APPENDIX I

RISK ASSESSMENT CONCEPT

APPENDIX I

CONCEPT OF RISK ASSESSMENT

Before attempting a discussion of hazards or risks it is worth making clear what is meant by the terms. Any industrial operation has a number of associated hazards due to the process and/or the materials being handled. In this context the term 'hazard' is used to describe a set of conditions which could potentially lead to an accident with harmful consequences. It is, therefore, important to know the likelihood (usually expressed as the chance per year or frequency) of such events happening. This is termed the risk, and in this case we mean the risk of spills over a given interval of time (taken as one year).

For hazards to people the concepts of individual risk and societal risk are often used. The former refers to the risk as experienced by an individual at a particular location or involved in a particular activity. There is now general agreement that the risk of fatality (i.e the probability of death per unit of time, usually per year) should be used in this context, although other measures of risk, such as the loss of life expectancy, could also be used.

For hazards to the environment the issues are not so clear, since no one parameter is agreed as representing the harm from environmental exposure. The questions of what is acceptable and of how to calculate such types of risk to the environment have not yet been fully answered.

In calculating the effect of an undesirable event, it is not just the consequence that is considered but the frequency also. Thus a crash of 2 large aircraft over a football stadium could have catastrophic results and, therefore be regarded as a high hazard, but it is not rated as a high risk because the frequency of the event is so low. The calculation of risk as a combination of frequency and consequence allows a balanced assessment of these parameters.

Quantitative risk assessment (QRA) was developed in the chemical and nuclear industries to assess the impact of such activities on people. Most of the techniques which have developed are related to risks to individuals or to the community. QRA is now widely used for assessing hazardous processes and such risk assessments are now increasingly required as part of the approval process before construction of new industries. The steps in a risk assessment are as follows:

(a) Identify and list the hazards associated with the operations performed. The result of this step is a list of inherent hazards (e.g. fire, spills etc.) arising from the nature of the operations and the materials handled, and a list of hazardous incidents which could lead to these inherent hazards (e.g. overturning and spillage of a truck trailer).

(b) For each listed hazardous incident, assess the likely severity of the consequences, using the appropriate methods. This involves assessment of the type and characteristic of the incident (e.g. a gas escape or a spill of concentrate have quite different characteristics) and assessment of the pathways for such releases to reach the environment (e.g. the extent of dispersion in the water).

(c) For each listed hazardous incident assess the likely frequency with which the incident can occur. This can be done from historical data on, for example, failure rates of cranes or conveyors, or it may require a detailed analysis of the systems to determine the ways in which they can fail. In general, where doubt exists, the assessed frequency should be conservatively chosen.

(d) By combination of the consequences and the frequency of occurrence, calculate the risk to the exposed members of the public, the environment or property from each hazardous incident. These risks are combined to give an overall risk from the plant operations.

When this has been done the risk can be compared against established guidelines for acceptability and areas requiring risk reduction can be highlighted. Risk reduction is, itself, a systematic process that looks at ways of :

- reducing the inherent hazard
- improving the preventive systems (i.e containment and control)
- improving the protection systems – both hardware and software.
- enhancing the damage limitation procedures.

Some or all of these areas can be used to decide on which risk reduction measures are needed.

Risk assessment has both strengths and weaknesses which should be borne in mind in using the results of such an assessment. While risk assessment has proven to be a very valuable tool for improving safety, it is open to abuse and misunderstanding. It, therefore, needs to be used with care and critically as an aid to decision making and not as the sole basis for them.

The safety of hazardous operation depends on both the related engineering and on how the operation is conducted and managed. A risk assessment can only consider the design and the managerial systems as they are proposed. If the design is subsequently changed, the risk will also change. Likewise if the operational and managerial systems are allowed to deteriorate, the safety of the operation will also deteriorate. Therefore, quantification of risk cannot indicate that an operation is safe, although it may help to indicate that an operation can be safe. Safety is ultimately dependent on management control and the systems and procedures set up to implement that control.

Using risk assessment in deciding the acceptability of a project should not be done without an awareness of the benefits to society of the project.