

# Environmental Risk Management of Fire in Oil Warehouses and Storage Tanks (Case Study: Central Storage of Yazd Oil Products Distribution Company)

AmanatYazdy Leila, MoharamNejad Naser

## Introduction

Oil storage tanks are one of the most important industrial facilities that are exposed to risks of toxic substances release, fire and explosion. Fire is a common risk and explosion is the most important risk at the oil storage tanks and petroleum products. In research with applications in chemical risk assessment that was published in 2007, Causes risk in the hands of the industries affected by three factors: human error, equipment failure and other factors (natural and intentional acts of terrorism) is enumerated and evaluated.

## Materials and methods

In this study, Environmental risk assessment methods have been carried out in two parts: Reviewing and evaluation of environmental characteristics and technical aspects of the study area (identification and risk assessment activities) were carried out. Also, in this study, Arc GIS software was used to analyze and identify regional environmental conditions.

After the library studies and reviewing articles, in order to collect basic information and identify the environmental risks Yazd oil storage was visited and experts and relevant authorities were interviewed. Then using the results of the situation, brain storming and reviewing the causes of fires in oil storage at the national level, Environmental risk were identified and evaluated. In this study, FTA method was used to investigate and identify roots of the most important environmental risk based on three factors: human error, equipment failure, and other factors (natural and intentional acts of terrorism) and FMEA techniques were used for risk assessment. The main reason for using FMEA risk assessment was high flexibility and openness and parameters in the assessor's assessment according to project requirements while the probability and severity of the FTA only two parameters can be used to assess. The risk identification method based on a tree diagram of the FTA (1) was defined. Thereafter, the risks were identified. The risk assessment based on the analysis of failure modes and effects on the environment For each of the parts warehouse was completed worksheet EFMEA potential failure modes, failure causes and potential effects of the potential malfunction is also entered in the worksheet EFMEA and RPN was calculated.

## Results and Conclusions

In this study, the scoring rate and severity of the pollution on the environment of GIS software was used and the distance to the assessment criteria were used for oil storage.

Based on the laws in Iran's oil ministry 35 meters of oil storage buffer should be considered. Also given that distance of oil storage to the close park at about 0.640 km, and the nearest are administered by the Department of Environment in Yazd province is about 18km. Therefore, fire will not impact on the areas. According to ancient cities and historical city of Yazd, making this position among the top 14 most important monuments of the city of Yazd face of fire in oil warehouse was studied.

The closest distance from oil Depo is about 3.5km. It seems unlikely that the radius of the fire reach to these areas.

Also, the population density in the radius of 2 km from the warehouse was assessed. This population density around the oil storage is 50 to 80 people per hectare. This raises the potential risk of oil storage. In addition, the old tissue was studied in the same radius.

35 meters buffer of oil storage for investigating the existence of different users were specified and evaluated. In the buffer, 20 households and a mosque are located inside the danger zone. Note that users such as chemical and industrial users that may exacerbate the risk of privacy are not included in that.

In addition, there are different types of users as industrial factories, population centers such as mosques,

schools, railroads, military centers and tourist centers in terms of influences and the influence of oil storage to four-kilometer radius were studied. Such industrial users like mosques and health centers and residential homes are at the tanks section, seven risks were ranked as moderate risks, including: dredging reservoirs by traditional methods, lack of time and accurate level of size of the tanks, welded tanks in insecure conditions, seal loss due to corrosion and poor maintenance on the roof, lightning and earthing system is out of performance or interrupted.

Transmission lines operating part three, the vehicle line, broken lines, lack of safety during repairs and seismic lines were of moderate risk.

The loading bay of the 10 risks identified seven risk categories as moderate risks, including:

Taking tankers to the platforms, drawing a bucket with the bottom of earth, smoking and the using mobile phones during loading, lack of safety during maintenance, electrical failure, technical failure cache of oil, failure to use proper lighting (explosion proof).

Based on fault tree drawn in the section tank, equipment failures with 41.67% were identified as the most important cause of environmental risk and human error with 33.33% as the second factor was identified.

In part of transmission lines and loading bay, with 45.46% and 40% of human error as the main factor and 36.36% and 20% of equipment failures respectively were identified as the second risk factor. 36.36% and 20% of equipment failures respectively were identified as the second risk factor. Other factors in the storage tank, transmission lines and loading with 18.18%, 40% and 25% are in the next category causing environmental and safety risks in the oil storage of Yazd.

After identifying the risks and the risks surrounding environment from oil storage activities, in this study, GIS software was used for crisis management planning.

Given that response time and response in emergency situations (when creating the event) is due to certain conditions that oil stock (proximity to residential areas) is very important position of sensitive facilities such as hospitals, emergency centers, fire access roads to oil storage and it was marked for disaster management.

After the identification and prioritization of risks and risk response plan require that appropriate ways to deal with risks and opportunities before they occur. The following corrective recommendations are derived from the results of this study.

The following corrective recommendations derived from results of this study to improve the unit's performance under review and reduce the incidence of causative agents of environmental risks in the oil reservoir of Yazd. Considering that the oil stock was located within the city of Yazd and is in proximity to residential areas.

The following fire prevention and risk control seems to be necessary: Management system implementation of five S (sort, straighten, shine, standardize, sustain) Fail Safe Division (FSD), Strengthening of engineering controls and safety devices, such as making use of the Fail Safe Division (FSD), running the risk of exchange programs, The use of safety signs at places with high risk, the use of CCTV cameras, especially in high-risk activities. Implementation and strengthening of early warning systems and fire fight and employing passive defense criteria, because of the importance of earthquake risks. Therefore, the following terms are necessary to deal with the earthquake risk in the oil storage: - Design and retrofit of earthquake equipments (tanks and pipelines and other industry related equipments)

- The use of separators in different parts of oil storage

-The use of insurance cover canals to reduce the economic losses to some extent

Due to the narrow streets of the adjacent warehouse and the risks of oil in storage, improving external conditions in warehouses, street at widening and also in other parts of the warehouse doors emergency recommended, if accident to the streets around the store can also be used.

Traffic load and street cars to be moved around and better conditions for relief and rescue operations to be created to manage the incident in the shortest time.

In general, it is important after accidents, managers and related experts be present at the scene and take the necessary measures to prevent accidents do next and a written report about the accident and its causes, and also provide for damages Damage created until Corrective measures need to be.

Preparing procedures and specific guidelines to reduce and minimize damage from accidents, will be very

useful. Guidelines and administrative procedures could include: Experts and technicians specialized in oil stock holding periods of periodic, Emergency response plan, Plans to deal with incidents and the external and internal exercises.

Also, compile responsibilities and powers of each of the managers and experts are concerned about the duties of each one of them during the occurrence of specified events to monitor events and take necessary measures as soon as possible.

Keywords: Risk of fire, Environmental risk, oil, storage tank

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