

A SCHEME FOR RECOGNIZING CHEMICALS AND THEIR HAZARDS IN AN EMERGENCY

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Summary

In recent years a number of potential emergency situations have arisen following traffic accidents or fires involving chemicals. In an attempt to minimise the danger from such incidents in the U K, an emergency advice scheme has been established by the Chemical Industries Association (CIA) in collaboration with Central Government.

As part of the scheme, chemical companies are providing information to facilitate the identification of products and their hazards, and advice for their safe treatment in an emergency. The information is being organised so that it can easily be searched using a computer-based information retrieval system.

The data being collected initially are related to the requirements of the public emergency services but they can be extended to meet the needs of other organisations. Indeed, the data bank is being augmented in this way under a contract from the E E C.

Introduction

The movement of chemicals within the United Kingdom has increased significantly in recent years. In addition, chemicals are being transported in larger quantities to meet industry's growing demand. Entry into the European Economic Commission has led to increased volumes of traffic entering and leaving the U K.. It is to the credit of the chemical industry and transport organisations that few serious accidents involving hazardous chemicals occur.

Road and rail accidents involving such materials could easily lead to the emergency services (Fire, Police and Ambulance) and the public at large being placed at considerable personal risk. Such people cannot be expected to know whether a liquid escaping from a ruptured container labelled "Brand X" is a highly concentrated pesticide or merely a harmless detergent.

Apart from quick reference guides for the most common chemicals on fire appliances and the standard chemical reference books kept within central fire controls, the emergency services have traditionally had to rely on obtaining such advice or help as they could from established "Company" emergency teams, or from personal contact with smaller local chemical companies who, from the moral standpoint, would provide technical expertise. A few major fire

service headquarters, such as London Fire Brigade, constructed their own reference sources, built up through contact with chemical producers or from experience.

During the early seventies it became increasingly clear that a formal coordinated emergency organisation to deal with incidents involving chemicals in the U K was needed. Central Government was anxious that the initiative for formulating such an organisation, should come from within the chemical industry. The Chemical Industries Association (CIA), which represents the vast majority of chemical producers in the U K., set up a working party to study the problem. This resulted in the formation of the Chemical Industry Scheme for Assistance in Freight Emergencies (CHEMSAFE) [1] which was launched on January 1st, 1974.

One of the principal aims of the CHEMSAFE scheme was to develop a general hazard information service, available at all times, and so allow for incidents where a product cannot be identified or its manufacturer contacted.

A National Chemical Emergency Centre was therefore formally established by the Home Office and the Department of the Environment as part of the Hazardous Materials Service of the United Kingdom Atomic Energy Authority. An emergency telephone at the Centre is manned continuously and a team of technically qualified staff are always available.

The role of the emergency centre

The National CHEMSAFE Centre at Harwell provides advice on chemical hazards to the public emergency services when they are unable to identify or contact the manufacturers directly. In addition, the Centre provides assistance at the scene of incidents, within a 50-mile radius, for which a specially equipped vehicle and caravan can be used.

The duty officers manning the Centre have had practical experience in handling a wide range of hazardous chemicals. Nevertheless, a knowledge of the hazards associated with a particular chemical product is of little value if the product is only described by its trade name. Knowing its chemical composition would of course enable the hazards of individual components to be assessed. Chemical manufacturers are generally concerned about divulging such information unless a genuine "need to know", such as an emergency situation, exists. They may not, however, be in a position to provide such information on a 24-hour basis, and experience shows that a significant proportion of chemical emergencies occur outside normal working hours. Therefore, there is a need for a national advice centre to cover the occasions when the manufacturer cannot be contacted or is not known.

The need for information

In order to handle requests for assistance effectively the Centre must recognise the hazards quickly and identify the correct countermeasures to employ. In principle, there is no need to know the name of the material

London Fire Brigade has adopted this approach with its "HAZCHEM" code which gives direct information to the emergency services during the first minutes of an incident. The concise nature of the code means that only limited essential information can be provided. Such information needs to be supplemented, as soon as possible, by specialist advice on the product. This advice can only be given if the chemical composition of the product is known. The need for product recognition is therefore of paramount importance.

The problem with product recognition is to select all materials whose properties match whatever description is given by the person requesting information. The total number of products from which the selection must be made has been estimated to be at least 30,000. This would present no difficulty if materials were universally described by an approved chemical name. In practice, however, the description of a product may be in any terms, ranging from its chemical formula to some details of its packaging. As a consequence, the size and complexity of product recognition puts it beyond the scope of a manual system, and some form of computer search technique must be used if a quick response is to be maintained.

Typical examples from the many different descriptions for which product identification has been requested are as follows:

- (1) Dewanol
- (2) Dimethyl tetrahydrophthalate
- (3) Macquers salt
- (4) M.E.K.P.
- (5) Material in a blue polythene 5-gallon container with black screw cap, part of purple label with the partial words "SPEED" and "ETCH", and acid label
- (6) Odourless white powder in 56-lb. paper sacks marked "Galleon Brand".

Once the material has been identified, the requirement becomes that of retrieving information on the hazards present and on how these should be contained. The value of the information that can be retrieved depends on the range (and quality) of information stored, and how closely it meets the needs of the individual requesting it. In the Chemsafe scheme requests for assistance come mainly from Police and Fire Services; consequently, the information collected is related to their needs. In different circumstances, adjustments of the data collected would enable other information to be provided.

Data definition

The efficiency of the Centre can only be as good as the amount and quality of information given to it. Some information on the hazards associated with trade products is available in numerous reference books, but no volume can be expected to hold all of the information required for every chemical in production. The only satisfactory method of obtaining information for recognising the many thousands of chemicals being transported is at its source, *i.e.* from the manufacturers. The manufacturers are also the most effective source of hazard information.

Accordingly the Chemical Industries Association and Harwell compiled a "questionnaire" which the chemical industry is being asked to complete for every chemical manufactured, marketed or imported into the U.K. Information being requested is based on an understanding of the problem faced by the emergency services. To this is added some peripheral data such as the name and location of the person providing the information. At present this is collected under the following headings:

Trade name

The product or selling name which normally appears on the label, package or container.

Name of company

Name of marketing company, *i.e.* that which is likely to appear on the package and associated with the trade name. It is *not* necessarily the parent company of a major organisation. It could be either manufacturer or an importer, etc.

Code marks

Any number or symbol displayed on the package or label which could assist in the identification of the contents or its manufacturer.

Composition

List of approved chemical names with approximate concentration in a mixture. A single substance is normally indicated as "100%".

Form

Whether solid, liquid or gaseous at normal temperature or the temperature during transport. Appearance of material, *i.e.* colour and other features, *e.g.* crystalline, powder, gelatinous, etc.

Types of packaging

Whether sack, drum, bulk, etc. with size/weight, colour and material of manufacture, *i.e.* paper, plastic, steel, etc.

Hazards

Brief descriptions of nature of hazard (*i.e.* degree of flammability, explosiveness, toxicity, etc.); and may include mention of unusual reactions with other materials. Precautions needed when handling material, such as type of protective clothing or breathing apparatus.

Hazard classification

U.N. serial number and U.N. hazard classification, both as listed in U.N. Transport of Dangerous Goods Publication. Kemler code and HAZCHEM code as available.

Spillage

Action to be taken in the event of a minor or major spillage. May also include a note on protection required for personnel.

Fire

Type of extinguishing media to be used and any additional measures required, *e.g.* protective clothing, cooling of vessels, need for evacuation, etc.

First aid

Immediate action to be taken in event of skin contact or ingestion, *e.g.* need to wash skin, to irrigate eyes and to call for medical assistance.

Knowledge

Name of an individual or organisation having relevant experience or knowledge of the specific material, with telephone number and availability

Routes

Any principal routes, *e g* docks to manufacturers or manufacturers to major consumer

References

Technical papers, sales literature relating to the product, with any reference number. Reference to appropriate pages in journals or standard text books

Accident reports

References in the literature or reports of any accidents involving the product

Compiler

Name and telephone number of the individual completing the form who can be contacted during working hours, in the event of query regarding its compilation

Data handling

The collection of data and its integration into a filing system amenable to computer searching is jointly handled by the CIA and Harwell. Data sheets (questionnaires, see Appendix 1) are distributed by the CIA to all companies trading in chemicals, whether manufacturers, traders or importers. One sheet is completed for each product, then returned to the CIA, checked for completeness and despatched to Harwell.

Each product is immediately recorded in an alphabetical index relating Trade Name to Manufacturer, then the complete document is transferred on to punched cards. An example of the format is given in Appendix 2. The transcript is checked, and corrected if necessary, to ensure that it is identical to the information given by the company. It is then added to the existing file of information and stored by product name in a form accessible to a computer-based information retrieval system.

The decision to reproduce text verbatim, rather than to adopt a codified system, was taken because it eliminates a possible source of error and permits the information provided by the company concerned to be passed directly to the emergency services.

Computer searching

The cornerstone of the computer searching is the STATUS information retrieval system [2]. Data is stored as single documents, each of which holds all the information on a single product. It is known by a title, which is the trade name of the product. A search enables all documents in which a given collection of words occur to be selected. In this way the system retains the flexibility of free text yet manages to overcome its imprecision. The process is perhaps best illustrated by an example.

Suppose it is desired to find the hazards of "Permanate", whose properties

are given in Appendix 2. If it is known that the product is Permanate, a search is made for all documents containing the word Permanate, and, in general, only one will be retrieved - the correct one. If, on the other hand, the properties of potassium permanganate are required, the search process is similar, except that details of all products containing a hazardous quantity of potassium permanganate will be retrieved. However, the system comes into its own when the product is described as red crystals spilling out of a paper sack and no other information is available. The request might be to identify all documents where the words red, crystals, paper and sacks occur, but it is necessary to ensure that the words red and crystals are adjacent as are paper and sacks, so all documents referring to red crystals and paper sacks are sought. Now red is a subjective judgement of the colour, others may see it as purple or as pink. Similarly, sacks may be described as bags, so the request is modified to search for (pink or red or purple) crystals and paper (sacks or bags).

Of the other search facilities the most important creates the ability to search the list of trade names for a given collection of letters and numbers. This is of particular value in looking for a trade name of which part is missing. It may be missing because the label has been torn or because part of the name has been obliterated by fire or corrosion.

The amount of data now stored has reached the stage which permits this application of computer searching to be fully evaluated.

Discussion

Development of the Harwell chemical data bank has shown how data relevant to a single user can be collected, stored and retrieved. The system could be extended to include additional information needed by other users (*e.g.* regulatory data) and offers considerable economic advantages if information common to several users is held in a single system.

At the present time, subject to sufficient funds being available, the next step would seem to be making the system available on a single small computer, into which the emergency services could dial to gain direct access to the information. Suitable safeguards would be incorporated to ensure confidentiality of the information.

For more rapid or frequent access regional centres could be set up offering either a direct line or dial-in facility, depending on the user's requirements. The back-up service, in the event of a computer malfunction, would come from dialling into a neighbouring centre. Alternatively, if such expenditure was merited, a single user could have his own dedicated computer.

References

- 1 CHEMSAFE, a manual of the Chemical Industry Scheme for Assistance in Freight Emergencies, Chem Ind Assoc Ltd, London, 1973
- 2 N H Price, C Bye and B Niblett, On-line searching of Council of Europe Conventions and Agreements, Inf Storage Retr, 10 (1974) 145-154

Appendix 1

CHEMICAL INDUSTRIES ASSOCIATION LIMITED
CHEMSAFE — CHEMICAL PRODUCT EMERGENCY INFORMATION

1 NAME OF COMPANY

ADDRESS

2 PRODUCT NAME

(i.e. NAME GIVEN

ON LABEL/PACKAGE)

| Manuf'd | Marketed | Imported |
|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

ALTERNATIVE NAMES USED

(if any)

Please tick box

3 CODE MARKS (if any)

4 APPROVED CHEMICAL NAME OF
CONSTITUENTS

(with approx concn if mixture)

| | % |
|--|---|
| | |
| | |
| | |
| | |
| | |

5 PHYSICAL FORM

| | |
|--------|--------------------------|
| SOLID | <input type="checkbox"/> |
| LIQUID | <input type="checkbox"/> |
| GAS | <input type="checkbox"/> |

Please tick box

COLOUR

OTHER FEATURES

6 TYPE OF PACKAGING

size and description

| | |
|-------|--|
| SACK | |
| DRUM | |
| BULK | |
| OTHER | |

7 HAZARDS (*Brief* description and handling precautions)

Flash point

(if flammable)

8 PRODUCT/HAZARD CLASSIFICATIONS (if known)

| |
|---|
| U N SERIAL NO |
| U N HAZARD CLASSIFICATION (Division & Subdivision) |
| KEMLER CODE |
| HAZCHEM CODE |

9 RECOMMENDED EMERGENCY ACTION IN EVENT OF

a) SPILLAGE

b) FIRE (e g extinguishing media)

10 FIRST AID TREATMENT

11 NAME OF INDIVIDUAL/ORGANISATION WITH SPECIALIST KNOWLEDGE

EMERGENCY TELEPHONE NUMBER

AVAILABILITY (days and hours)

12 PRINCIPAL TRANSPORT ROUTES

13 *LITERATURE REFERENCES (e g Technical data sheets giving additional information)

14 NAME AND TELEPHONE NUMBER OF COMPILER (in event of any queries)

N B *Wherever possible such publications should be included with this completed form

Appendix 2

| | |
|---------------------|--|
| Trade name | Permanate |
| Company name | Parton Chemical Co Ltd , Northern Road, Parton, Warwickshire |
| Packaging | 25-kg paper sacks |
| Code marks | |
| Composition | Potassium permanganate — 100% |
| Form | Solid, crystals, dark purple—metallic sheen |
| Hazards | Powerful oxidizing material Explosive in contact with sulphuric acid or hydrogen peroxide Reacts violently with finely divided easily oxidisable substances Spontaneously flammable on contact with glycerine and ethylene glycol Increases flammability of combustible materials A strong irritant due to oxidising properties Use breathing apparatus |
| Hazard Class | U N Serial No 4190 U N Hazard Class 5 1 0 |
| Spillage | Wear breathing apparatus at all times with full protective clothing Flood with water Beware hazard of contaminated clothing on drying out |
| Fire | Flood with water |
| First aid | |
| Knowledge | Mr H Weston |
| Phone | Parton 49255, available 24 hours |
| Routes | |
| References | Technical Data Sheet 1,3(a) enclosed |
| Compiler | Mr J Jones, Parton 49312 |
| Date | September 1974 |