

Risk Analysis and Emergency Management of Ammonia Installations

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Quantitative Risk Assessment (QRA) is increasingly used, worldwide, for evaluating the risk of handling hazardous materials in the process industry and for land-use planning purposes. Techniques and methods are also used in the development of emergency management tools.

Much experience, also related to possible ammonia releases, has been achieved in this field. Several studies concerning the risk of handling, storage and transport of ammonia have been carried out. This paper describes some state-of-the-art experience in the Netherlands.

INTRODUCTION

In 1982, the European Communities issued the 'Council Directive on the major accident hazards of certain industrial activities'. The direct inducement for this was the release of toxic dioxins from a pesticides factory in Seveso, Italy, in 1976. The said directive is therefore better known as the 'Post Seveso Directive' [1].

The implementation of the Directive in the Netherlands requires from the (about 80) notified industries the drafting of an external safety report, including a Quantitative Risk Assessment for major hazards [2]. Also for ammonia and fertilizer producing plants such investigations have been carried out.

Risk assessment is always carried out for smaller scale applications of ammonia, like cooling facilities in icecream, dairy products, fruit and vegetables stores and for ice-skating courts. Environmental licenses and regulations to prevent hazard, damage and nuisance, often require quantified hazard analysis.

The application of ammonia also requires a judgement from 'pressure vessel' regulations. Although these regulations were originally developed with regard to occupational safety, several installations which are located near populated areas, are also judged from external safety point of view. The need for a universal and simple evaluation of, often relatively

old, existing installations resulted in the development of a general method for certification of ammonia cooling systems.

Quantitative Risk Assessment is a relatively new technique for determination of the acceptability of industrial activities in populated areas. The extended use of QRA's, for environmental licences, land-use planning and risk reduction, has led to the development of several standard methods and tools. They are also widely applied in emergency response planning for both on-site and off-site purposes.

Especially for ammonia, both for large and small scale application, experience has been built up in TNO in the past years. Several studies and consultancies were carried out, not only in the Netherlands but also abroad.

This paper aims to give an overview of these experiences, illustrated with some case studies.

Although much published research on ammonia releases is available, the uncertainties about the physical behaviour and the potential toxic impact of ammonia vapours still appear obvious. Also the knowledge and quantification of the influence of management and material factors on the reliability of technical systems in the chemical industry ought to be given increased attention, in order to include site-specific circumstances into risk-determining failure probabilities.

Industrial support in the enhancement of knowledge is vital.