for those differ from country to country, but the objectives to be achieved by co-ordination[11].

Chemical Hazards in Ports and Marshalling Yards

In the course of discussions on the Seveso 2 Directive, there was some disagreement as to whether temporary storage sites in transport interfaces (in practice, mainly ports and railway marshalling yards) should be included or not. The issue is not straightforward, not merely because these sites already come under other regulation, but because, at least in the case of ports, they are also already "interface sites", interfacing between land and sea regulations covering major hazards. Moreover, there are many different types of port terminals, some of which are used for long-term storage; it may be that different regulations would be appropriate for different parts of a port.

To study this question a seminar involving Seveso Directive Authorities and Transport Authorities (so far as I know, in this case they are different in every Member State) has been organised. As the seminar will finish only three days before this Conference, I can only offer an oral report to the Conference.

TECHNICAL WORKING GROUPS AND GUIDELINES

Over the last few years, various technical working groups have been established to consider technical matters arising in the course of discussion on European legislation and its implementation. Typically, a Working Group has been established in response to a need, either for the definition of some term: "What do we mean by a Safety Report, and what sort of material should be in it?" or when the diversity of procedures adopted in the different countries has made it difficult to decide to what extent the end result differs: "How do we take into account Major Accident Hazard in Land-Use Planning?"

The objective of the Technical Working Groups is in general to produce "guidance", non-binding suggestions - sometimes referred to as "soft law". This may be, for example, guidance as to how to interpret terms used, for example, in European Directives, or it may take the form of a "code of best practice"; in either case room is left for differing approaches where that is deemed appropriate. Like the seminars I refer to above, these working groups usually benefit (I use the word advisedly) from industrial participation. Currently there are four such technical working groups active, two of which (on "Safety Reports" and "Safety Management Systems") have virtually agreed on their guidance documents, and are nearing the end of their lifespan: and two others (on "Inspection Systems" and "Land-Use Planning") which are likely to need further time to work on their material.

When the Working Groups produce guidance or guidelines, these are then published by the CDCIR. In one area, that of Information for the Public, the MAHB has been charged with producing guidelines by direct consultation with parties involved without the involvement of a formal working group[12].

LESSONS LEARNT FROM RESPONSE TO CHEMICAL ACCIDENTS

One area in which it became clear several years ago that there was a need to share experience was that of organising the emergency response to chemical accidents, whether in fixed installations or in transport. Many Member States were aware of difficulties in organising the response mechanisms, and in particular of eliminating substantial disparities.

The first large-scale systematic studies organised by the CDCIR were therefore aimed at studying the response to chemical accidents in the 12 Member States. This series of studies

was started in 1990, and completed last year[13,14,15,16,17,18,19,20,21]; however in the meantime the Community had grown, so that we now have not 12 Member States but 15. We hope to be able to undertake similar studies in the new States; in the meantime an overview and comparative summary of the 12 studies so far undertaken is being prepared; at this stage it is fair to say that despite very disparate systems of organisation the problems faced, and the content - if not the detailed organisation - of the solutions found were quite similar, particularly in organising the response to transport accidents.

THE SEVESO 2 DIRECTIVE

In January 1994, the European Commission published a proposal for a new Directive of the control of major hazards[22]. This proposed Directive has subsequently undergone some modifications in the course of first readings in both the European Parliament and the Council of Ministers, and now goes under the name of the "Seveso 2" Directive. This Directive is still under discussion - in fact it should be coming before the Environment Committee of the Parliament tomorrow - but since it has been agreed (unanimously in the case of the Council of Ministers) it is reasonable to regard the provisions as they stand as a good guide to what the new Directive will finally contain.

The new Directive introduces a number of tidying-up provisions, and other technical changes - for example, the long list of named substances from the current Directive is largely replaced by naming categories of substances. As to the more fundamental changes of approach, it will come as no surprise that many of these correspond exactly to the areas I have discussed in relation to the Bureau's work. Let me run briefly over three important ones:

Safety Management Systems

Safety Management Systems are not mentioned in the existing Directive. The new Directive requires the operator of a hazardous establishment to prepare and document a Major Accident Prevention Policy (MAPP), and to implement a Safety Management System to ensure the MAPP is put into operation.

Criteria for accident notification

Since the current Directive does not define a major accident, there has been a lot of inconsistency over accident reporting to the Commission - inconsistency sufficiently large and consistent that the MARS database cannot be used to draw statistical comparisons between Member States. The new Directive lays down a series of specific criteria for notification of accidents, linked to the amount of substance involved or the effects (e.g. any death, hospitalisation of at least 6 people, 10 hectares of land seriously polluted, 10 kilometres of river seriously polluted). It does however also allow and encourage the reporting of "near-misses", incidents which did not turn into accidents but might have done so, and which can be very useful in terms of lessons learnt.

Public access to information

Perhaps the most significant changes are in the area of supplying information to the public. Although the current Directive was modified in 1988 to ensure that information was supplied to members of the public who could be affected by a major accident, it is in general quite restrictive concerning public access to information. Thus at present, information concerning major accident hazards received by the Commission and the National Authorities cannot be used for purposes other than those for which it was sought; in other words, there is a general presumption of confidentiality - which is the reason, for example, why the MARS database is not at present accessible to the public. The new Directive replaces this presumption with one of freedom of information, except of course where confidentiality is required (this concerns in particular security measures and questions of commercial confidence).

The new Directive also calls for the public to be consulted about external emergency plans, and to have the chance to express its view on new establishments, modifications of existing establishments, or other developments around Seveso sites.

In my opinion these changes can be seen as a reflection of a general political evolution, which leads to the public being more and more involved in decisions, with the idea of the "right to know" coming to the fore. Of course this political evolution is at different stages in different countries - and indeed in different industries; I am by no means convinced that the

openness which we now find in the chemical and petrochemical industry in Europe is mirrored in all other industries which may find themselves handling dangerous substances.

EMERGENCY RESPONSE AND CIVIL PROTECTION

Community co-operation in Civil Protection dates back to a 1985 ministerial meeting, since when 6 successive Council resolutions on the subject have enabled co-operation mechanisms to be set up. As with the Seveso Directive activities, the responsibility lies with the Member States, and European activities are centred round information actions, such as training, exchange of experts, and international simulation exercises; there is also a 24-hour emergency response system and a European "operations manual" to enable rapid mobilisation of specialist resources from other Member States, and further actions in the area of public information and awareness and the use of modern communications technology are under way.

Of course in one sense the action of the Civil Protection unit goes far wider than that of the Major Accident Hazards Bureau, as they cover all types of emergencies, including those arising from natural hazards such as earthquakes, flooding and forest fires. However I am pleased to say that the last few years have seen increased co-operation between these two units; given the substantial area of overlap this seems quite appropriate.

CONCLUSIONS

While many countries across the world, in addition to working individually in the control of major hazard, participate in international discussions and consultations of various sorts, I think the European experience has unique features.

We have countries - originally 9 and now 15 - all of which were sufficiently developed to have already had some mechanisms for the control of industrial activities even before the Seveso Directive discussions started. But the mechanisms were very different, and the philosophies and traditions, both industrial and academic, were diverse and had developed in fashions which were internally consistent but not co-ordinated with those of other countries.

Having decided that the activities involved in control of major hazard should be defined at a European level, these diverse traditions had to come together, to agree what the objective of these activities should be, and then to discuss among themselves how they went about

achieving those objectives; not in general with a view to standardising (the key word in Euro-speak is "harmonising") procedures, but to see what could be learnt from others' approaches and from their experiences, both good and bad.

This was achieved with the aid of the Major Accident Hazards Bureau as an international coordinating body, and we have seen that it is possible using quite modest resources to encourage some convergence among these various traditions. Convergence, and not harmonisation: we still have, for example countries which enthusiastically use probabilistic risk assessment along with others who refuse entirely to discuss risk in terms of probabilities. But overall, the reaction among the Member States, both from Authorities and from industry, to the Commission's continuing involvement in this field is very positive; and on that basis I would predict that European activities in major hazard control will continue well into the future.

And in the end the richness of diverse traditions is also useful; as we all know, safety is often about not overlooking things, and "two heads are better than one". How much better again with 15! I can't pretend that co-ordination and dialogue across 15 countries in 11 languages is the easiest way forward in this domain, but I do believe it has been - and will continue to be - a very fruitful one.

[1] Council Directive 82/501/EEC of 24 June 1982 on the major-accident hazards of certain industrial activities (Official Journal of the European Communities L230 of 5.8.1982) subsequently amended by Council Directive 87/216/EEC of 19 March 1987 (O.J. of the E.C. L85 of 28.3.1987) and Council Directive 88/610/EEC of 24 November 1988 (O.J. of the E.C. L336 of 7.12.1988)

[2] Communication from the Commission to the Council and the European Parliament "The Major Accident Hazards Bureau" COM(96) 7 final, European Commission, Brussels, 09.02.1996

[3] Major Accident Reporting System: lessons learned from accidents notified, *G. Drogaris*, EUR 15060 EN, Elsevier, Amsterdam 1993

[4] The Experience with the Major Accident Reporting System 1984-1993, *K. Rasmussen*, forthcoming

[5] CDCIR Bulletins N° 1 to 9, European Commission, Joint Research Centre, Ispra, 1990-1996.

[6] Emergency Planning for Industrial Hazards, Eds. *H.B.F. Gow & R.W. Kay*, EUR 11591 EN, Elsevier, London 1988

[7] Communicating with the Public about Major Accident Hazards, Eds. *H.B.F. Gow & H. Otway*, EUR 12255 EN, Elsevier, London 1990

[8] Natural Risk and Civil Protection, Eds. *Tom Horlick-Jones, Aniello Amendola & Riccardo Casale*, EUR 16050 EN, E & FN Spon, London 1995

[9] Safety Management Systems in the Process Industry, Eds. *P.C. Cacciabue, I. Gerbaulet & N. Mitchison*, EUR 15743 EN, European Commission, Brussels 1994

[10] The Safety of "Runaway Reactions", Eds. *N. Mitchison & B. Smeder*, European Commission, forthcoming

[11] Accident Scenarios and Emergency Response, Eds. *N. Mitchison, A. Garcés, B. Smeder*, forthcoming

[12] General Guidelines for content of Information to the Public: Directive 82/501/EEC - Annex VII, *B. De Marchi & S. Funtowicz*, EUR 15946 EN, European Commission, Joint

Research Centre, Ispra 1994 *(French and German versions in press: EUR 15946 FR & EUR 15946 DE respectively)*

[13] Lessons Learnt from Emergencies After Accidents in the United Kingdom Involving Dangerous Substances, *E.J. Smith & G. Purdy*, EUR 13322 EN, European Commission, Luxembourg 1990

[14] Lessons Learned from Emergencies after Accidents in the Federal Republic of Germany Involving Dangerous Substances, Ed. *G. Drogaris*, SP.-I.91.23, European Commission, Joint Research Centre, Ispra 1991

[15] Lessons Learnt from Emergencies after Accidents in France Involving Dangerous Substances, *B. Brette, B. Lequime & J-C. Bernard*, EUR 15059 EN, European Commission, Luxembourg 1993

[16] Lessons Learnt from Emergencies after Accidents in Denmark Involving Dangerous Substances, *C.D. Grønberg, L. Smith-Hansen & D.S. Nielsen*, EUR 15562 EN, European Commission, Luxembourg 1994

[17] Lessons Learnt from Emergencies after Accidents in Ireland Involving Dangerous Substances, *D.R. Maxwell*, EUR 15565 EN, European Commission, Luxembourg 1994

[18] Lessons Learnt from Emergencies after Accidents in the Netherlands Involving Dangerous Substances, *T. Wiersma, I. Heidenbrink, P. Van Beek*, EUR 15563 EN, European Commission, Luxembourg 1994

[19] Lessons Learned from Emergencies after Accidents in Greece and Italy Involving Dangerous Chemical Substances, *I.C. Ziomas, P.N. Tzoumaka, C. Fiorentini, A. Romano & M. Locatelli*, EUR 15767 EN, European Commission, Luxembourg 1995

[20] Lessons Learnt from Emergencies after Accidents in Portugal and Spain Involving Dangerous Chemical Substances, *J. Ventur, M. Macedo, N. Sousa, J.A. Vilchez Sanchéz, C. Garcia Roca, J. Niño Melero & S. Savilla Fortes*, EUR 16121 EN, European Commission, Luxembourg 1995

[21] Lessons Learned from Emergency Interventions Following Chemical Accidents in Belgium and in the Grand Duchy of Luxembourg, *F. Behaegel, L. De Grave, M. Haegemann & J-P. Tack*, EUR 16122 EN, European Commission, Luxembourg 1995

[22] Proposal for a Council Directive on the control of major-accident hazards involving dangerous substances (COMAH), COM(94) 4 final, European Commission, Brussels 26.01.1994