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Environmental risk: towards an integrated assessment of industrial activities

G.J. Stam [a,*], P.H. Bottelberghs [b], J.G. Post [c]

[a] *Institute for Inland Water Management and Waste Water Treatment RIZA, P.O. Box 17, 8200 AA Lelystad, Netherlands*

[b] *Directorate-General for Environmental Protection, Directorate for Chemicals, External Safety and Radiation Protection, Netherlands*

[c] *National Institute of Public Health and the Environment, Laboratory of Radiation Research, Netherlands*

Abstract

In Dutch environmental pollution policy, great importance is attached to the assessment of hazards due to failures and accidents in industrial installations. In particular, for the aquatic environment a systematic approach was developed to be used in environmental licensing procedures. Two software models for environmental risk assessment of industrial activities are available, VERIS and RISAM. At present, these models are being integrated in one comprehensive model. The results of the new model can be used as a starting-point for preventive, repressive or mitigating measures, as well as for a basis of a risk management system. The question of which standards, such as limit values for risk thresholds, should be set is still a matter of discussion. It is to be expected that in spring 1998 a first discussion paper on the topic will be published.

Keywords: Industrial activities; Environmental risk; Hazards

1. Introduction

Over the last decades the level of intrinsic safety of industrial installations and activities has strongly increased. Nevertheless, accidents still happen. Some of these accidents have adverse effects for men or environment. In Dutch environmental pollution control policy, great importance is attached to the assessment of hazards due to failures and accidents in industrial installations [1,2]. This was also the case for releases

* Corresponding author. Tel.: +31 32 0298 458; fax: +31 13 2024 9218; e-mail: g.stam@riza.rws.minvenw.nl

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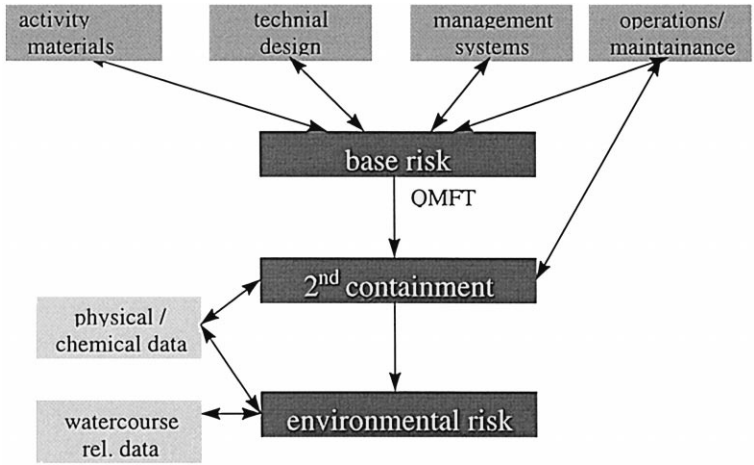

Fig. 1. Main structure of the new environmental risk assessment model.

impacting the environment. In particular, for the aquatic environment a systematic approach was worked out to be used in environmental licensing procedures. Nowadays, two software models for environmental risk assessment of industrial activities are available, VERIS [3] and RISAM [4,5]. The operational experience with these models gave reason to widen the scope and to proceed with the development of the methodology together with combining the two models in an integrated one.

2. Results and discussion

It is a widely accepted fact, as can be concluded from literature, that failures and accidents in industrial installations result from a great variety of causes. The probability of an incident is influenced by operational factors (maintenance, working procedures, level of education), management factors and the technical design. The extent of a spill depends on preventing and mitigating measures and how quick emergency response comes to action. Previously mentioned factors are all site-specific and may differ per installation or activity.

With respect to hazards for the aquatic environment, material-related data and information on the receiving watercourse also are relevant.

In Fig. 1 the concept of the risk assessment model is presented.

In practice, not all the necessary data is available. Therefore, default values for most parameters are included in the model [6,7]. The user can adjust most default values according to the actual site, activity or installation specific situation.

Since the default values are based on the average situation related to the safety level of Dutch industry, it is possible to make an adequate estimation of the risks of an installation or site based on a small set of data. When required, installations or activities

with a relatively high risk to the aquatic environment can be evaluated in more detail by feeding specific data in the model.

Default risk scenarios are available for:

- storage of bulk chemicals,
- storage of packed chemicals,
- batch processes,
- continuous processes,
- pipelines,
- transhipment of bulk chemicals,
- transhipment of packed chemicals.

The results of a risk assessment can be reported in several ways. In general, the results are presented in the form of a frequency–consequence curve, with the horizontal axis representing some measure of harm. An example of a frequency–consequence curve is given in Fig. 2.

Since the results of a risk assessment can be used for different purposes, it is possible to choose between three measures of harm:

- the actual amount of the spills (in kg),
- the area of the watercourse influenced by the spill (in m^2 or m^3),
- an environmental harm index.

The results of the new model can be used as a starting-point for preventive, repressive and mitigating measures, as well as a basis of a risk management system. A specific tool to analyse the results is part of the new model.

The question of which limits should be set, such as limit values for risk thresholds, is excluded from this project. With respect to this question, a parallel project is started. In this project, the Dutch government and industry are working together to define possible

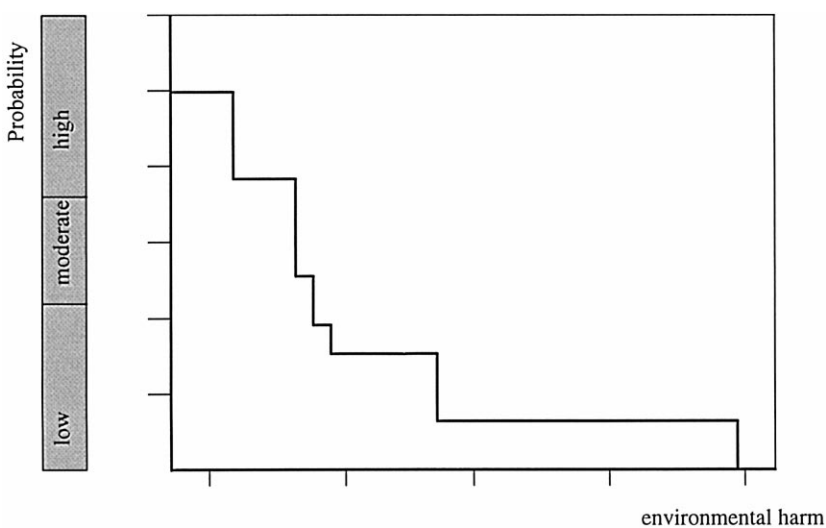

Fig. 2. Example of a frequency–consequence curve.

criteria for limit values. It is to be expected that in early 1998 a first discussion paper will be published.

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