The inspection and assessment of special risks: Energy risks

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The theory and process of risk assessment and the problems posed in the technical handling of these risks have already been dealt with in this publication. When however we are confronted by the need to inspect and assess oil and gas risks, better known as energy risks, it might seem in the first instance that the problems posed are complex. The insurance company engineer however has various factors in his favour with which he should be familiar and use in order to obtain what is truly important to him: the risk level of the inspected installation and its insurability.

In the first place, given the potential dangers inherent in these types of risks, both safety levels and the technical know-how and awareness of those involved tend to be greater than those which we normally find in the world of conventional risks.

In the second place, many of these installations have in-depth safety case studies available which have been carried out either because of legal requirements which exist in many countries (see TREBOL No 5 «The Seveso Directive») or because of the policy of their parent company. This aspect will be the main point that this article deals with.

The insurance company should take advantage of these studies by using engineers who are not so much specialised in the application of the techniques necessary to carry out these studies, but who rather have sufficient expertise in order to interpret the results and conclusions of the safety case studies.

An overview will be given of the principal sets of information which make up the safety case studies to which we refer, and note will be made of the aspects and information which may be found in these which are most useful to insurance companies.

The first set of information which may be found is that called «Identification of Hazards». In general this is compiled using databases of accidents which have occurred in similar installations. This information may be consulted and compared rapidly and increasingly cheaply.

The conclusions arising from consulting these accident databases may be used to provide information with respect to the loss experience and causes of accidents in installations which are technically very similar.

As an additional element which takes into account the fact of scale, the application of techniques such as risk indices (DOW and MOND principally) is

useful. These supply qualitative information with respect to accident causes and quantitative information with respect to risk valuation.

Any company regularly operating in this field should have available some kind of regular access to these types of accident databases as a source of common information.

An analysis of the indices of the different units can provide an initial estimate of the real levels of technical risk of the installation, comparing the values which result with the tables published by Dow Chemical Co and Imperial Chemical Industries.

The «Identification of Hazards» set of information is sometimes completed with the application of one of the detailed analysis techniques called ORAs (operational reliability analysis) amongst which HAZOPs (hazard and operability) and FMECAs (fault mechanism evaluation and criticality analysis) take special place because of their rigour and applicability.

The results arising from the application of these techniques give the inspector information of great interest:

- Accidents identified as possible.
- Instrumentation level of the systems.
- Identification of equipment and systems critical for operation.
- Degree of implementation of modifications, etc.

The second set of information of the safety case study, and possibly even more attractive for the inspector, is the «Estimation of Accident Consequences».

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This provides the inspector with models and layout representations of the various likely effects of possible accident scenarios which have been postulated from the results and conclusions of the previous phase. It is therefore the inspector's mission to verify that the scenarios have been defined with technical rigour (discharge rates, meteorological conditions, etc.) and that the mathematical models which have been used, (normally integrated within internationally recognised software packages) are acceptable. It is however advisable to compare the results available from the safety case study of at least one accident with greater consequences (simple or domino) with those obtained through the use of a proprietary tool.

The third and last set of information available in the safety case study is that called «Quantitative Risk Analysis» made up of the corresponding «event trees» and «fault trees» which, correctly quantified and simplified, give the occurrence probabilities of the abovementioned accidents. In addition to giving the various fault and event sequences leading to an accident, depending on the inspector's experience, he may obtain some idea of the level of reliability of the installation under study and of the probability of incurring a certain level of damage in the case of accident.

This set includes a «Damage Analysis» based fundamentally on the PROBIT (probability unit) technique through which the effects represented by the value of the danger variable generated in the accidents (e.g. overpressure associated with an explosion) is transformed into property damage and personal injury values (vulnerability) within its area of influence.

In conclusion, it is possible to obtain very precise information on the risk being considered from the interpretation of the safety case study results, evaluating the rigour of these results and comparing them with the company's own experience. ■