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Editorial

Hazardous materials display such an enormous diversity of properties and effects that it should be no surprise to note the corresponding variety of topics and organisations represented in, for example, the pages of this journal. This is also reflected in the various groups of organisations that form and re-form in the wider process of management, handling, development of codes of practice and legislation, and other aspects of the use of hazardous materials. These groupings are sometimes determined by the official remit of the organisations themselves, e.g., the bodies concerned solely with regulation of the nuclear industry, and sometimes they evolve from new developments, such as the current concern of the energy gas industries with LNG and LPG. Although it may be expedient for these groups to operate within a particular context of needs in order to get their work done, it may also be to their disadvantage to be isolated from developments in the broader field, since these may may be of direct relevance. By way of illustration, there is much effort currently being directed towards improving the dispersion modelling of dense gases, a problem which is of considerable importance to the chemical industry as well as the nuclear industry. There seems to be considerable scope here for mutually-beneficial pooling of resources and effort, dealing with the problem on a generic as well as substance-specific basis.

We need to identify unifying themes that provide frameworks for co-ordination. One such theme may be found in the growing importance of Quantitative Risk Assessment as a component of the overall practice of Risk Management. This is an enormous field and much remains to be done to improve the techniques involved. There is an emerging consensus as to what is meant by risk assessment, epitomised perhaps most clearly by published studies such as the USNRC's Rasmussen Report of 1975 on nuclear reactor safety (for light water reactors), and the UK Health and Safety Executive's Canvey Report of 1978, dealing with a particular petrochemical installation. These studies illustrate the overall philosophy of risk assessment as being a statement about the combined effect of the frequency of occurrence of an undesirable event and the magnitude of the consequences of that event for all the significant modes of failure that can be identified. The scope of risk assessment must then include such elements as plant design and operation, safety and reliability engineering, loss prevention, event and fault-tree analysis, mechanisms of dispersion of substances released, response of structures to explosion, flammability criteria, toxicology and epidemiology. Applications of risk assessment include a variety of circumstances in which toxic, explosive or radioactive materials are manufactured, processed, stored or transported.

A likely and reasonable reaction to the above description is to question whether such a complex interaction of elements can be of any real practical use, especially in view of the various uncertainties associated with each factor. Dr. A.V. Cohen of the UK Health and Safety Executive identifies at least three classes of risks, namely those which clearly and identifiably lead to casualties and for which reliable statistics are available (fires, factory accidents, etc.), those for which an effect is believed to exist but where the causal connection to the individual cannot be certain (carcinogens or radiation), and experts' best estimates of probabilities of catastrophes which it is hoped will never happen. One may associate progressively greater margins of uncertainty with each of these as one moves from data to estimates.

In making use of the techniques of Quantitative Risk Assessment one must be very careful not to fall into the many traps ready for the unwary. Nonetheless, the technique is a powerful one when used with critical awareness of its limitations, and there is considerable evidence that it now has a major influence on the development of regulations likely to affect the chemical and nuclear industries, with varying degrees of quantification in the requirements.

It is because of this influence that there is a pressing need for improvement in the accuracy and reliability of the techniques of risk assessment. Ill-founded assessment may lead to unrealistic and unattainable regulatory conditions being imposed, especially where those conditions are quantitative. This would discredit the regulatory process, and impose an unreasonable burden on industrial technology. On the credit side, quantitative risk assessment can contribute positively to the improvement of safety practices, and the identification of previously unseen hazards. Better use of resources can result from improvements in the techniques referred to above, and it is our hope that contributors from a wide range of appropriate industrial, research and regulatory bodies will participate in that process through the pages of this journal.

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