Technical University of Denmark

DTU

Unforeseen Accidents: Improving Risk Management Practices and Predictability

Taylor, R.; Kozin, Igor

Published in:
Program and abstracts.The Future of Risk Analysis in the Nordic Countries

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

DTU Library
Technical Information Center of Denmark

Unforeseen Accidents: Improving Risk Management Practices and Predictability

R. Taylor and I. Kozine
Technical University of Denmark

A follow-up study of the end results for 132 oil, gas and chemical plants with risk analyses carried out over 36 years demonstrates that risks were found to have been reduced significantly. Most of the major accidents have occurred due to management failure to implement recommended safeguards. This particular problem was solved over the period of the study. However 20% of the accidents were found to have been due to unpredictable accident scenarios, which is a very serious observation. If this pattern is maintained over a wider range of industrial areas, it means that the promise of risk analysis as a tool for safety improvement is much diminished. It also means that risk analysis is of limited value in making policy decisions about the safety of new technologies. Initial studies indicate that the problem indeed is significant in many areas such as aerospace, automotive, medical and pharmaceutical, energy production industries, and in power and communications infrastructures. Research is ongoing now at DTU to identify and classify the causes of unforeseen accidents and to do a mapping between them and solutions (organisational and computational) to improving the predictability of accidents.

In this research, among unforeseen accidents we distinguish *unpredictable* and *predictable* accidents. Unpredictable accidents can only be described in retrospect and after that become predictable and preventable if proper lessons have been learned and proper barriers implemented. Predictable accidents occur and become unpreventable because of deficiencies in the risk management process, negligence of the responsible personnel, misjudgement of losses and benefits, or simply because of accidents' assessment as not incurring large losses compared to expenses for their prevention. We distinguish four groups of causes for not being prepared for accidents: (1) organisational and human, (2) inadequate models (including expert judgements) providing assessments of accident probabilities (frequencies) or severity of accidents, (2) accidents which are in principle predictable, but for which current methods are impractical and (4) accidents for which there is currently insufficient knowledge to allow predictability.

A substantial volume of unforeseen accidents have been collected and a number of reasons have been identified which can lead to inability to predict accidents. To exemplify some, the following reasons are listed:

- The knowledge needed for prediction simply does not exist;
- The knowledge needed for prediction is reported, but not available to the analysts responsible for safety analysis, nor to the engineers responsible for design;
- Errors and oversights due to inadequacies in the hazard identification process;
- Deficiency in the scope of the analysis.

In the presentation we will demonstrate all the causes of inability to predict accidents we have identified and our suggestions for improvements in risk management practices to avoid preventable accidents. The current limits of accident prediction, and as far as possible, finding ways of eliminating these limits will be discussed as well.