

# Chapter 58

## A Literature Survey for Hazardous Materials Transportation

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### ABSTRACT

*Transportation has the greatest importance in logistics. The main focus for the carriers is the cost of transportation. Transportation of hazardous materials (hazmat) is a special kind of transportation due to freight transported. Causalities due to the accidents caused by vehicles that are carrying hazardous materials will be intolerable. For hazmat transportation, in addition to transport costs, risk of transporting hazmat also has to be considered. Many researchers studied on hazmat transportation problems in order to propose optimal solutions with respect to cost, risk, emergency response, facility location etc. In this study, a literature survey of articles about hazmat transportation was prepared. The articles published in refereed journal from 1973 to 2014 were taken into consideration. The articles were also classified according to their main focuses and hazmat type carried.*

### INTRODUCTION

Hazardous materials (also called as dangerous goods) are defined as any substance or material capable of causing harm to people, property and environment (Erkut et al., 2007). Dangerous goods are sorted into nine classes according to their properties by United Nations. These are explosive substances and articles, gases, flammable

liquids, flammable solids, oxidizing substances, toxic substances, infectious substances, radioactive material, corrosive substances, miscellaneous dangerous substances and articles. The rulers in countries and the carriers must take a special care for transporting hazmats. If there is no accident then transportation of hazmats will not be different from transporting other goods. When an accident occurs then the harm to population

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and environment will be inevitable. Although it is vital to keep information of hazmats only few countries have special departments for transporting hazmats. These departments keep a database for all hazmat incidents and their results. Figure 1 shows the distribution of accidents by hazmat class in 2013 in USA according to information of PHMSA - US Department of Transportation Pipeline and Hazardous Materials.

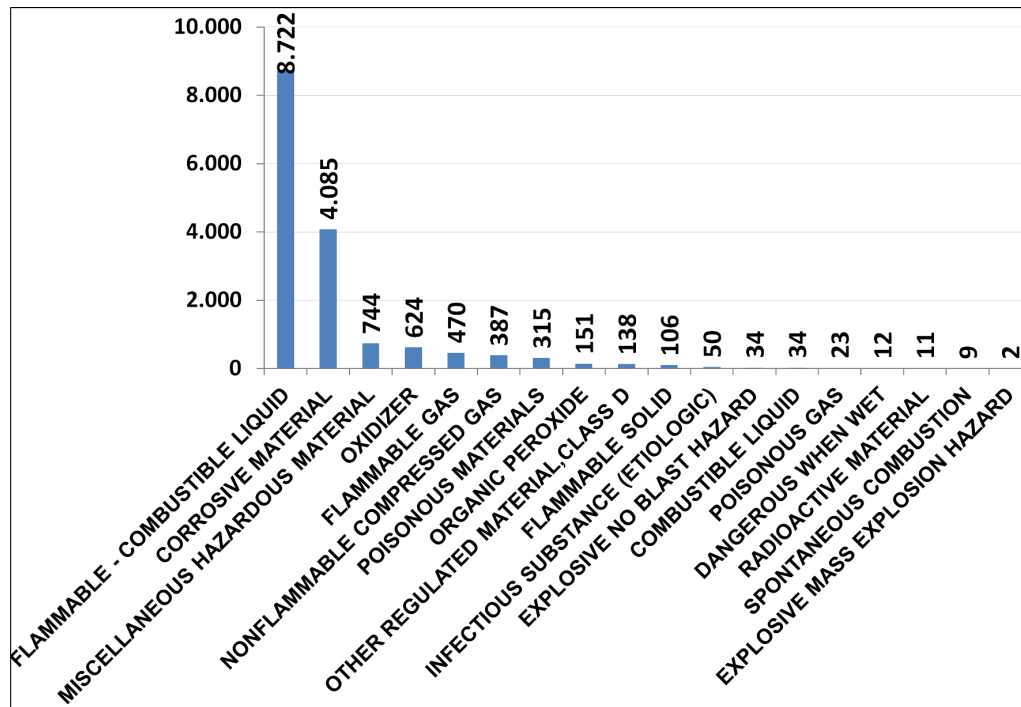
The Figure 1 illustrates that the majority of the accidents/incidents are flammable-combustible liquids incidents.

Hazmat can be transported by all kind of modes (air, highway, railway, water and pipeline), but they are mainly transported by road. Most of the incidents caused by hazmat carrying vehicles were resulted in fatalities, injuries and environmental damage. If an accident cause hazmat release from the vehicle, then these accidents are called as incidents. In 2013, there were 15,919 total

incidents resulting 12 fatalities and \$81,365,866 damages in USA (Hazmat Intelligence Portal, U.S. Department of Transportation).

The special importance of hazmat transportation forces the researchers to study on how to decrease risk or which route is the best for hazmat transportation. Risk reduction is the main subject for hazmat transportation but the cost of the transportation has to be considered equally. The researchers also searched the emergency response models and evacuation methodologies after hazmat accidents. Accident analysis was studied by the researchers to have an understanding of the results after the hazmat accidents. Not only the hazmat transportation but also hazmat waste transportation was studied by the researchers especially about the nuclear waste. From 1973 to 2014, there were 179 articles which were published in refereed journals about hazmat transportation.

*Figure 1. Accidents by hazmat class in 2013 (PHMSA, 2014)*



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