Summary and Recommendations of the 2nd European ALARA Network Workshop on "Good Radiation Practices in Industry and Research"
Chilton, England, November 1998

Scope of the Problem

The opening presentation by Croft and Lefaure reviewed the wide range of uses of radiation in industry and research, identified potential problem areas and posed a number of questions designed to focus discussions during the Workshop. Dose distribution data, mostly from previous issues of the EAN Newsletter was used to identify that industrial and research sectors figured prominently in the higher dose bands, often being comparable to or even more important than doses from the nuclear sector. This was reinforced by later presentations both in terms of dose distributions and accident data. This latter point was developed and emphasised by Dr Cosset of the Curie Institute Paris who presented some fascinating data on the 696 victims of irradiation accidents treated in the Institute, since the inception of the Radiopathology unit in 1951. Table 1 provides a summary of some of this data.

Table 1. Number of victims of irradiation accidents treated in the Curie Institute (France 1951-1997)

Activity Sector	French cohort	Foreign cohort	Total
Occupational exposure			
Nuclear industry	46	16	62
Non Nuclear Industry	265	39	204
Research Laboratories	131	22	153
Medical Facilities	56	3	59
Patients	73	15	88
Public	11	25	36
Radiophobia / Advice	86	8	94
Totals	**568**	**128**	**696**

Subsequent sessions of the workshop covered: influences of management, naturally occurring radioactive materials (NORM), industrial radiography, research, irradiators, gauging systems and feedback. During these sessions a number of common themes emerged and rather than provide a chronological account of the presentations it is perhaps more relevant to present an overview grouped by the recommendations emerging from the final discussion.

Safety Culture: How to Influence?

A common theme running through the various sessions was the need to improve radiological safety culture; but it was recognised that this needs to be part of an overall approach to safety. Both the management and the workforce have roles to play but it is crucial that management fully embrace safety. A number of presentations identified that a strong influence on management can be the recognition that safety, efficiency and profitability go hand in hand; and that failure to address safety can be expensive - if you think safety is expensive, try an

accident! (Aamlid). DuPont are a renowned leader in safety, and push management ownership of safety. This can be traced back 150 years to when a plant producing explosives blew up. The management decided to start again, but under strict safety measures and to focus management' s attention on safety they were forced to have their offices on the top of the plant!

A variety of regulatory enforcement programmes were presented emphasising different aspects, e.g. prior notification of use to permit inspections, approval of equipment designs, targeting of sectors for special attention (e.g. industrial radiography), prior risk assessments etc. Regulatory frameworks and the national safety culture will influence which are the most effective in each country. However, it is clear that regulatory enforcement programmes influence management approaches to radiological safety. Similarly the level of awareness of management and workers to radiological safety can be raised by feedback mechanisms from accidents (see below).

There is a need to pursue actions, which will improve radiological safety awareness as part of an overall approach to safety. In this respect cooperation with professional bodies and industry group organisations may be productive.

Feedback of Information from Accidents

The Learning the Lesson articles in the EAN Newsletter have become a regular feature, and the interest and usefulness of such feedback was reflected at the workshop both in case studies presented and discussions.

This was considered to be one of the most important areas for future development, both in terms of feedback to the users and an input to decisions on resource allocation by competent authorities.

Whilst the establishment of a European accident database may be a useful long-term goal, the Workshop recommended that the EC should give priority to:

a) Encouraging the establishment of compatible accident databases in all Member States: in this respect the UK database, IRID, and the experience in establishing it, may prove to be a useful template; and

b) Supporting the establishment and operation of feedback mechanisms to ensure widespread dissemination of case studies and lessons to be learned from accidents

The Workshop placed particular emphasis on (b) and identified it as a priority matter. It was noted that the existing European ALARA Network could be used as a means of achieving this. To be useful at the worker level it would be essential to have the case studies in the native language of the worker. It was felt that the EC could help in this matter.

Dose Data Analysis

Dose data from a number of countries was presented, and Frasch presented the work of the ESOREX project; European Study of Occupational Radiation Exposure. The present study includes the EC Member States plus Iceland, Norway and Switzerland; but there will be a second phase covering potential new entrant countries. The present study reviews the legal provisions, the organisational structures and technical facilities of the national registration system to monitor individual occupational radiation exposures; with a view to the potential to harmonise approaches. It is apparent that there are significant differences both in the practices of monitoring and record keeping and in the data structures e.g. work categories and dose

bands. Harmonisation of the collection and formatting of dose data across Europe was seen as a desirable objective. However the Workshop wished to emphasise that the objectives of collecting such data should be clear and we should avoid collecting data that does not have a clear objective. Different profiles of exposure will occur in different countries; but what is important is understanding the driving forces so that options for improvement can be identified.

National and European data should be structured to help identify trends, areas that are not well monitored and overall to help to prioritise allocation of resources in order to reduce exposures.

The Workshop identified that the Commission could usefully encourage a more uniform approach to the assessment of dose from exposures to naturally occurring radioactive material and from internal exposure.

Source Security

It was noted from the analysis of the feedback from accidents that poor source security had been the primary cause of a number of accidents. Further, poor source security in countries outside the EU; particularly from the former Eastern Block, posed risks from orphaned sources turning up in the metals recycling industries.

The Workshop commended the Commission' s collaboration with IAEA, World Customs Organisation and Interpol (as evidenced by the Dijon meeting) in order to address this problem and considered continued collaboration to be a high priority matter.

Industrial Radiography

The Workshop identified that industrial radiography accounted for a significant number of the annual doses above 15 mSv in a year and was the predominate sector responsible for serious radiological accidents. Both Spain (Zamora) and UK (Paynter and Smith) reported on enforcement programmes and associated initiatives targeted at this area of use.

a) Shielded Facilities

Many of the accidents and higher doses related to site radiography situations where there was almost total reliance on operator competence for radiological safety. If the work could be carried out in shielded enclosures then a high degree of safety from engineered safety features such as interlocks, could be provided. Dr Smith (HSE, UK) posed the ALARA orientated question, "when would it be reasonably practical to invest in the expense of a shielded enclosure?". His proposed benchmark, based on case studies, was pragmatic; namely, when you could fit the workpiece on the back of a lorry. However in keeping with the earlier theme he also emphasised the power of regulators pointing out economic influences on management in preference to using regulatory muscle. One example he quoted was that of investment in an extensive and sophisticated installation costing approximately £400,000. Here the payback period for the company was estimated to be just 2 years, mainly due to a productivity increase of 30% associated with flexibility of working and more immediate feedback into production control from the quick turnaround NDT inspection regime that can come with a fixed facility.

b) Training Standards

A major contributory factor to accidents and high doses was the generally low standard of training in radiation protection and the lack of fresher training. The feedback from accidents addressed above was considered to be particularly relevant to possible improvements in this area.

The Workshop recommended that the EC take steps to encourage an improved and coherent standard of training and refresher training in industrial radiography. In this respect it would be effective to cooperate with both national professional bodies and recognised accrediting organisations.

c) Radiography Equipment

It was noted that equipment failures, particularly in the decoupling of sources, often provided the challenges to safety systems and procedures that eventually resulted in overexposure. Unfortunately equipment manufacturers were not represented at the Workshop.

There was a perception from participants that the design of radiography equipment had not progressed at the same rate as other technologies and that the Commission could usefully support work to generically improve the robustness of source control mechanisms and to investigate the viability of fail-safe source return sensors/detectors.

It was also noted that as the nuclear industry had discovered, active dosimeters, could provide useful direct feedback to workers on the consequences of their actions and raise their general level of awareness. Their use in many sectors may be beneficial, and particularly so in industrial radiography.

Qualified Experts

It was noted that the term Qualified Expert was interpreted differently across Europe, with the standard ranging from that of a professional consultant to an employee who has received only 1 week's training, targeted towards supervision within his organisation. The Workshop identified that Qualified Experts could have a significant influence on the standard of radiological protection actually achieved in the Industrial and Research sectors and that in view of the disparate uses in these sectors, professional consultancy was of importance.

It was recommended that the Commission further support the efforts of the Article 31 Group to harmonise the level of expertise needed in this function.

Internal Exposure

It was considered that the assessment and management of internal exposures was less well developed than that for external exposures. There was general support for the proposal by EAN to the Commission for the Third Workshop to address internal exposures.

NORM

A case study on the manufacture of refractory material using sands containing NORM (Smith) provided an example of a situation where occupational radiation exposure, mostly from internal exposure, had only recently been recognised. He described efforts made to reduce exposures, which had been running at a significant fraction of the dose limit for decades. It was generally agreed that this was typical of a number of NORM processes, and warranted attention. This case study also identified a conflict between the ALARA principle and the Not in My Back Yard (NIMBY) approach to waste. The case in point had accumulated some 200 tonnes of waste for which legal authorisation for disposal had been granted but without anyone willing to accept it; resulting in occupational doses being accrued from storage of the waste. (See Communications and Perceptions below).

The removal of radium bearing low specific activity scale from pipework used in the offshore oil and gas industry produced waste disposal issues which were seen to be treated in an inconsistent manner. Cleaning carried out on oil rigs allowed this waste from NORM to be disposed of at sea whereas if carried out on land the waste could not be treated in the same way as it would contravene the London Dumping Convention and OSPAR. Similarly the radiologically attractive option of re-injecting the waste into oil wells was not permitted.

It was felt that the Commission could usefully explore improvements in the disposal of low activity waste arising from NORM.

Communication and Perception

A common feature of many aspects of use of ionising radiations was communicating with both workers and public on the levels of risk involved.

The Workshop considered that perceptions and comparisons of risk were at the heart of the acceptance and implementation of radiation protection. This requires easily understood information to be made available to the various audiences. This was seen as an area the Commission should support.

Conclusion

The Workshop achieved its objective of providing a focus for feedback on the application of ALARA in Industry and Research. The format of the Workshop again fostered discussion and the identification of what it is hoped will be useful recommendations to the Commission. We now look forward to the next Workshop in Munich.