Chapter 13
Transportation Risk Analysis

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ABSTRACT

Petroleum is transported across the water in barges and tankers, and on land, using pipelines, trucks, and trains. Natural gas is moved, mainly, by pipelines. The most common causes of tanker accidents are: fire/explosions, loading/offloading, structural damage, collision, and grounding. Pipeline accidents are due to: corrosion, third parties activities, mechanical damage, natural events, and operational error. Some of the most commonly applied preventive activities that reduce spills in waterborne transportation are: double-hulled tanker, navigation safety and radio communications equipment, tanker exclusion zone, etc. The pipeline condition can be recorded by using various nondestructive measurement techniques or by chemical analysis of fluid flows. Different types of sensors can be used to locate and determine the size of an anomaly in the pipeline geometry. Mayor methods for detecting leaks are measuring the hydrodynamic parameters or registering abnormal conditions in the fluid flow and detecting phenomena in the immediate vicinity of the pipeline.

INTRODUCTION

Advances in exploration and production have helped to locate and recover a supply of oil and natural gas from major reserves across the globe. At the same time, demand for petroleum-based products has grown in every corner of the world. But supply and demand are rarely concentrated in the same place. Transportation therefore is vital to ensuring the reliable and affordable flow of petroleum we all count on to fuel our cars, heat our homes and improve the quality of

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our lives. Pipelines, marine vessels, tank trucks, rail tank cars and so forth are used to transport crude oils, compressed and liquefied hydrocarbon gases, liquid petroleum products and other chemicals from their point of origin to pipeline terminals, refineries, distributors and consumers.

Crude oils and liquid petroleum products are transported, handled and stored in their natural liquid state. Hydrocarbon gases can be handled, transported and stored in both the gaseous and liquid states and must be completely confined in pipelines, tanks, cylinders or other containers prior to use. The most important characteristic of liquefied hydrocarbon gases (LHGs) is that they are stored, handled and shipped as liquids, taking up a relatively small amount of space and then expanding into a gas when used. For example, liquefied natural gas (LNG) is stored at -162°C, and when it is released the difference in storage and atmospheric temperatures causes the liquid to expand and gasify. In liquefied form, the volume of LNG is 600 times less than the same amount of natural gas at normal temperature and pressure.

Because of the large volumes of products which are transported by pipelines on a continuous basis, there is opportunity for environmental damage from releases. Depending on company and regulatory safety requirements and the pipeline's construction, location, weather, accessibility and operation, a considerable amount of product may be released should a break in the line or leak occur.

In addition to the usual maritime working hazards, transporting crude oil and flammable liquids by marine vessel creates a number of special health, safety and fire prevention situations. These include surging and expansion of liquid cargo, flammable vapor hazards during transport and when loading and unloading. The economics of operating modern tankers requires them to be at sea for extended periods of time with only short intervals in port to load or unload cargo. This, together with the fact that tankers are highly automated, creates unique mental and physical demands on the few crew members used to operate the vessels.

BACKGROUND

Much of the oil and gas fields are located in countries far away from industrialized areas where the need for energy growing each day. This is why large quantities of hydrocarbons have been transported all over world by land and sea. Increased transport increases risks. However, it can be said that the last decade has been a reduction in accidents and incidents. What is the cause?

Whether transported by sea or by land safety and security of operations is key task. Pipelines and tankers are constructed and operated under strict regulations. During operations are applied national and international laws, conventions and regulations. New technologies that enhance transportation security are also implemented. Despite the safety problems that may occur, maritime oil shipping accidents have fallen steadily. The number of major oil spills (i.e. over 700 tons) decreased eightfold between the '70s and '00s. These encouraging results were made