

# Application of Data Mining in Hydrocarbon Transportation, Storage and Safety Handling

Rajesh Kanna, S Kalpana, Pushpa Sharma



**Abstract:** Considering the present scenario, in the hydrocarbon industries, heavy oil prices and need for explorations leads to decide the economy of the country. Technology had been identified and experimentally considered for new hydrocarbon exploration with the help of data mining. Besides, transportation and storage of the produced Hydrocarbon has been monitored and can be maintained in control limit using data mining too. Hydrocarbon can be stored within a tank made up of steel, iron or combination of suitable material. The tanks are properly designed, erected and all its fittings are secured. Proper construction and maintained will aid in preventing any leakage of petroleum products to the environment. Current study is about influence of hydrocarbon transportation and storage using available methodology in upstream hydrocarbon sectors. Petroleum reservoir consist of complex heterogeneities that are not limited to extract the hydrocarbon from the subsurface to surface. Post drilling, produced crude and gas will be transported fuel have to transported to refineries for further processing of crude into various products. Apart from upstream, persons working on midstream and downstream plays a crucial role. Crude hydrocarbon can be transported by vessels, pipelines and road. Pipeline and truck transportation are considered to be the prior most than other modes. Transporting oil and gas by pipeline or rail is in general quite safe. But when the safety of transporting oil and gas by pipelines and rail is compared, taking into consideration the amount of product moved, pipe-lines are found to be the much safer transportation method. Refinery has to ensure safety aspects of storing the received petroleum crude which has to be processed in to commercial products. They must be maintained in prescribed temperature and pressure condition. In order to make this successful, some of the safety protocols has to be followed which are defined and approved ministry and safety norms. This article deals about the process and procedures in transporting and storage of fuels from upstream, midstream and downstream. Hence, the protocols and other safety precaution aspects are discussed to have a safe storage and handling practices.

**Keywords:** Downstream, Hydrocarbon, Midstream, Safety, Transportation.

## I. INTRODUCTION

India is a country where demand for energy is increasing day by day.

Currently some of the techniques utilizing profit and are considered to be important and critical in corporate and finance; such as improvement in revenues so that costs are reduced [5]. It is to be noted that there was steep decline in oil prices since few decades and more specifically during mid of 2010, till recently, reduction in cost is and more attention are focussed in the energy industry. Since we are developing country and populated approximately 1.4 billion in 2020 stands second to China. At an average, an India family utilization of vehicles plays a critical role for demand of energy. India has a limited source of exploration and exploitation activities. We depend on other countries for our fuel and energy requirements. Insignificant exploration has been noticed to investigate the global factors, influencing Indian basket crude oil price changes. In other way, it can be said that like other international crude oil price benchmarks, Indian basket crude oil benchmark has not been studied much. The consumption rate of energy in India was increased from 83% to 87% from 2015 to end of 2019 which is around 198 million tonnes [1]. Since the recruitment of energy is increasing safe and transportation has to be maintained intact as the prescribed protocols has to be deemed implemented and executed effectively.

During the exploration and exploitation of hydro carbons, surveys and analysis are conducted in order to predict the hydrocarbon source utilizing the available raw dataset collected [2]. Hydrocarbon sector is one of the industry where, transportation of highly risk substance are involved. Hence in order to maintain a track, large amounts of data are generated during management of traffic, loading the substances, unloading at the destination, accidents analysis etc. These data are helpful in critical decision making so that to arrive with a conclusion during drastic conditions solve problem. Decision makers are always relay on ease ways so that a key access to and applying disparate datasets. Characteristics of the data, and identifying the situation and history alone will be interest for the decision makers. They will transform the data into information for necessary applications during transportation and storage handling of hydrocarbons [6].

## II. TECHNICAL PROCEDURE FOR TRANSPORTING AND STORING

### A. Hydrocarbon Transportation Methods

Crude oil transportation after drilling and production are transported either by cargo vessels, pipelines, trucks, cargo and tankers. The ideal method and easiest mode of transportation is mainly depend on the destination of the refinery. Transportation should be safe since the hydrocarbon products are volatile and explosive components are present.

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\* Correspondence Author

**Rajesh Kanna\***, Department of Petroleum Engineering, Academy of Maritime Education and Training (AMET), Chennai, India. Email: rajeshkanna.a@ametuniv.ac.in

**Kalpana S.**, Department of Physics, Academy of Maritime Education and Training (AMET), Chennai, India. Email: kalpanaphy@ametuniv.ac.in

**Pushpa Sharma**, Department of Petroleum Engineering, UPES, Deharadun, India. Email: arkanna1983@gmail.com

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Hence by following prescribed methods, accidents and pollutants of crude oil can be prevented [3]. The biggest problem in transporting is the pollution and that the oil can spill. To compare the relative safe mode of transportation of oil and gas by pipelines and rail, data is derived from governmental sources on oil transport to a common metric of million barrels of oil equivalent (Mboe).

## B. Safety Methods and Precautions for Handling Hydrocarbons

In general, all petroleum products are vulnerable to atmospheric conditions. Parameters such as temperature, pressure and density has their own critical response. Petrol, aviation turbine fuel and diesel are highly flammable. Safety method of handling have to be incorporated all over the surroundings so that fire accidents with respect to fuel handling areas and reactors can be controlled by monitoring. Pumps and valves has to be audited frequently to misleading in operations and errors. Improper usage and storage of these compounds leads to health

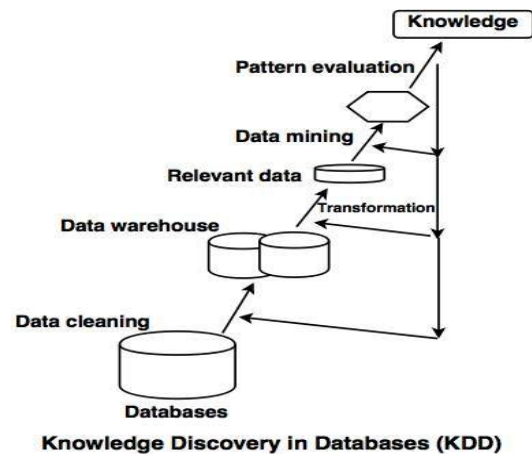
issues. Petrol if accidentally splashed on skin, remember as a first aid immediately wash with detergent water so that skin irritations and damages may be prevented. Ensure that the surroundings where highly flammable petroleum products are stored, place a sign board insisting NO SMOKING. Petrol can be used only for commercial vehicle usage only. As petrol and diesel filling stations must be facilitated with proper fire extinguisher. Sign boards should be placed and usage of mobile should be banned by displaying warning signs [3]. Storage of gasoline must be done using prescribed and approved fuel container only. Volatility of the gasoline is possible and it gets expanded due to high temperature. During this part of the fluid are vaporised and exposed to room so that container have been placed for their expansion. Storing gasoline in ambient temperature and exposure to sun light has chances for ignition if sources spark or leakage of electrical devices, other devices with a plot flame. Nitrogen can be purged on the top of the container for safety aspects [4].

Liquified petroleum gas (LPG), mainly used for household cooking purpose mainly consist of propane ( $C_3H_8$ ), propylene ( $C_3H_6$ ), butane ( $C_4H_{10}$ ), (n-butane and iso-butane) and butylene ( $C_4H_8$ ). LPG storage godowns must be kept clear, between any building or public place, public road near the property built and the storage shed for the stocking of LPG cylinders. Proper firefighting equipment has to be installed and maintained. A method is proposed for assessing and analyzing parameters for LPG storage in bulk volume, usage of induction log response and gamma rays render their efficiency in characterizing and monitoring so that there is no deviation, if so serious accident may encounter. BP neural network regressor is also applied for the similar task. In initial stage regression neural network is generally applied for identifying network design aspects and in future it is used to optimize the performance of storage and safety level.

## C. Pavement Data Management

Pavement Management System (PMS) will generate a large volume of bulk data. These data will be helpful in analysis of various datasets and has been great challenge to many highway agencies in order to land up into critical decision making for pavement and maintenance. Data mining technique has been used to pavement serviceability ratings

(PSR) that simplifies for obtaining the remaining life of pavements with parameters such as were the present serviceability rating, ride quality, weather condition, overlays and type of the surface.



**Fig. 1: Data mining and knowledge discovery process**



**Fig. 2: TREM card painted in tanker**



**Fig. 3: TREM card in petrol tanker**

## III. RESULTS

Hydrocarbon sector is considered to be main industry which determines the economic and financial growth of the country depending upon its source of export and import level. This industry is prone to many drastic accident. Hence the company should be equipped for handling the worst cases. It also should stick to the government policy and regulations. Frequent auditing will be the solution to avoid such problems. Ministry has provided standards such as pipe line colour change, corrosion and spillage of chemicals during transportation and storage these petroleum products. During transportation of products in tankers and trucks must have transportation emergency (TREM) cards mentioned. It will give technical details of chemicals, firefighting procedures and emergency contact numbers.

#### IV. CONCLUSION

Present provides an overview update on data mining applications in petroleum transportation, storage and handling. We also addressed heterogeneities with data mining efforts for decision making in several occasions to avoid losses to human and finance. To conclude, hydrocarbon materials are more dangerous since they are highly toxic, flammable which will cause serious damage to the living environment. Activities such as transportation and storage should strictly follow the protocols prescribed the company law. Frequent auditing will help to prevent accidents which will lead to healthy work environment.

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#### AUTHORS PROFILE



**Dr. Rajesh Kanna** is currently working as Associate Professor, Dept. of Petroleum Engineering, AMET, Chennai. He has more than 8 years of experience both in India and abroad. Current area of research includes Data Mining, IoT, Automation, Enhanced Oil Recovery. Published more than 13 research articles indexed in Scopus and 16 articles in UGC Journal. Life member in SPE, SPG and AMI. Graduated with B.Tech, M.Tech and Ph.D from Anna University Trichy Campus, Anna University Chennai Campus and IIT Madras respectively. E-mail: [rajeshkanna.a@ametuniv.ac.in](mailto:rajeshkanna.a@ametuniv.ac.in); [petrorajesh@gmail.com](mailto:petrorajesh@gmail.com)



**Dr. S. Kalpana** is Associate professor in Physics Department at AMET, Chennai. Has more than 20 years of teaching experience. Research Interest includes: Petrochemicals, Nanoscience and IoT. E-mail: [Kalpanaphy@ametuniv.ac.in](mailto:Kalpanaphy@ametuniv.ac.in)



**Dr. Pushpa Sharma** is Distinguish professor in University of Petroleum and Energy Studies, Dept of Petroleum Engineering, Dehradun. She has more than 15 years of teaching experience and 15 years of Industry experience. Research Interest includes: Petroleum reservoir, Numerical modeling and HSE in Petroleum. E-mail: [arkanna1983@gmail.com](mailto:arkanna1983@gmail.com)