



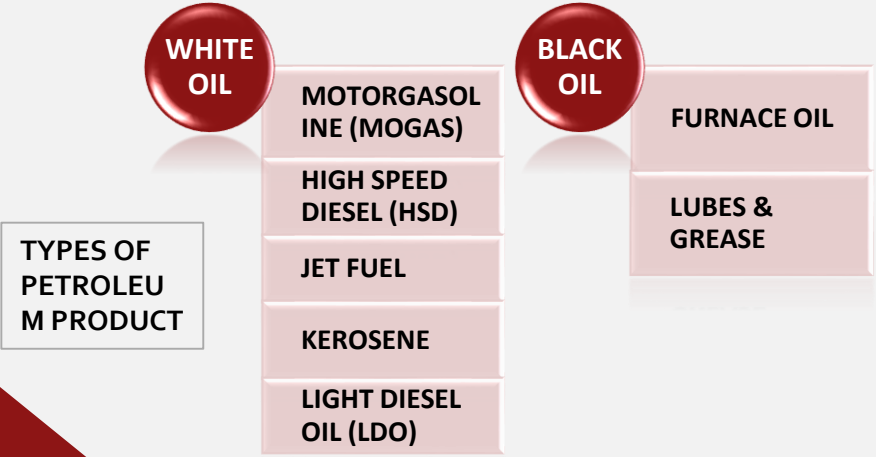
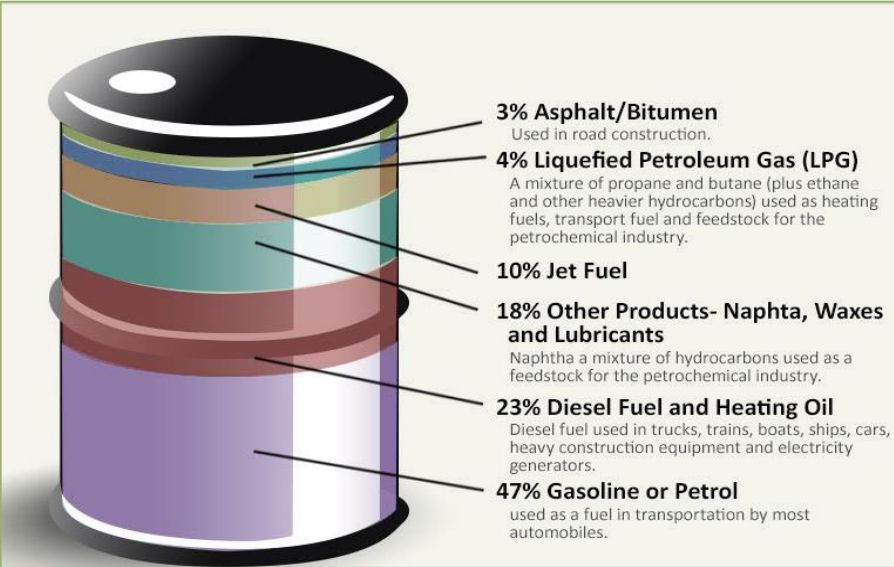
OIL | TRANSPORTATION

PIPELINE SYSTEM



OIL | PRODUCT OVERVIEW

- ❖ **Petroleum Products:** Produced from the processing of crude oil and other liquids at petroleum refineries.
- ❖ Petroleum refining or Oil refining is an industrial process in which crude oil is extracted from the ground and transformed and refined into useful products, A typical refinery produces a wide variety of different products from every barrel of crude oil that it processes
- ❖ Under the mix of petroleum products, most widely used, in terms of volumes are **High speed diesel (HSD), Motor gasoline (Mogas) and Furnace Oil (FO)**



Typical products made from 42-gallon barrel of crude oil

SUPPLY CHAIN

Refining
(Manufacturing and Product Imports)



REFINERY



REFINED PRODUCTS



Gathering Pipeline

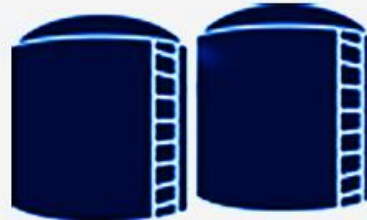


Distribution
(Transportation/Storage)

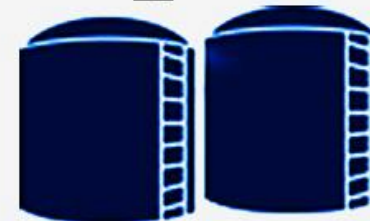
TRUCK, RAIL, MARINE



STORAGE



STORAGE



PRODUCT PIPELINE



RETAIL OUTLETS



FARMS



COMMERCIAL CONSUMERS



WHOLESALE DISTRIBUTOR



LICENSED IMPORTERS

HISTORY OF OIL TRANSPORTATION

- In 1860s. Oil had to be transported to refineries across quite a distance, so the railroad system was used extensively.
- First method of transporting drilled oil to rail stations was in wooden barrels on horse and/or donkey drawn carts. Later on simple wooden pipelines were used that brought the crude oil to the stations. As the demand for oil increased, iron and eventually steel pipelines were constructed to speed up the process.
- Later on, tanker trucks were used extensively to transport oil to refineries. Field storage tanks on raised platforms were built at the well site and visited periodically by tanker trucks.
- Eventually, the tanker truck transport system reached its capacity limits and long-distance pipeline systems were considered. At first pipeline transportation was viewed as too unpredictable, with high risks of clogging the pipes in case of lower temperatures. This was avoided by burying the pipeline into the ground, but this increases the construction costs. Finally a solution came along in diluting the crude oil by a natural gas condensate.
- Pipelines are currently considered as the most economical way of transporting large quantities of oil across land.



Pipeline in early ages

MODES OF TRANSPORTATION

PRIMARY METHODS

PIPELINES

- Most commonly used form of oil transportation, which include natural gas, biofuels, and liquid petroleum.
- Makes use of less energy than trains and trucks.
- Safer and cost efficient way to transport petroleum products
- The product gets delivered to storage tanks and other destinations where it will then be trans-shipped to other regions and markets through different vehicles.



SHIPS / VESSELS, TANKERS BY SEA

- There are barges moving oil inland by the rivers too and through the seas and oceans all the way to designated refineries around the world.
- High volumes transported in a single trip thus, largely cuts down costs of moving oil from one point to another.



TANKERS

- Commonly used for transporting smaller amounts of oil from remote regions to where it is needed.
- Better outreach to destination as compared to pipeline and ships.



RAIL TRANSPORT

- Relatively small capital costs and construction period make rail transport an alternative to pipelines for long distance shipping. However speed, carbon emissions and accidents are some significant drawbacks to rail transport.



OIL | MAJOR TRANSPORTATION MEDIUMS

Liquid Cargo

Liquid bulk's are used as carriers for transporting petrochemicals including refined products. Pakistan's Seaborne trade through liquid bulk was 34mln.M,T in 2018

Road Tankers

At present, a fleet of approximately total tankers in the country were 12,000 while the number of containers amounted to 30,000. The tankers are regulated by OGRA whereas the containers do not fall into its ambit.

Oil Pipeline Network

Pakistan has a total oil pipeline network of 2,576km and 1,087 km of refined product pipeline

- ❖ Road transport accounts for 59% of the cumulative movement of petroleum, oil and lubricant products, pipeline's share is 37.7% and use of railways for refined products stand at 3.6%.
- ❖ Pakistan's energy/fuel sector is import dependent which is catered by seaborne trade.
- ❖ Seaborne activity is essential part of petroleum trading segment - as around ~70% of oil demand is fulfilled through imports.
- ❖ Introduction of White Oil Pipeline in the country in 2004, eliminated 4000 tanker trucks for HSD distribution since then.
- ❖ Furnace Oil (FO) is mainly imported in Pakistan, around 60% to 70%, that is catered through liquid cargos. For intercity transport, railway network is used. However, from the last quarter of 2017 GoP imposed a ban on import of furnace oil which eventually curtailed the railway oil cargo transport.
- ❖ The demand for tankers will continue as pipeline has limited reach to all destinations
- ❖ The road tankers are subjected to high safety standards & regulations
- ❖ At present, the entire country's demand of Mogas is fulfilled through oil tankers by road, which is considered an unsafe mode.

PIPELINE SYSTEM



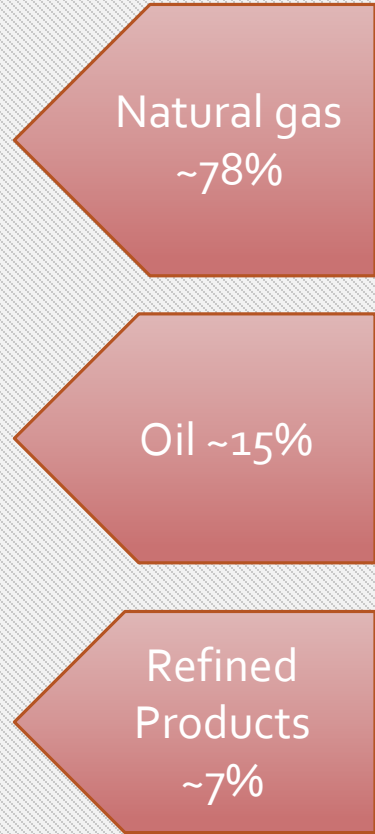
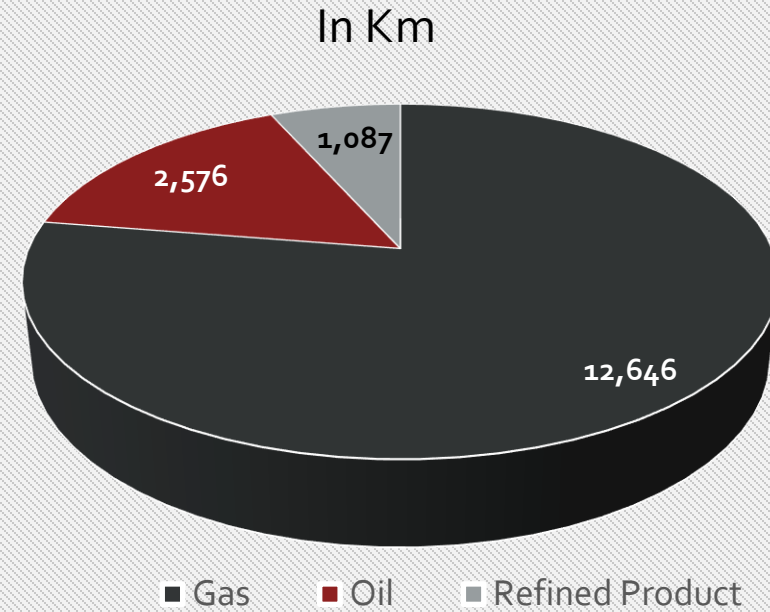
Pipelines are usually underground, that transport and distribute fluids. In an energy context, the fluids are usually either oil products and natural gas.

- ❖ Petroleum pipelines are generally used to transport crude oil, petroleum products and natural gas liquids.
- ❖ There are two main types of petroleum pipelines involved in this process: gathering pipelines and transportation pipelines
- ❖ Gathering pipeline are smaller interconnected pipelines, with the purpose of bringing crude oil or natural gas from several nearby wells to a processing facility.
- ❖ Once the petroleum is processed into products such as gasoline or kerosene, it is transported via the transportation pipeline systems to storage or deposit points.



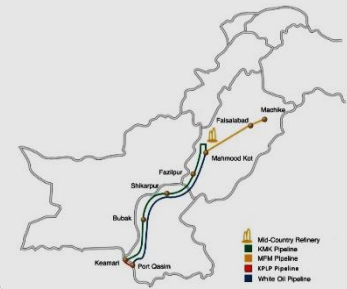
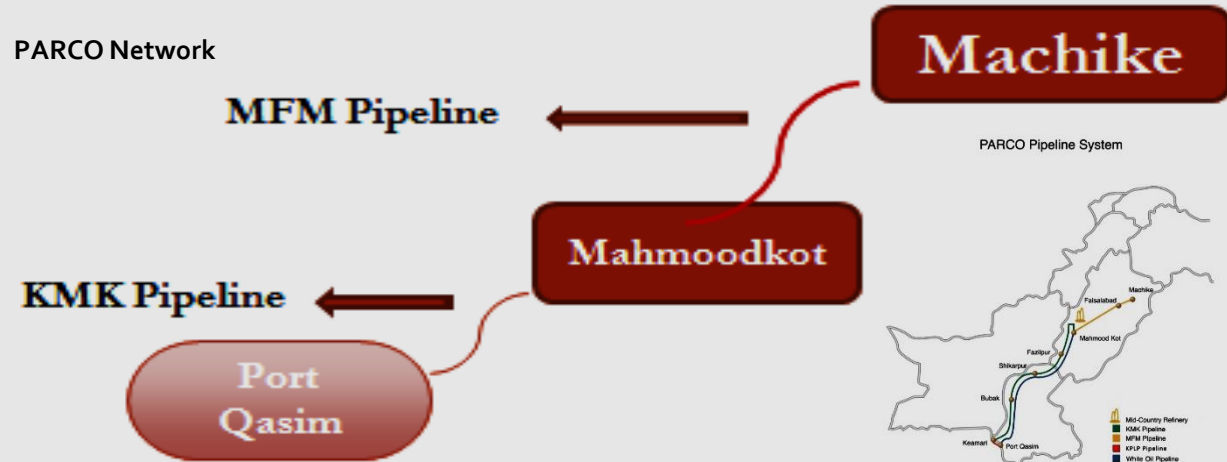
DOMESTIC PIPELINE NETWORK

- ❖ Pakistan's entire pipeline network is bifurcated in three segments Oil, Gas & Refined products.
- ❖ In country's total oil & refined product pipeline, PARCO and PAPCO, collectively takes up the share of ~57% .
- ❖ Out of the total refined product line (1,087km) Pak Arab Pipeline Company - PAPCO, a joint venture between PARCO, Shell, PSO and Total Parco, owns 786km main pipeline system (~72%).

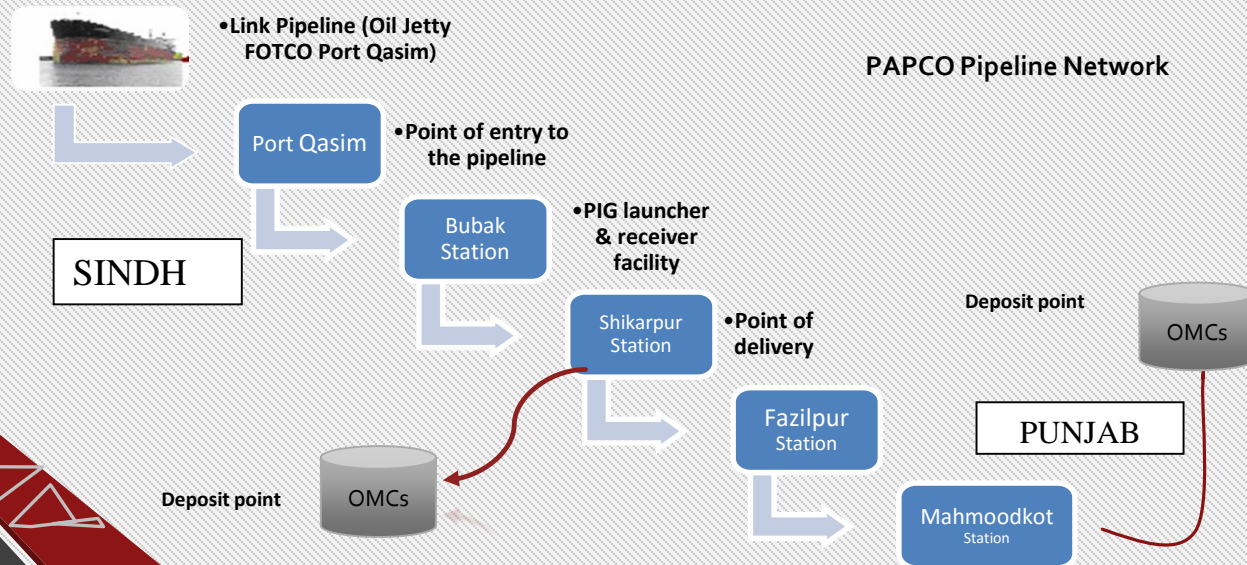


OIL PIPELINE NETWORK | PAKISTAN

PARCO Network



PAPCO Pipeline Network

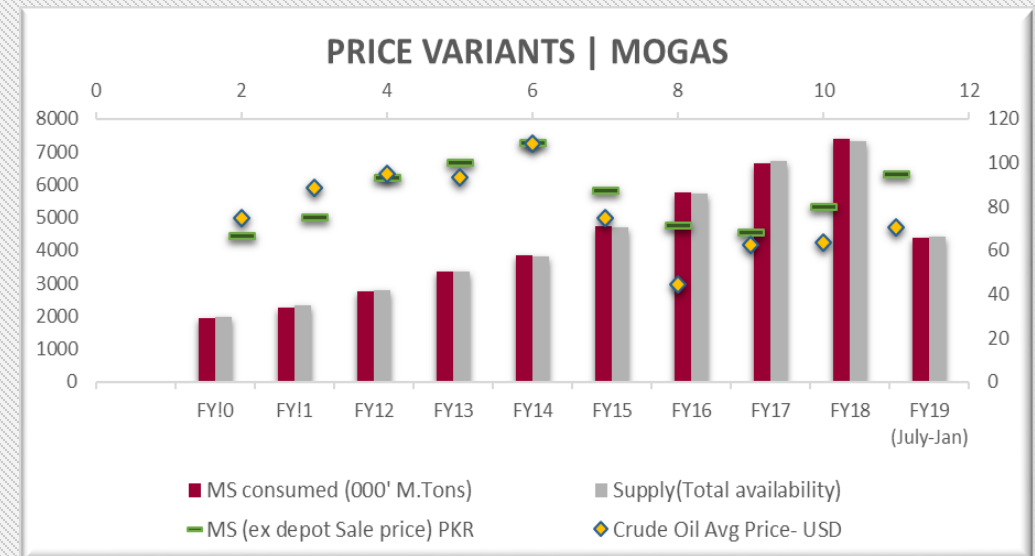


- ❖ **PARCO** has 870-km Karachi-Mahmoodkot (KMK) Pipeline, commissioned in 1981, to transports crude from Karachi to Mahmoodkot near Multan
- ❖ PARCO another commissioned pipeline of 362-km, Mahmoodkot-Faisalabad-Machhike (MFM) Pipeline, in 1997 to transport refined products like diesel and kerosene to Faisalabad and Machhike near Lahore.
- ❖ **White Oil Pipeline (WOP):** In Pakistan, there is one exclusive refined product pipeline known as White Oil Pipeline (WOP), connecting Karachi with Mahmood Kot in South Punjab, is owned and operated by Pak Arab Pipeline Company-PAPCO.
- ❖ WOP has capacity of 12mln tons for HSD and MOGAS supplies Entire Pipeline is placed underground.
- ❖ The network has two delivery depot stations; Shikarpur and Mahmood Kot
- ❖ White oil Pipeline is currently dedicated to transporting HSD upcountry from Karachi port
- ❖ The existing white oil pipeline will be upgraded to multi-grade pipeline by the year 2019 as a carrier for both HSD and MOGAS.
- ❖ Lastly, to transport Residual Furnace oil, an 82 km pipeline exists, owned by Asia Petroleum Limited (APL), from Pipri Terminal Sindh through the outskirts of Karachi and terminating at HUBCO on the Arabian seacoast of Hub in the Balochistan

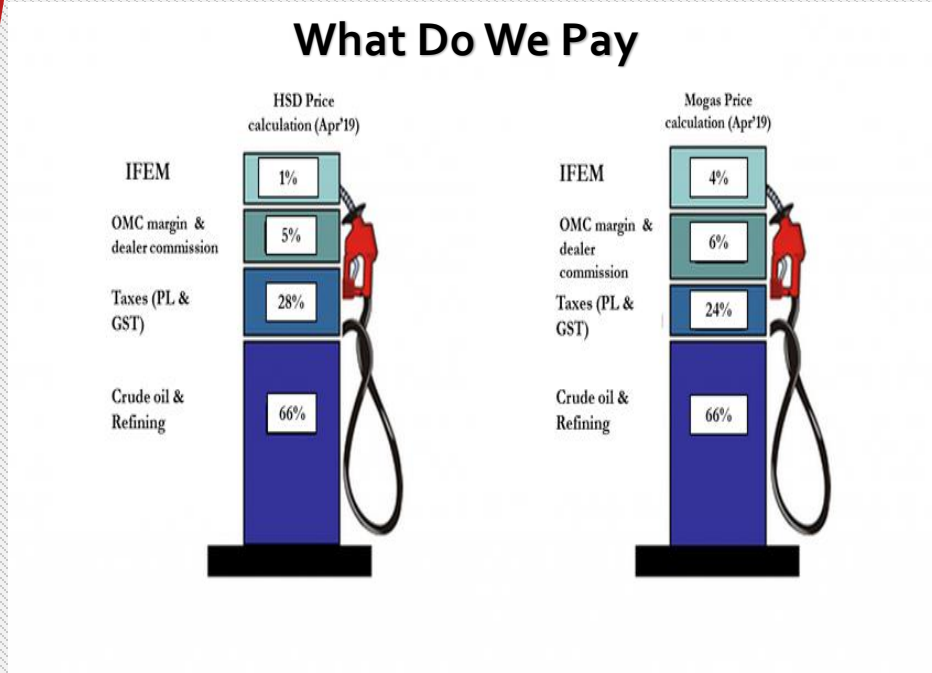
OIL | PRICE VARIANTS

- ❖ The oil industry is full of economic booms and busts. In 2014-2016, the industry suffered a downturn, and the price of crude oil dropped significantly. Major attributing factors were oversupply situation and declining demand as the economies of Europe and developing countries were weakening.
- ❖ Crude oil is the benchmark for commodity pricing, hence the price movement in HSD, MOGAS and FO are also variant to international crude prices.
- ❖ The rising demand of transport sector in Pakistan led the increase in HSD and MOGAS consumption from 2016 onwards, while 2019 has turned to be an omen for the sector Rupee devaluation, ban on non-filers, slowdown in economic activity and significant price hike impaired the purchasing power and eventually the demand for HSD & Mogas.
- ❖ Demand for furnace oil is translated from power sector, which is an expensive source of energy. In view to reduce the import bill and high FO prices, GoP imposed a ban on its import from Dec'17 onwards. In later years, the decision over the ban continue to be volatile, whereas at present the Govt. has lifted the ban to cater the power requirements.
- ❖ The instability phase in the international market has subdued in 2018-2019 and the prices have recovered.

Ex-Depot Prices Pattern							
White oil	Apr-14	Apr-15	Apr-16	Apr-17	Apr-18	Apr-19	Rs/litre
MOGAS	108.31	74.29	64.77	74	86	98.8	
HSD	113.85	83.61	72.5	83	96.45	117.43	
Black Oil	Dec-14	Apr-15	Apr-16	Apr-17	Apr-18	Apr-19	USD/M.T
FO	341.1	326.4	173.94	300.94	384.85	419.5	



OIL | PRICING ANALYSIS



- ❖ On Avg, estimated price for transporting oil through tankers is Rs 3000 per ton for a distance of 1,250km.
- ❖ The price for transporting HSD through white oil pipeline is ~30% cheaper and has delivered PKR 100b saving to the consumer of Pakistan in 11 years' time.
- ❖ Current, freight charges of road transport for Mogas is PKR 5.2/litre which will be reduced by PKR 2/litre when multi-grade white oil pipeline is functional
- ❖ White oil pipeline has been awarded with a set tariff, determined by OGRA, hence not variant to market volatility giving added edge to the company..
- ❖ The expected commissioning of MOGAS upgrading project will further bring savings to the country's consumer
- ❖ In terms of Furnace oil, Govt. has directed PSO, since it is the sole furnace oil supplier to all Independent Power Projects (IPPs), to use railway infrastructure for fuel transportation as it offers up to 26% lower fares compared to transportation through a pipeline and road.

Applicable IFEM rates are notified on the OGRA website every month

- Ex-Depot sale price Includes:**
- IFEM
 - Dealers commission
 - OMCs Margin
 - Petroleum Levy
 - Sales Tax

- Inland Freight Equalization Margin (IFEM):**
- ❖ IFEM is the cost of inland movement incurred by
 - (i) A refinery for transportation of crude oil from source to refinery
 - (ii) by an oil marketing company for transportation of finished product from supply point to depots in the country.
 - ❖ Purpose of IFEM is to maintain the same prices of Motor Gasoline (Petrol), High Speed Diesel Oil (Diesel), Light Diesel Oil (LDO) and Kerosene Oil across the country

OUTLOOK

- +Safer, and cost efficient alternate option
- +Rising trend in eco friendly medium of business
- + Reduced chances of spillage as compared to tankers
- +Swift delivery of the products
- Huge initial investment requirement
- Political interference
- Decline in HSD & restricted growth in MOGAS demand

OPPORTUNITY

MACHIKE TARU JABBA OIL PIPELINE PROJECT (MTOPP)

A new white oil pipeline project is under its way. A 427-kilometer Machike-Tarujabba oil pipeline, from Sheikhupura to Peshawar will be laid to transport high speed diesel and motor spirit across the country. The project is an advance stage and will be undertaken by Frontier Oil Company

At present the north country's demand is fulfilled through trucks and oil tankers



GLOBAL | OIL PIPELINE NETWORK

GLOBAL PIPELINE NETWORKS | OVERVIEW



The US has the largest network of energy pipelines in the world with 240,711 km (149,570 miles) in petroleum products.



In the list of world's largest pipeline network, Russia takes the second place. It has 80,820km oil pipeline



China has the third largest pipeline network with 26,200km of oil pipeline and 25,500 km of refined product pipeline



India's pipeline network include 8,943km of oil pipeline and 11,069km of refined product pipeline

REGIONAL MARKET | Snapshot

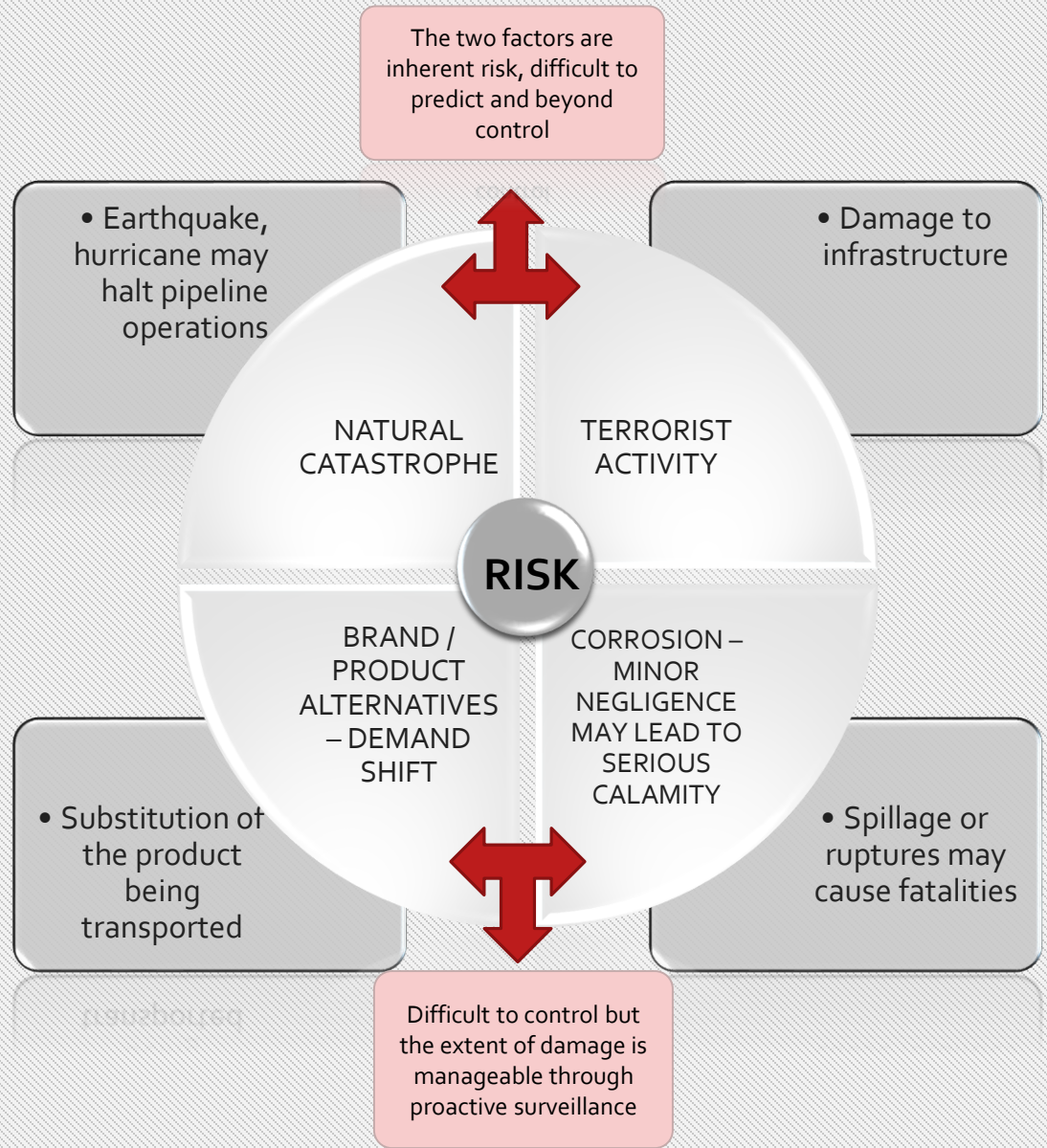
- ❖ The world has a total length of 3,500,323km pipeline network constructed by 120 nations.. The top two countries, USA & Russia, constitute around 73% of the total pipeline length.
- ❖ USA is the world's top oil producing country. It has the largest Oil & Gas pipeline network.
- ❖ After USA, Russia and China are among the top five largest oil producing countries. China surpassed USA to become the largest importer of crude oil in 2017.
- ❖ India is the net importer of oil therefore has prominence in the pipeline network. India and Bangladesh have also entered into a cross-country pipeline project for the construction, in later 2018, of 136-km pipeline for diesel transportation with a capacity of 1 million tonne

ENERGY DISASTERS

- ❖ Fuel is an essential source of energy for industrial sectors of any country, but logistical problems are a concern. As the product is highly inflammable, minor mishandling can cause serious damages.
- ❖ Around the globe, tanker collision /explosion accidents or oil spillage are not unusual anymore, such as **Sanchi oil tanker collision (2018)** and **Atlantic Empress Oil Spill (1979)**. Hence, diverting the worldly forces to focus towards safer and cheaper mode of Oil transportation i.e. pipeline.
- ❖ In 2017, a national tragedy occurred in the history of **Pakistan** when an oil tanker caught an explosion accident leaving more than 200 people dead. After this instance Oil & Gas regulatory authority of Pakistan (OGRA) made stringent regulations for the oil tankers, however, the execution of such regulation is still hazy



RISK ATTRIBUTES



REGULATORS

REGULATORY BODY: Oil & Gas Regulatory Authority (OGRA)

Applicable Rules and Standards:

- Pakistan Petroleum Rules, 1937
- OGRA Ordinance, 2002
- OGRA technical standards/guidelines
- National Highway Safety Ordinance, 2000
- Motor Vehicles Ordinance, 1965 & Motor Vehicle Rules, 1969

Association for Road Transport:

- All Pakistan Oil Tankers Association

PAPCO – Member of:

- Oil Companies Advisory Council

INTERNATIONAL BODIES

- World Pipeline Association
- Association of Oil Pipeline – AOPL
- National Association of Pipeline safety Representative (NAPSR)
 - *Since US is the largest oil producer and has an overall longest pipeline network, major associations are US driven. .*
- Federal Energy Regulatory Commission

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