UK IONISING RADIATIONS INCIDENT DATABASE (IRID)

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ABSTRACT

The widespread use of ionising radiations carries with it the potential for incidents and accidents. Their severity can vary from the trivial to the fatal and may involve substantial economic penalties. In order to assist in learning the lessons from events that have occurred, the NRPB, HSE and Her Majesty's Inspectorate of Pollution (HMIP) have established a national Ionising Radiations Incident Database (IRID). This paper provides details of the specification and operation of the database together with the proposed feedback mechanisms.

INTRODUCTION

A fundamental part of any assessment of, and plans for the prevention and mitigation of reasonably foreseeable radiological incidents, is to learn the lessons from accidents that have occurred and to feed this back through training and guidance to users. The efficiency with which this happens depends on the collective experience of individuals. Each may have direct experience of some types of accident, but will almost certainly have to rely on data from publications, conferences and possibly anecdotal information. There is a natural tendency for organisations not to publicise their own accidents, especially if the accident was a 'near miss' that fortuitously did not have serious consequences - this time! As a result our feedback experience from accidents both nationally and internationally can be limited, fragmented and difficult to pass on to the next generation of workers. Thus there is a need for a more coherent means of feedback.

DEVELOPMENT AND OBJECTIVES

UK legislation requires that accidents, incidents and occurrences which satisfy specified criteria are reported to the regulators, HSE and/or HMIP. The regulations also require an employer working with ionising radiations to appoint a Radiation Protection Adviser (RPA) and to involve that person in investigations of incidents and accidents. NRPB acts as RPA to some 800 organisations and provides technical services to many others. As a result, NRPB is involved in the investigation of a wide range of incidents and accidents, including many 'near misses' which would not be legally reportable. An NRPB/HSE feasibility study (1990) on improving feedback concluded that mechanisms were in place in the nuclear and transport sectors, but that there would be significant benefits from a national incident database to cover the non-nuclear sector ie. industry, research, teaching and health care. However it also highlighted some crucial practical problems related to the confidentiality of information; the resolution of which took some time. Impetus to the work was provided by the Commission of the European Communities (CEC), both in supporting work in this area and as a result of their 4th European Seminar on Optimisation of Radiation Protection in April 1993 (1) which concluded that a principal challenge for the future is ".... to improve our feedback from past experiences by developing databases".

As a result of subsequent work the NRPB, HSE and HMIP have entered into a partnership to combine incident and accident data in a confidential form in the Ionising Radiations Incident Database (IRID). The objectives are:

(a) to establish and operate a database that will act as a national focus on radiation incidents primarily in the non-nuclear sector, ie. industry, research, teaching and medicine;

(b) through appropriate publications, to provide feedback and guidance to users of ionising radiations on preventing or limiting the consequences of radiation incidents; and

(c) to provide regulatory bodies and others with advisory responsibilities, analyses of relevant data that help in assessing priorities in resource allocation.

SCOPE

The database is designed to cover radiological incidents including near misses and occurrences involving actual or potential occupational and public exposure. However, some types of incident are excluded from IRID since they are already covered by existing arrangements. Those excluded are:

(a) **Nuclear incidents:** these would include nuclear (as opposed to radiological) incidents that involve criticality or events related to the safety of reactors or nuclear processing plants.

(b) **Transport incidents:** the NRPB runs, under contract to HSE and the Department of Transport (DTp), a database (2) of incidents involving the transport of radioactive material.

(c) **Patient exposure:** The HSE (3) and Medical Devices Agency have systems for reporting and dissemination of relevant data. In addition at a European level the European Federation of Organisations for Medical Physics (EFOMP) are in the process of establishing a database for radiotherapy accidents in Europe (4).

Included are:

(a) **Radiological incidents occurring on nuclear sites:** eg. an incident involving a radiography source being used on a nuclear site.

(b) **Occupational and public exposure in the medical sector:** eg. a radiotherapy source left implanted in a patient discharged from hospital.

(c) **Incidents involving radioactive material in the public domain not arising from discharges authorised by regulatory bodies:** these would include incidents which required the National Arrangement for Incidents involving Radioactivity (NAIR) to be invoked.

(d) **Radiological incidents in the defence sector:** the unattributable nature of the database may now allow such incidents to be reported, without the origins being obvious.

(e) **Unintentional and/or unauthorised discharges of radioactive materials into the environment:** these would include discharges from nuclear and non-nuclear licenced sites.

NRPB are responsible for the management of the database and together with HSE and HMIP are reviewing their files to provide historical data. This will be generally limited to the last decade, although some earlier incidents will be included because of their value in 'learning the lesson'. It is recognised that this data is incomplete and that any retrospective analyses would need to be used with caution.

DATABASE STRUCTURE

The database operates on a Personal Computer (PC) using DBASE V software and consists of 24 fields including one text field. These are defined in a Data Element Dictionary and are summarised below:

1	Case number	13	Occupation of worker(s)
2	Area	14	Type of equipment
3	Incident Date	15	Isotope(s) involved
4	Incident Level	16	Activity
5	Exposure Level	17	Kilovoltage of radiation generator
6	Site Level	18	Cause of incident
7	Nature of accident	19	Availability and effectiveness of contingency plans
8	Number exposed: occupational	20	RPA: appointed, involved in investigation
9	Number exposed: public	21	RPS: appointed, involved in investigation
10	Whole body dose(s)	22	Follow up action (eg improvements)
11	Extremity dose(s)	23	Date of entry in database
12	Internal organ dose(s)	24	Description: text field

Fields 1 to 23 contain either numeric data (eg. dose in mSv) or one or more codes that categorise the incident and have been designed to permit useful analyses of the database; for example searching for incidents over a specified period of time involving industrial radiography and resulting in doses in excess of the dose limit. In defining the fields, a balance has had to be made between the level of detail, its usefulness and the effort involved by those submitting incident data. To maximise the overall benefit it was felt important to achieve a high reporting percentage and that this would only be achieved if the reporting system was not

onerous on the contributors. Therefore the number of data fields has been minimised to that consistent with categorisation and analysis requirements. Field 24 is a text field that contains descriptions of the incidents, the causes, the consequences, follow up actions and lessons to be learned. The format has been designed to allow it to be directly reproduced in publications to provide feedback to the users.

CONFIDENTIALITY AND QUALITY ASSURANCE

The information entered into the database will not contain any names or addresses of organisations or individuals. Only the originator of the incident entry will know the names of the organisations or individuals concerned and all data presented to NRPB will be in a sanitised format. NRPB has undertaken not to divulge any privileged information to a third party. HSE and HMIP are well aware of the natural wariness that potential contributors may have in respect of the involvement of regulatory bodies. Therefore they have given assurances that they will not seek to obtain further information from the other partners (or the contributing organisation, if different) about any incident recorded on the database which was not reported to regulators.

Simple reporting proformas and guidance has been developed to help obtain consistency in the reporting of incidents. To try and minimise the degree of variation in the categorisation of incidents the Database Co-ordinator at NRPB will independently code the data (from the text description) and discuss any discrepancies with the contributor prior to data entry and entry validation. Checks have been devised to identify duplicate reports by automatically cross referencing a number of fields.

FEEDBACK

Undoubtedly the value of IRID will be judged on the quality and accessibility of feedback to users and regulators. Equally this will be a crucial factor in maintaining the flow of contributions from various organisations. Initially the primary feedback route will be through publications:

(a) NRPB/HSE/HMIP will publish periodic review documents that reproduce the text descriptions of incidents, where appropriate enhanced by diagrams or drawings of accident scenes, and analyses of the distribution and trends in incidents.

(b) Incidents that are of particular relevance will be published in NRPB's 'Radiological Protection Bulletin' HSE's 'RPA Newsletter' and HMIP's Bulletin.

A key use of the feedback from IRID should be in the training of all those involved in the use of ionising radiation. Therefore a number of short joint publications (with slides) that can be used as training material targeted at specific work groups will be produced.

FUTURE DEVELOPMENTS

Although initiated by NRPB and HSE and joined by HMIP, it is intended that IRID is made as wide a collaborative effort as possible, involving others in the partnership or as contributors.

There are also valuable lessons to be learned from incidents outside the UK and it is envisaged that one future development will be to add a module covering such incidents. This may be influenced by the development of comparable databases in other countries and international organisations such as IAEA and the European Union (EU). Undoubtedly each country or international organisation will have a need for specific data fields but it should be possible to agree on core data fields and formats - a challenge for the future.

REFERENCES

1 European Commission. Discussion overview and conclusions to the session on 'The application of the optimisation principle to worker exposure; proceedings of 4th European Scientific Seminar, Radiation Protection optimisation 'Achievements and Opportunities, 20-22 April 1993. European Commission, Luxembourg, Report EUR 15234 EN.

2 Hughes, J S and Shaw, K B. Radiological consequences resulting from accidents and incidents involving the transport of radioactive materials in the UK series: 1994 review, Chilton NRPB-M549.

3 Gill, J R. Overexposure of Patients due to Malfunctions or Defects in Radiation Equipment. Radiation Protection Dosimetry, Vol 43 No 1/4 pp 257-260 (1992).

4 Haywood, J K. Radiotherapy Accidents in Europe - A Preliminary Report. SCOPE 2, 1 March 1993, pp 45-46, IPEMB York.

In a Tritium facility the measurement of Tritium surface contamination is required to insure :

- The radiation protection of workers at different work places,
- the sorting, disposal and storage of wastes and materials.

The most common way to measure surface contamination is to quantify the removable surface contamination by liquid scintillation counting. However this process is unaccurate since the removal efficiency has not been quantified so far. There are very few scientific reports about this issue. Some studies related to stainless steel has been carried out, nevertheless data about organic compounds are still missing.

Our experiments were carried out using the smear technique on four types of specific materials belonging to Valduc Tritium utilities :

- Stainless steel,
- waste containers (steel + painter),
- vinyl,
- floor coating.

Results are gathered on the paper. They highlight we must introduce in the relationship used to evaluate the surface activity a coefficient which depends on the type of material and on the surface state. On another way we can observe a good agreement between our values and those from the theoritical model proposed for stainless steel (1).

REFERENCE :

1/ R.A. Surette and R.G.C. Mac Elroy, "Regrowth, retention, and evolution of Tritium from stainless steel", Fusion technology, 14, (2), 1141-1146, (1988).