THE EXPLOSIVES INCIDENTS DATABASE ADVISORY SERVICE (EIDAS)

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Introduction

It is a truism that important lessons can be learnt from past mistakes: careful analyses of the causes and effects of incidents can point to measures to help prevent recurrences and reduce the severity of any further incidents that might occur. However, if these lessons are to be widely disseminated and not subsequently forgotten, it is vital that incident information be methodically collected, analyzed and then stored in an easily retrievable and widely accessible form.

The advent of computerized databases has made this task much easier. Certainly, in the past the retention of incident data was often problematic. While organizations have generally been good at keeping records of major incidents, the picture with regard to minor incidents and "near misses" – i.e. incidents where because of fortuitous circumstances a catastrophic outcome was avoided – is more mixed. Paper records of such incidents have often been lost as a result of the periodic weeding of files, though the information contained in such records can provide valuable insights into the risks of an activity and any organization wishing to assess safety performance should systematically record and monitor such information. Experience has shown that even information on major incidents is not always readily retrievable: this information in the form of official reports, articles in learned journals, conference proceedings etc., is often stored in diverse files and archives, and a painstaking search is often necessary to uncover details about a specific incident or particular types of incidents.

There is thus a need for a service that collects information on incidents, analyzes that information and stores it in a way such that it is readily accessible and retrievable. This became particularly apparent in the UK in the late 1980s following the completion of a number of risk assessment studies by both the UK Health and Safety Executive (HSE) and the Explosives Storage and Transport Committee of the UK Ministry of Defence (ESTC). The reconstruction of historical accident records formed an important component of these studies (this was to allow inferences to be made about accident likelihood and consequences), and in both cases the task was made difficult and time-consuming by of the lack of a single, comprehensive source of accident data.

Both the HSE and the ESTC subsequently set up computerized databases to encode details of past and on-going incidents, both in the UK and worldwide. Apart from providing input for future risk assessment studies, it was perceived that there would be a number of other benefits in maintaining such databases, including: (i) monitoring the safety of activities involving explosives and hence identifying areas that might require special attention, (ii) assisting incident investigations, (iii) providing data to validate explosion effects models as well (iv) providing a service to officials seeking information about specific incidents. A more recent use has been in aiding the preparation and evaluation of Safety Reports required under the Control of Major Accident Hazard Regulations (COMAH – these regulation implement the Seveso II Directive in the UK).

The HSE and the ESTC subsequently merged their databases in 1991 and the Explosives Incidents Database Advisory Service (EIDAS) was thus inaugurated. The information held on EIDAS is of particular value to organizations that manufacture, process, store, transport or use explosives as well as regulatory authorities, defence agencies and the emergency services.

Aims of EIDAS

The principal aim of EIDAS is to provide an efficient management and control system capable of collecting, recording and distributing data on explosives incidents. The specific objectives within this principal aim are:

- to obtain as comprehensive a capture of data on explosives incidents as can be reasonably achieved;
- to encode pertinent details of these data on to an application developed from a desk-top Relational Database Management System (RDBMS);
- to provide the application with a user friendly interface that allows operators to retrieve records and generate tables, reports and statistics with the minimum of effort;
- to make the system widely available.

Ownership of the system

The Safety and Reliability Directorate of the United Kingdom Atomic Energy Authority (UKAEA) initially developed the service for the HSE in the late 1980s. However, following the privatization of the UKAEA in the following decade, the HSE purchased the copyright and all other rights in EIDAS and the system is now maintained on behalf of the HSE by MBTB Ltd. In the last few years the use of the database has been restricted to the HSE, ESTC and certain other UK government departments and agencies. But as from May 2005, all non-classified information on the database will be made available to SAFEX members following the signing of a memorandum of understanding between the HSE and SAFEX.

Hardware Requirements

The EIDAS database has been developed using a commercial desk-top RDBMS (Microsoft Access 2000) and can be run on an IBM compatible PC of the following minimum specification:

- Pentuim 200 MHz processor
- 64 Mb RAM (128 recommended)
- 300 Mb free hard disc space
- 24 x CD-ROM Drive
- SVGA monitor
- Microsoft Mouse (or equivalent)
- Printer for which there is a Windows™ driver
- Microsoft Windows 98 or later
- Microsoft Access 2000
- Adobe Acrobat Reader 6 (to read the supporting documentation)

Structure of the Database

The records are displayed on a tabbed form, which comprises two pages: Main Details and Further Details (see Figures 1 and 2).

Figure 1: Main Details of Incident

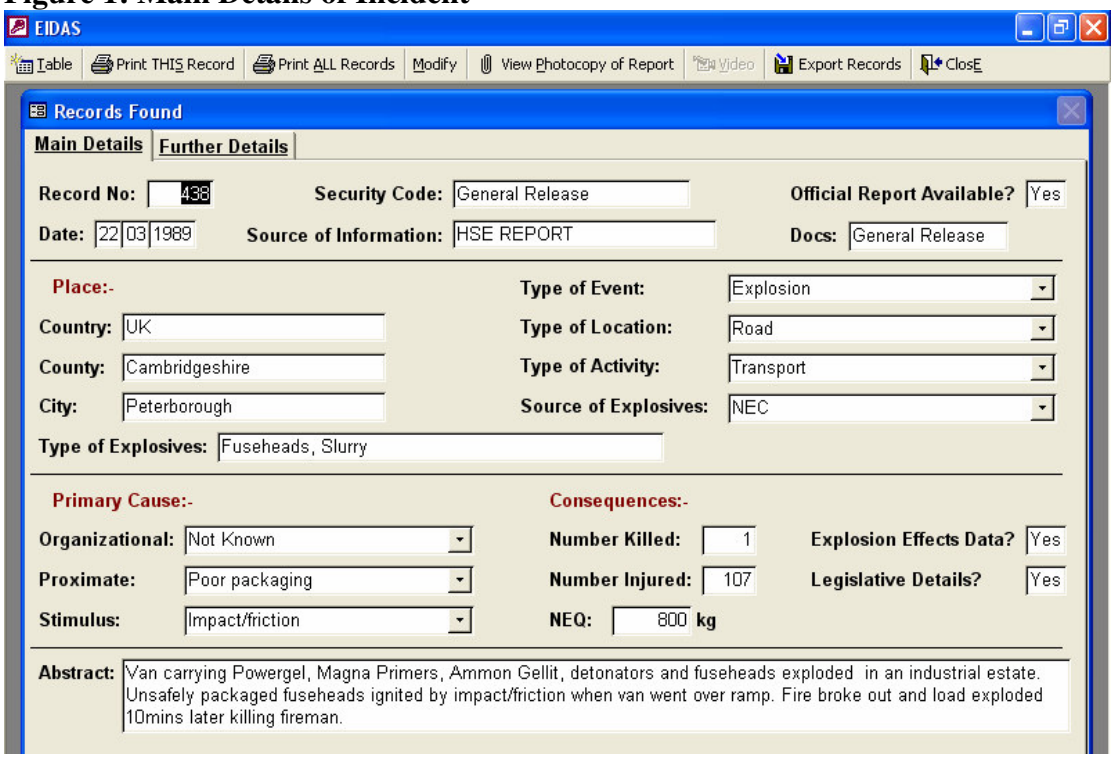
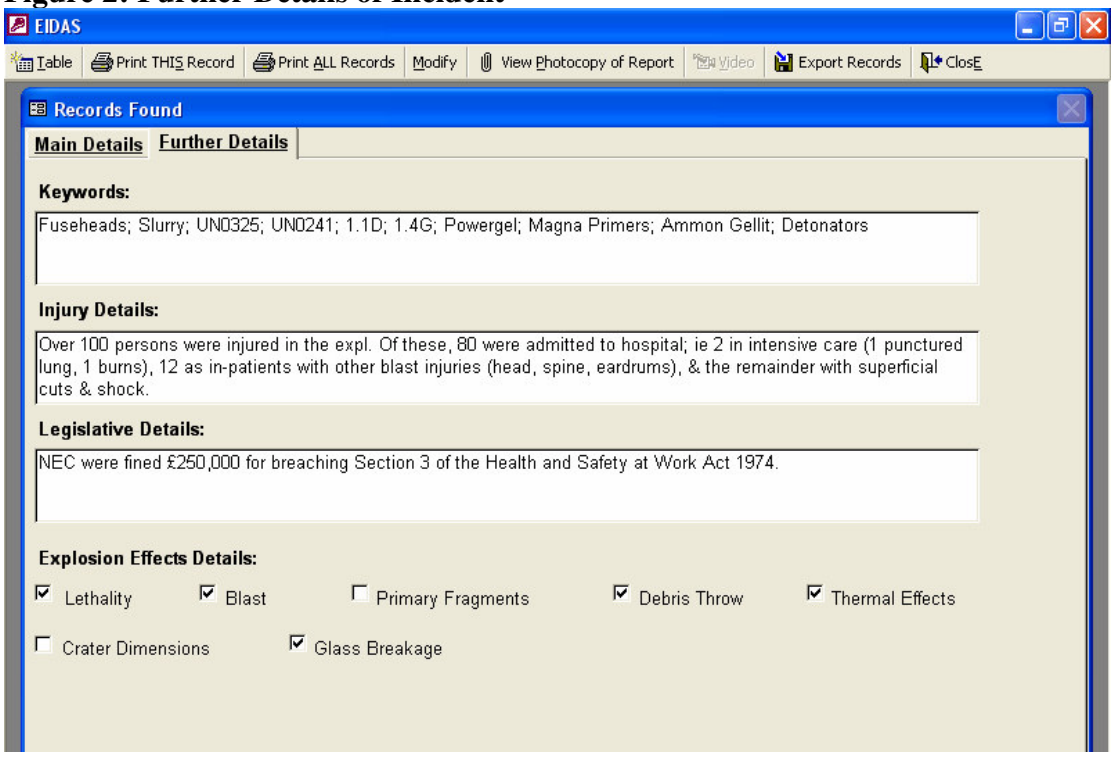


Figure 2: Further Details of Incident



The main form of the database is shown in Figure 1. It comprises 26 fields covering all pertinent factors, including:

- Date
- Place
- Type of location (manufacturing site, storage area, maritime port etc)
- Type of activity (manufacture, storage, transport, etc.)
- Type of event (explosion, fire, loss of explosives, etc.)
- Source of explosives
- Cause of the incident
- Number of casualties

The final field on the main form, the Abstract Field, is a 255-character text field that provides a brief description of the incident. The form has been designed to provide an "at-a-glance" summary of each incident. The source documents (official reports, conference proceedings, journal extracts, etc.) from which the records have been encoded are in many cases also stored on the database and can be easily accessed by simply clicking the command button at the top of the screen (i.e. the "View Photocopy of Report" button – see Figure 1).

In the early days of the project the source documents were copy typed and stored in the system as Microsoft Word documents. This was a labour intensive and costly procedure; but later with advances in technology it became feasible to store photocopies of the original documents and to make these documents searchable by use of optical character recognition (OCR) software. An example of this is shown Figures 3 and 4. Figure 3 shows the first page of a photocopy of an incident report dating from 1876.

Figure 3: Photocopy of old incident report

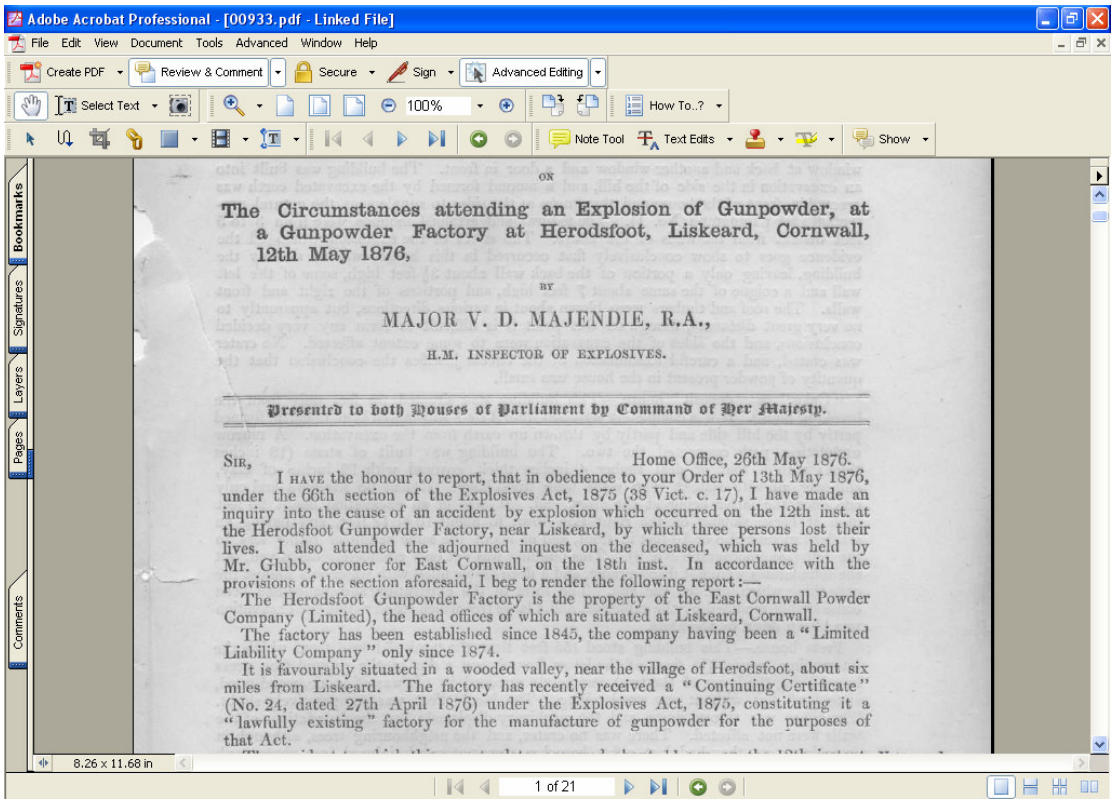
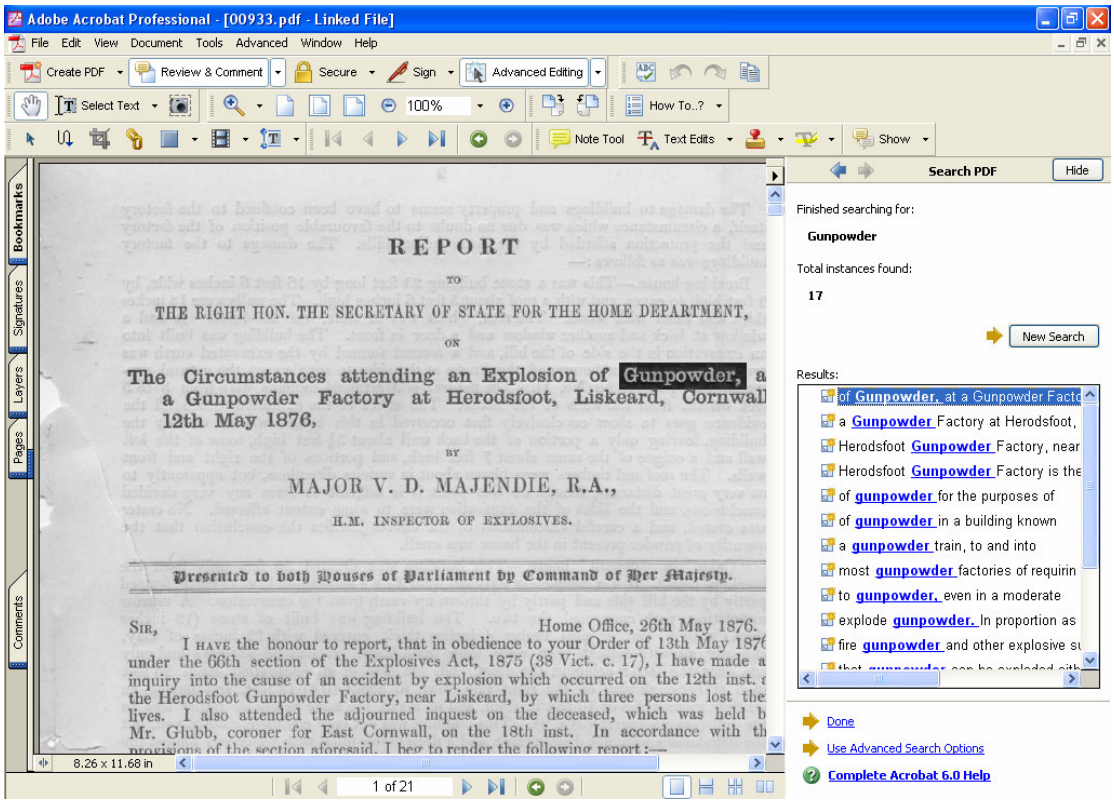


Figure 4 shows the results of a search for occurrences of the word “gunpowder” in the document.

Figure 4: Search on document for the word "gunpowder"



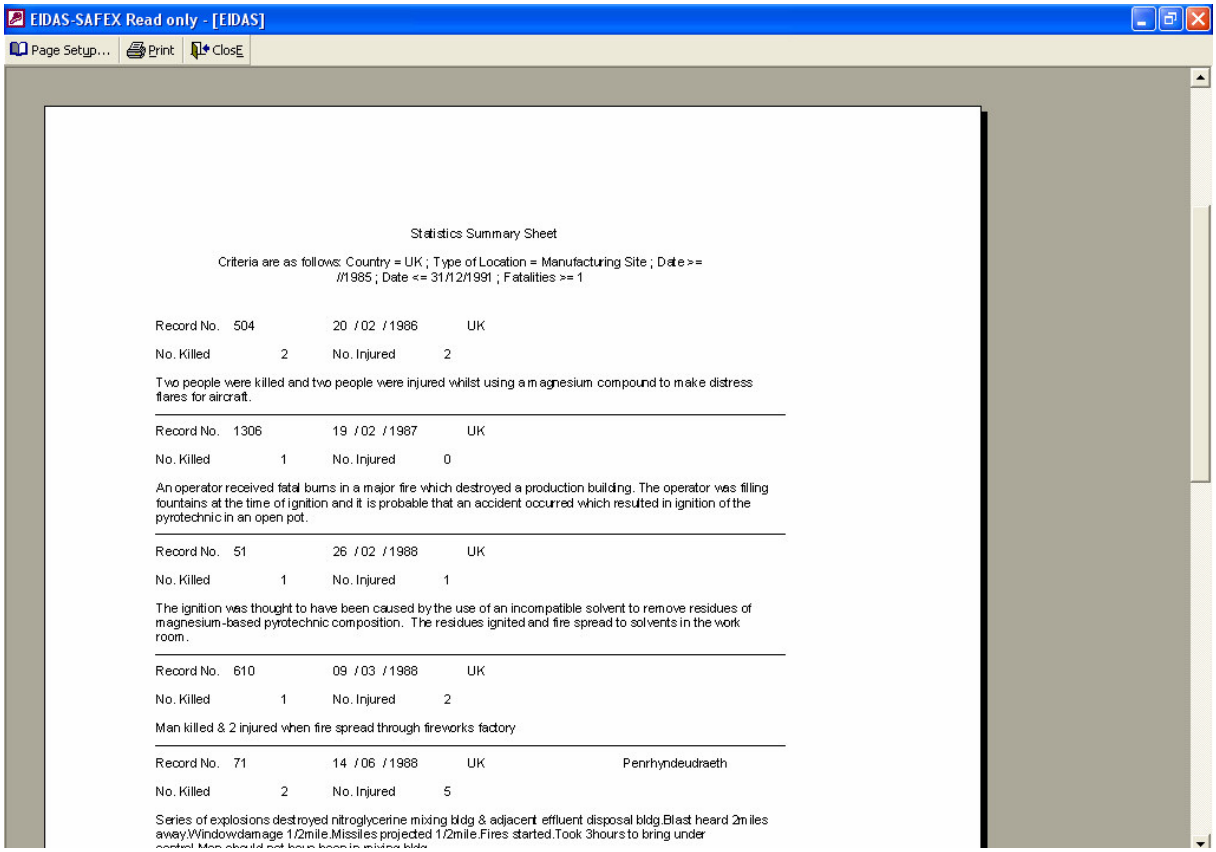
It is important to stress that this facility will only work in cases where the print quality of the original document remains good; if the document has deteriorated to the point where the type has become faint or is no longer clear, then the OCR software will simply fail to recognize many of the words in the photocopied image. No special software is required to view and search the source documents – all such documents are stored in PDF format (in most cases with recognized text hidden behind the image) and can be read with Adobe Acrobat Reader 6.0, which is available as a free download over the Internet.

The database can also store video footage. Hitherto not much use has been made of this facility but it is seen as possibly being an important means of storing information in the future.

The database may be searched on all fields, either singly or in combination. The logical operators "or" and "not" may be used with text fields while searches on numeric fields may be carried out with the comparison operators "equal to", "greater than", "less than" and "between".

Users can generate accident statistics and accident listings and bring up brief reports on particular accidents. Figure 5 illustrates a brief statistics report while Figure 6 illustrates an accident listing.

Figure 5: Statistics Summary Report (for incidents that occurred on manufacturing sites in the UK between the years 1985 and 1991)



Statistics Summary Sheet

Criteria are as follows: Country = UK ; Type of Location = Manufacturing Site ; Date >= //1985 ; Date <= 31/12/1991 ; Fatalities >= 1

Record No. 504 20 /02 /1986 UK

No. Killed 2 No. Injured 2

Two people were killed and two people were injured whilst using a magnesium compound to make distress flares for aircraft.

Record No. 1306 19 /02 /1987 UK

No. Killed 1 No. Injured 0

An operator received fatal burns in a major fire which destroyed a production building. The operator was filling fountains at the time of ignition and it is probable that an accident occurred which resulted in ignition of the pyrotechnic in an open pot.

Record No. 51 26 /02 /1988 UK

No. Killed 1 No. Injured 1

The ignition was thought to have been caused by the use of an incompatible solvent to remove residues of magnesium-based pyrotechnic composition. The residues ignited and fire spread to solvents in the work room.

Record No. 610 09 /03 /1988 UK

No. Killed 1 No. Injured 2

Man killed & 2 injured when fire spread through fireworks factory

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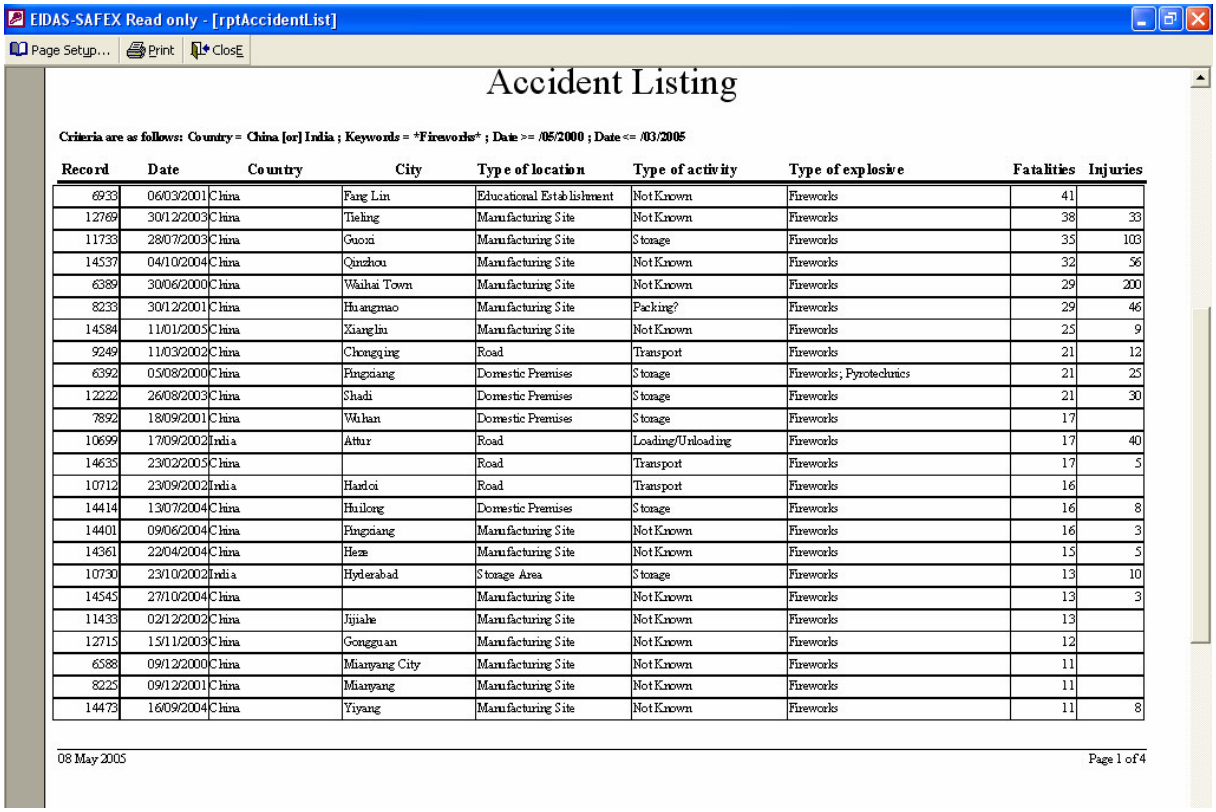
Record No. 71 14 /06 /1988 UK Penrhyndeudraeth

No. Killed 2 No. Injured 5

Series of explosions destroyed nitroglycerine mixing bldg & adjacent effluent disposal bldg.Blast heard 2miles away.Windowdamage 1/2mile.Missiles projected 1/2mile.Fires started.Took 3hours to bring under

Figure 6 List of fireworks accidents to have occurred in India or China in the period May 2000 to March 2005, records ordered by fatality in descending order



EIDAS-SAFEX Read only - [rptAccidentList]

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Accident Listing

Criteria are as follows: Country = China [or] India ; Keywords = *Fireworks* ; Date >= /05/2000 ; Date <= /03/2005

Record	Date	Country	City	Type of location	Type of activity	Type of explosive	Fatalities	Injuries
6933	06/03/2001	China	Fang Lin	Educational Establishment	Not Known	Fireworks	41	
12769	30/12/2003	China	Tieling	Manufacturing Site	Not Known	Fireworks	38	33
11733	28/07/2003	China	Guoxi	Manufacturing Site	Storage	Fireworks	35	103
14537	04/10/2004	China	Qinzhou	Manufacturing Site	Not Known	Fireworks	32	56
6389	30/06/2000	China	Waihai Town	Manufacturing Site	Not Known	Fireworks	29	200
8233	30/12/2001	China	Huangmao	Manufacturing Site	Packing?	Fireworks	29	46
14584	11/01/2005	China	Xianglin	Manufacturing Site	Not Known	Fireworks	25	9
9249	11/03/2002	China	Chongqing	Road	Transport	Fireworks	21	12
6392	05/08/2000	China	Pingxiang	Domestic Premises	Storage	Fireworks; Pyrotechnics	21	25
12222	26/08/2003	China	Shadi	Domestic Premises	Storage	Fireworks	21	30
7892	18/09/2001	China	Wuhan	Domestic Premises	Storage	Fireworks	17	
10699	17/09/2002	India	Attur	Road	Loading/Unloading	Fireworks	17	40
14635	23/02/2005	China		Road	Transport	Fireworks	17	5
10712	23/09/2002	India	Harloi	Road	Transport	Fireworks	16	
14414	13/07/2004	China	Huilong	Domestic Premises	Storage	Fireworks	16	8
14401	09/06/2004	China	Pingxiang	Manufacturing Site	Not Known	Fireworks	16	3
14361	22/04/2004	China	Hezu	Manufacturing Site	Not Known	Fireworks	15	5
10730	23/10/2002	India	Hyderabad	Storage Area	Storage	Fireworks	13	10
14545	27/10/2004	China		Manufacturing Site	Not Known	Fireworks	13	3
11433	02/12/2002	China	Jijiahe	Manufacturing Site	Not Known	Fireworks	13	
12715	15/11/2003	China	Gongguan	Manufacturing Site	Not Known	Fireworks	12	
6588	09/12/2000	China	Mianyang City	Manufacturing Site	Not Known	Fireworks	11	
8225	09/12/2001	China	Mianyang	Manufacturing Site	Not Known	Fireworks	11	
14473	16/09/2004	China	Yiyang	Manufacturing Site	Not Known	Fireworks	11	8

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All output from the database (i.e. records, stats tables, accident listings and reports) can be printed.

Experience with EIDAS thus far

EIDAS has now been in operation for sixteen years. During this time the main rôle of EIDAS has been:

- to provide input data for risk assessment studies sponsored by the HSE and the ESTC;
- to provide a monitoring service to keep the HSE and the ESTC informed of the number and types of explosives accidents occurring worldwide;
- to provide a first port of call for officials seeking information on specific incidents;
- to allow trends to be discerned from the stored data.
- a more recent use has been to provide data to assist HSE in the evaluation of COMAH safety reports.

This rôle has been steadily enhanced by periodic modifications to the database which have improved storage capability, provided a better format of printed output, and an

ever more friendly interface – users can now carry out complex searches and generate statistics using simple menu-driven procedures, i.e. without having to write computer code.

The database currently holds records for more than 14,500 explosives incidents worldwide, spanning a period of over 300 years, from 17th Century gunpowder explosions to the most recent incidents of explosions, fires and "near misses".

Future Developments

An exercise is currently underway to make the database comprehensive in respect of the reportable explosives accidents that have occurred in the UK since the Explosives Act was passed in 1875. This is a huge undertaking but it is hoped that the exercise will be completed in the next year.