REGIONAL RISK ASSOCIATED WITH THE TRANSPORT OF HAZARDOUS MATERIALS

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Abstract-- An increasing concern over the level of risk associated with hazardous materials transportation has led international efforts to focus on risk assessment at regional level. Following this trend, the aim of this work is to review the latest procedures for analysing the regional risks resulting from hazardous materials transportation by means of road and rail. In particular, two methodologies are reviewed and discussed, a method recently developed at Swiss Federal Institute of Technology [1] and the strategy outlined by CCPS [2]. The extent of these methodologies has been explored in order to find their advantages and disadvantages. As a case study this paper considers the transport of methanol from its production site to the port where it is going to be stored, obtaining risk results using at least one of the above mentioned methodologies.

Keywords--Risk Analysis, Hazardous Materials, Transport.

I. INTRODUCTION

Assessing the risk of a region implies the use of a complex methodology, requiring information about hazards to health and environment. In particular, special attention has to be paid to potential risks arisen from the transport of hazardous materials (HAZMAT) through large territorial areas which, in some cases, are heavily populated.

Actual or potential incidents in transport and distribution of hazardous substances could result in death or injury to people, property damage, or damage to the biophysical environment, through the effects of fire, explosion or toxicity. An increasing number of transportation accidents involving dangerous substances have occurred world–wide, giving place to major awareness in government, industry and community in topics that have to do with safety management of hazardous materials transportation.

Transportation Risk Analysis (TRA) is quite similar to risk analysis in fixed facilities and makes it possible to manage and control transport risks by determining the most sensitive parameters as well as to identify and evaluate risk reduction strategies and alternatives. TRA can be conducted on a qualitative or quantitative basis calculating relative or absolute risk indexes, depending on both the information available and the purpose of the study. The present paper will focus on methodologies developed to perform quantitative studies.

In this scope, the methodology recently developed at Swiss Federal Institute of Technology (Nicolet-Monnier and Gheorghe, 1996) and the strategy outlined by CCPS (1995) are studied, leading to the estimation of individual and societal risk. The main procedural steps related to quantitative risk analysis for transportation systems are supported by the foregoing developed methods for fixed installations. Special attention is also given to how to gather local information and to estimate coefficients that reflect the conditions prevailing in the region considered in the case study presented.

II. CCPS METHODOLOGY

To perform a TRA analysis, CCPS suggests some basic steps to take into account all the representative factors that affect the risk over a route where it is being transported a certain amount of a hazardous substance: 1) Movement Description; 2) Hazards or Initiating Events Identification; 3) Incident Enumeration; 4) Selection of Significant Scenarios; 5) Consequence Estimation; 6) Likelihood Estimation; 7) Risk Estimation; 8) Utilisation of Results.

A. Route Segmentation and Frequency Analysis

The way characteristics (population density, weather conditions, topography, accident frequencies, etc.) could vary very much from point to point, so the route should be divided in sections having similar features. This helps to assign the proper conditions to each portion of route, making the study more rigorous.

The global chance of release is calculated separately for the various sections of the route and later, probabilities are assigned to each proposed scenario

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