OIL | TRANSPORTATION

PIPELINE SYSTEM

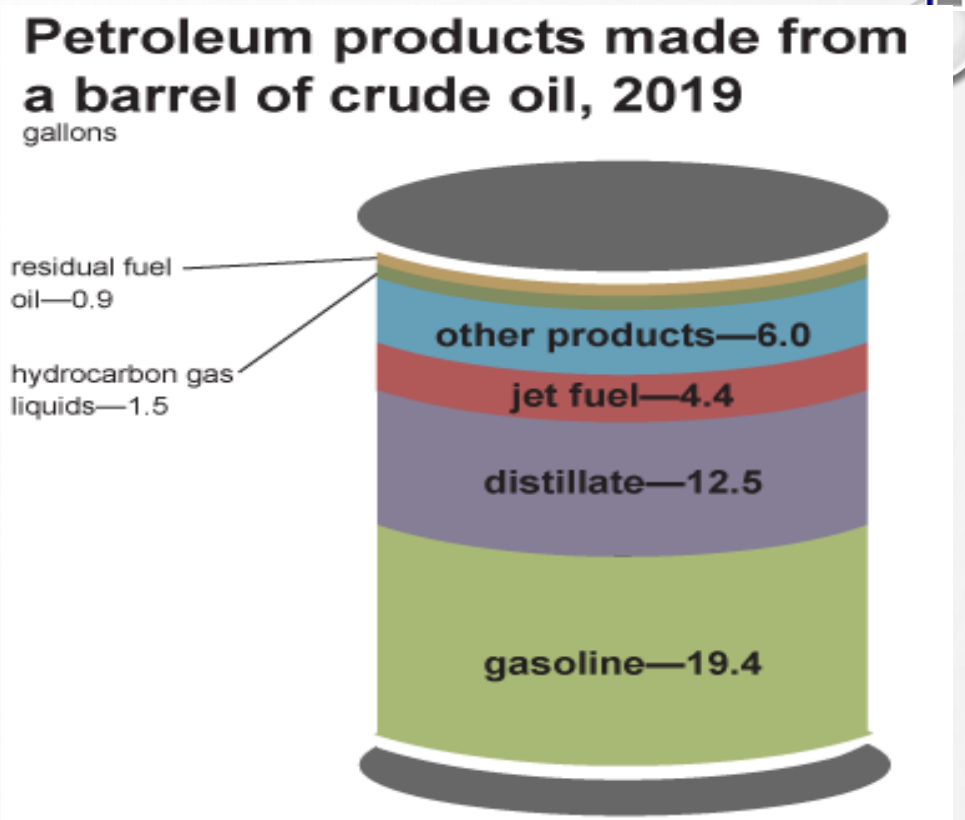
MAY 2020

OIL | PRODUCT OVERVIEW

- **Petroleum Products**: Produced from the processing of crude oil and other liquids at petroleum refineries.
- **Petroleum refining/Oil refining :** is an industrial process in which crude oil is extracted, 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 commonly used are:
  - **High speed diesel (HSD)**
  - **Motor gasoline (MOGAS)**

Common Petroleum Products

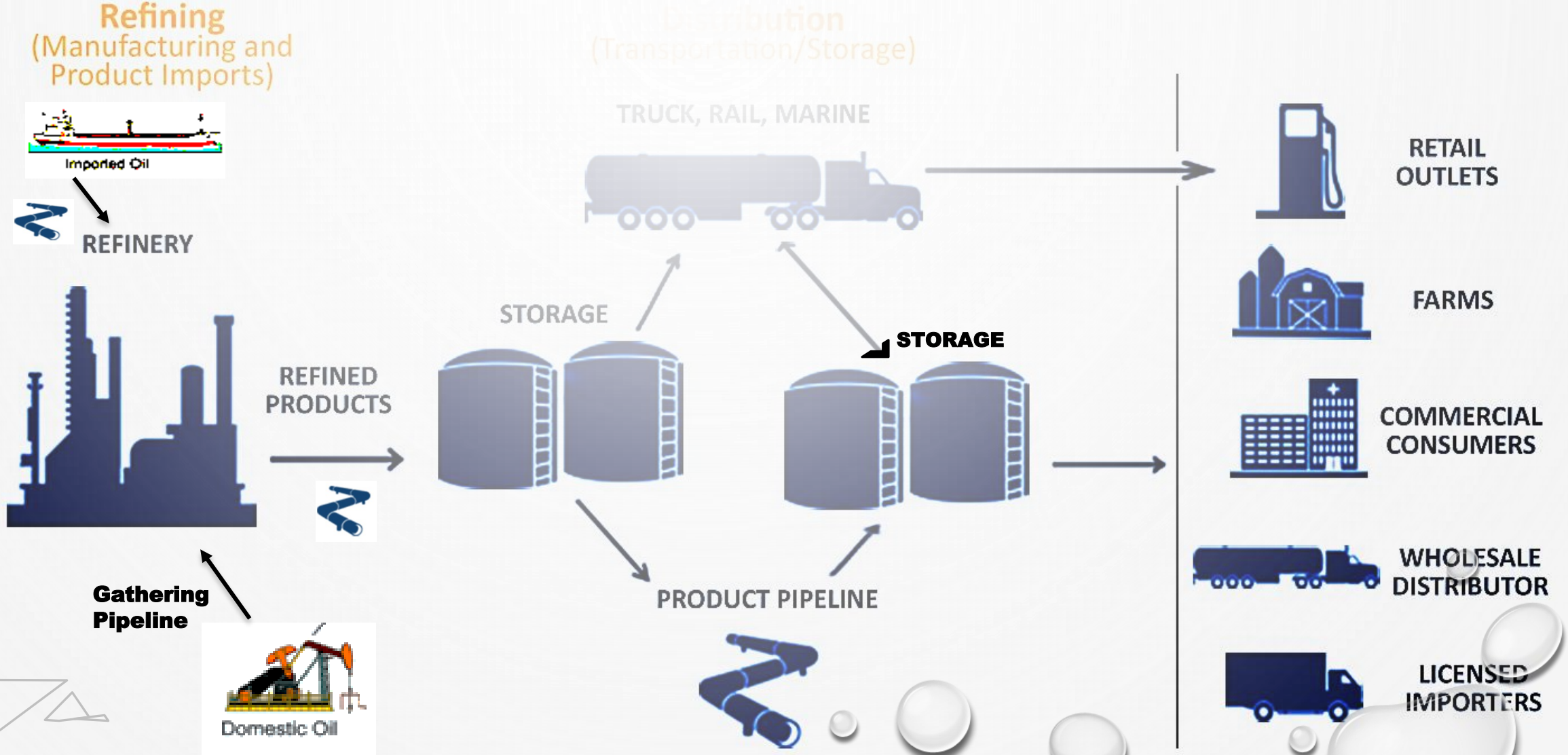
- Diesel
- Gasoline
- Jet Fuel
- Fuel Oil/Furnace Oil (FO)
- Asphalt & Bitumen
- Lubricants



Typical products of a 42-gallon of refined crude oil.

**Note: The mix may vary depending on the refining complex recipe.*
***distillate refers to diesel and fuel oil.*

OIL | SUPPLY CHAIN



MODES OF OIL TRANSPORTATION

PRIMARY METHODS

PIPELINES

It is the most commonly used form of oil transportation.

Makes use of less energy than trains and trucks.

Safer and cost efficient way to transport petroleum product.

The product gets delivered to storage tanks and other destinations where it is then trans-shipped to other regions and marketed 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

PIPELINE SYSTEM

- Pipelines are usually underground ~8-10 meters deep, that transport and distribute fluids. In an energy context, the fluids are usually either oil products or natural gas.
- Oil pipelines are made from steel or plastic tubes. The oil is moved through the pipelines by pump stations along the pipeline.
- Natural gas (and similar gaseous fuels) are lightly pressurized into liquids known as Natural Gas Liquids (NGLs) and are constructed using carbon steel.
- Heating/teleheating systems use a network of insulated pipes which transport heated water, pressurized hot water, or sometimes steam to the customer.
- 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..
  - ✓ **Transportation pipelines** are long pipelines with large diameter used to transport refined products from refineries to storage or deposit points

GLOBAL | OIL PIPELINE NETWORK

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

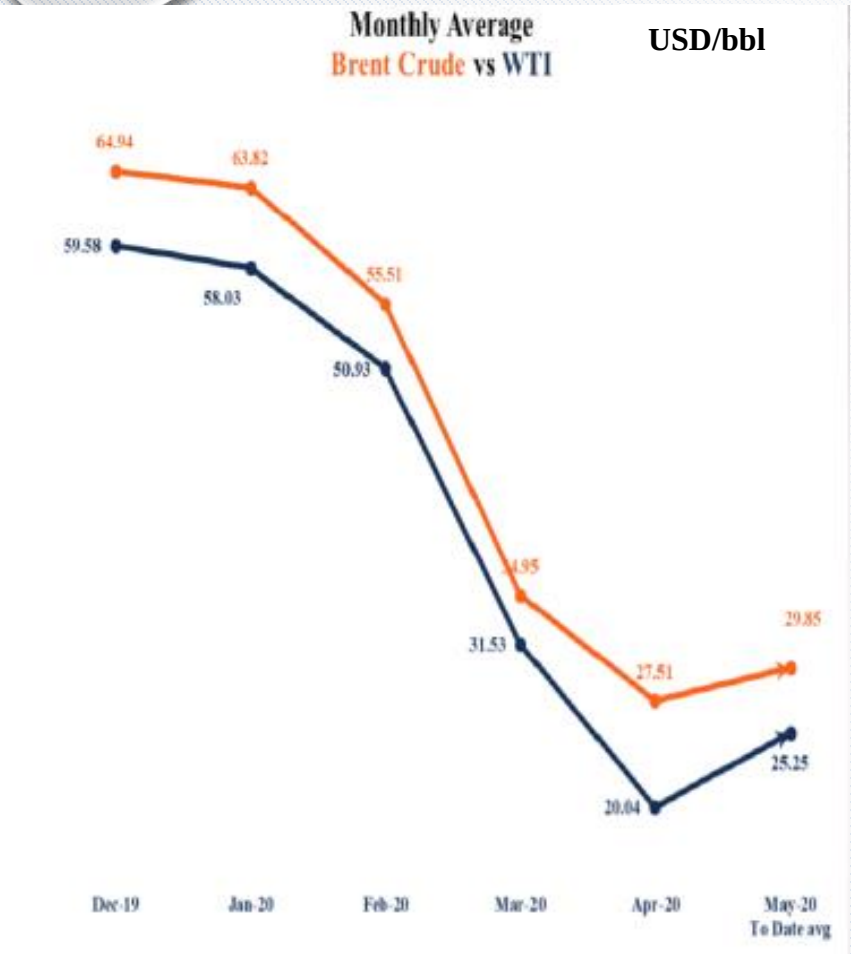
In the list of world's largest pipeline network, Russia takes the second place. It has 80,820km oil pipeline

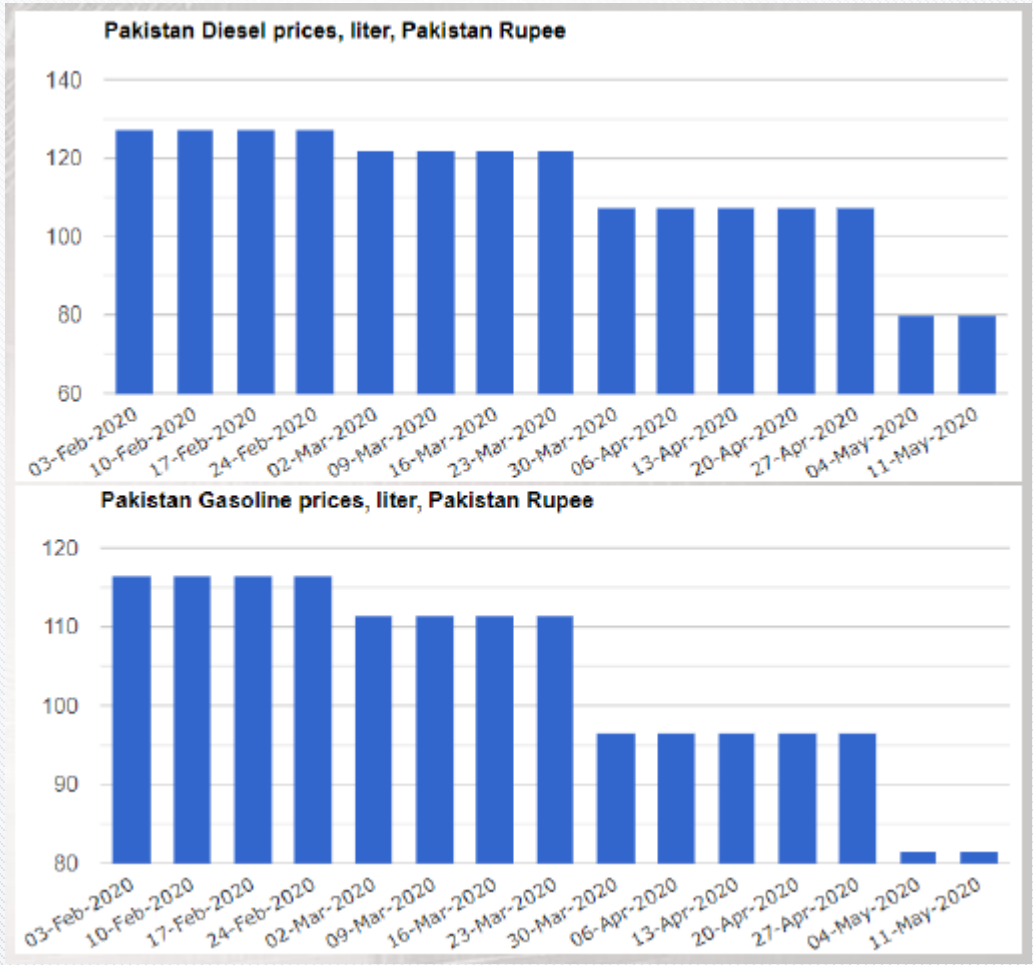
China has the third largest pipeline network with 26,200km of oil pipeline and 25,500 km of refined product pipeline

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

Pakistan has a network of ~3,663km oil pipeline, of which ~2,576km pertains to crude and ~1,087km pertains to refined products.

OIL | PRICE TREND





- Global Oil market has witnessed a historic distress in the 1QCY20 on account of the outbreak of Covid-19 pandemic.
- Crude and Petroleum Prices took a drastic dip with little or no demand coming from the major economies in1QCY20.
- Global prices are, however, now heading towards a stabilization trajectory as a consequence of production cuts by oil producing countries and gradual revival in demand.
- The country's pipeline networks also witnessed lower throughputs which are expected to recover in 2HCY20.

OIL | TRANSPORTATION | PAKISTAN

Liquid Cargo

- Liquid bulk's are used as carriers for transporting petrochemicals including refined products.
- Imports are mostly catered through seaborne trade.

Road Tankers

- Commonly used method for transportation of crude oil and refined products
- The tankers are regulated by the Oil & Gas Regulatory Authority (OGRA).

Oil Pipeline Network

- Long pipes with large diameter used to move products between cities, countries or continents
- Pakistan has a total oil pipeline network of 2,576km of which 1,087 km pertains to refined product pipeline

- Pakistan's petroleum products consumption comprised ~36% Imported HSD, ~70% imported Mogas and ~22% imported FO (FY19).
- Crude Oil is transported in the country through road as well as pipeline network.
- Currently, PAPCO (a subsidiary of PARCO) caters transportation of around ~45% of the Country HSD demand through its White Oil Pipeline (WOPP) (discussed in the coming sheets). The remaining share still lies with the road tanker Industry.
- 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.

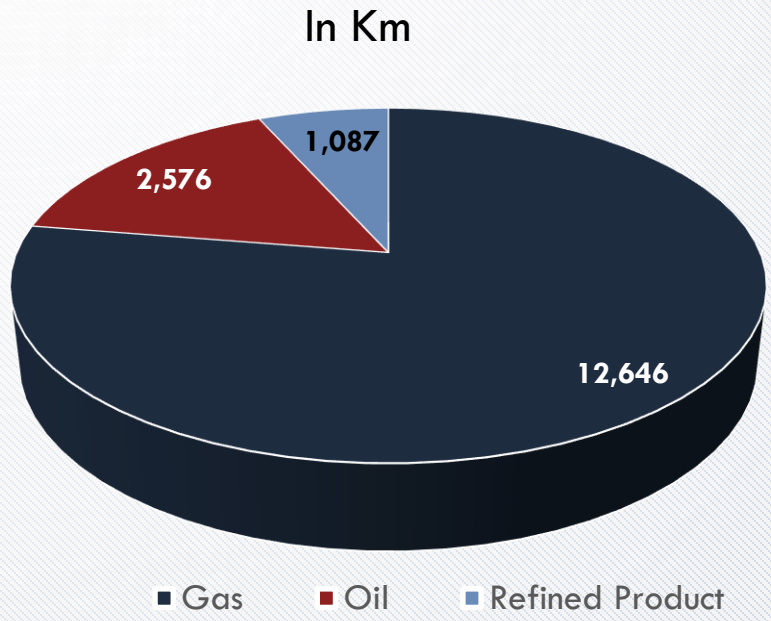
PAKISTAN

DOMESTIC PIPELINE NETWORK

- PAKISTAN'S PIPELINE NETWORK CAN BE BIFURCATED IN THREE SEGMENTS: ***NATURAL GAS, CRUDE & REFINED PRODUCTS.*** TOTAL PIPELINE NETWORK OF THE COUNTRY IS RECORDED AT APPROX. 16,309KMS.

- IN COUNTRY'S TOTAL OIL & REFINED PRODUCT PIPELINE, PARCO (INCLUDING PAPCO), COLLECTIVELY TAKES UP A 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%).

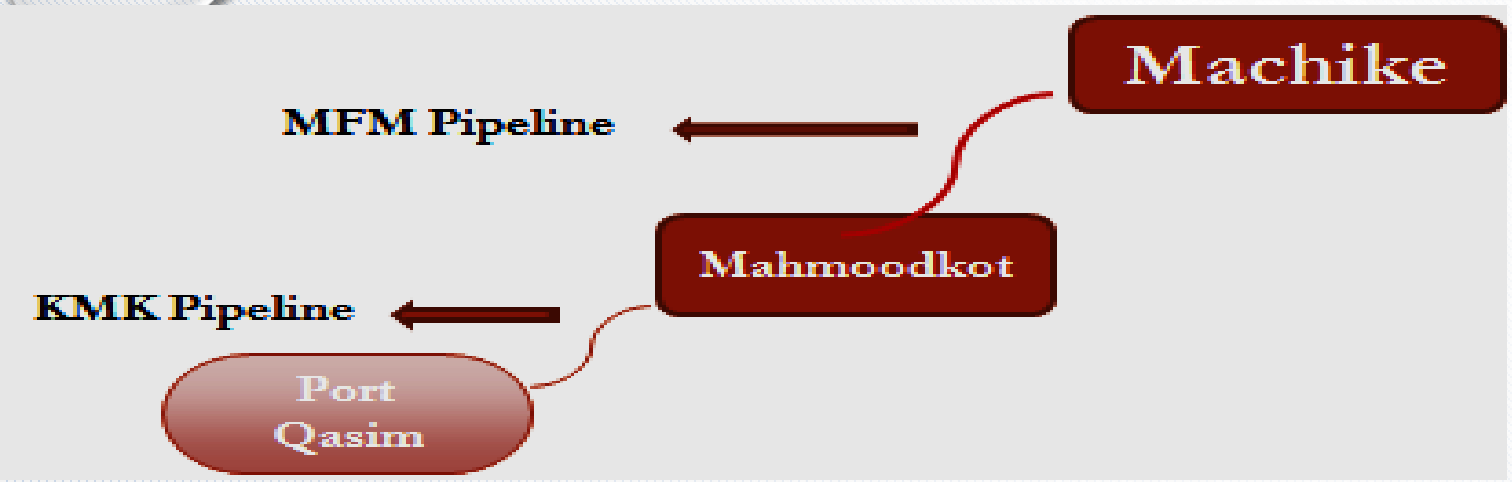


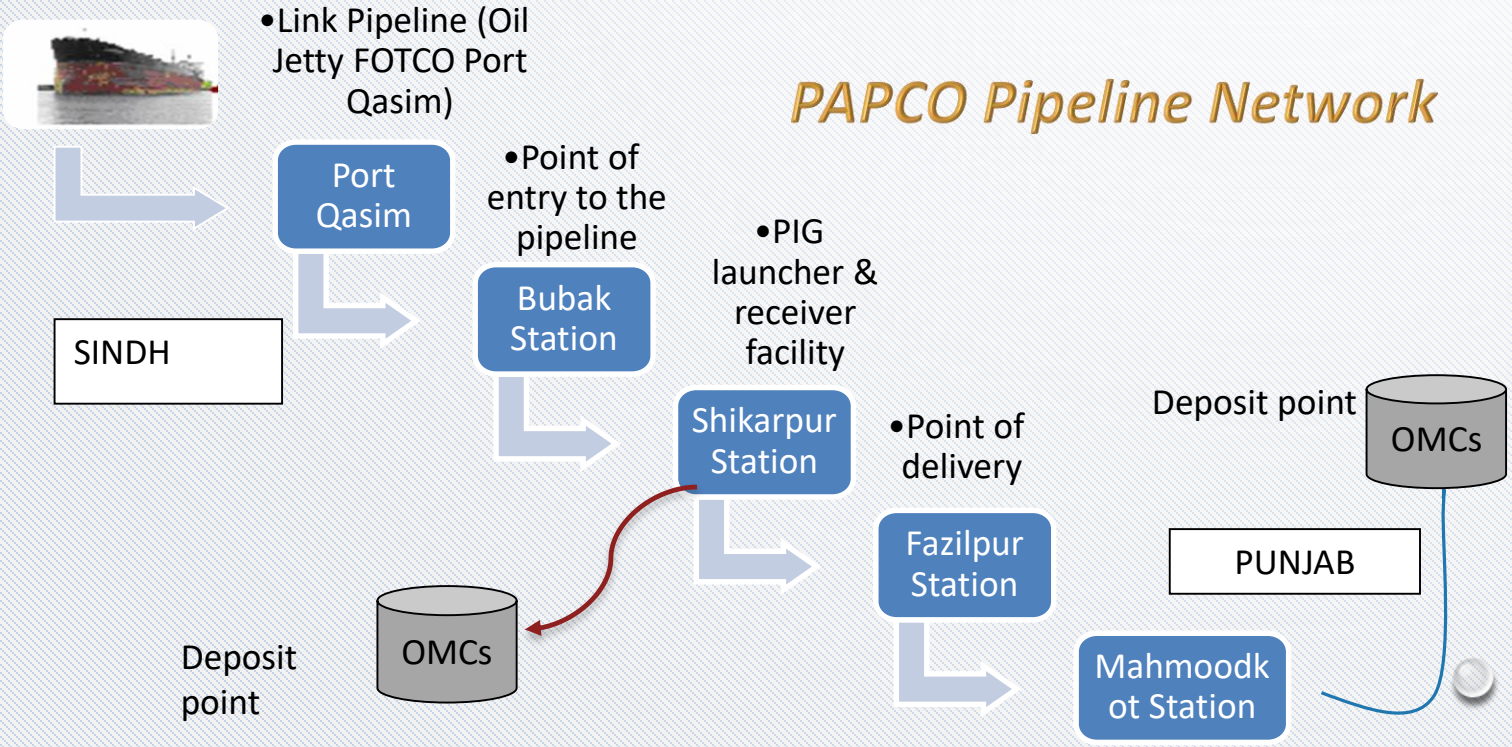
Natural gas ~78%

Oil ~15%

Refined Products ~7%

OIL PIPELINE NETWORK | PAKISTAN



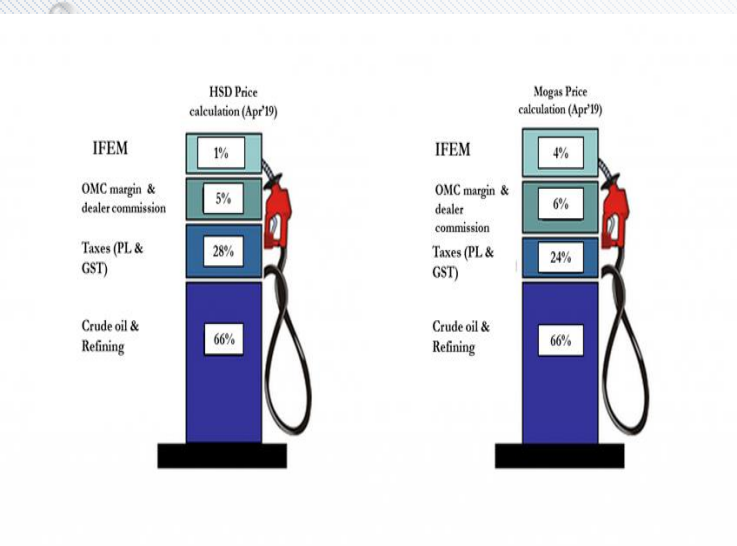


- **PARCO** has 870-km Karachi-Mahmoodkot (KMK) Pipeline, commissioned in 1981, to transport crude from Karachi to Mahmoodkot near Multan.
- PARCO commissioned another pipeline of 362-km, Mahmoodkot-Faisalabad – Machhike (MFM) Pipeline, in 1997 to transport refined products like diesel and kerosene from Mehmoodkot to Faisalabad and Machhike near Lahore.
- A strategic asset for Pakistan was developed and commissioned in 2005 by PARCO for transportation of refined products up country known as White Oil Pipeline (WOP), connecting Karachi with Mahmoodkot in South Punjab. The WOP is operated through PARCO's subsidiary – PAPCO.
- WOP has a capacity for transportation of 12mln tons of HSD and MOGAS. The pipeline is placed underground.
- The network has two delivery depot stations; Shikarpur and Mahmoodkot
- White oil Pipeline is currently dedicated to transporting HSD upcountry from Karachi port, while upgradation for transportation of MOGAS through the pipeline is at an advanced stage.

OIL | PRICING ANALYSIS

PAKISTAN

What Do We Pay



HSD Tariff	Karachi-Mahmoodkot	Karachi-Shikarpur
Period	US $/Ton (Payable in Pak Rs.)	US $/Ton (Payable in Pak Rs.)
1st Five Years Period	15.889	10.068
2nd Five Years Period	15.342	9.770
3rd Five Years Period	13.252	8.476
4th Five Years Period	10.416	6.884
5th Five Years Period	9.670	6.387

MOGAS Tariff	Tariff (USD/MT)
Karachi-Shikarpur	6.43
Karachi-Mahmoodkot	11.27

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

EXPANSIONS

MOTOR GASOLINE PROJECT (MOGAS)

THE EXISTING WHITE OIL PIPELINE IS IN THE PROCESS OF UPGRADATION TO MULTI-GRADE PIPELINE

ARRANGEMENTS HAVE ALREADY BEEN MADE TO TRANSPORT MOGAS VIA ITS EXISTING WHITE OIL PIPELINE IN NEAR FUTURE WHICH WAS TRIGGERED BY DEMAND OF MOTOR GASOLINE (MOGAS) IN THE UPCOUNTRY REGION, THOUGH, THE FEASIBILITY REMAINS DEPENDENT ON DEMAND OF MOGAS, WHICH IS CURRENTLY SIGNIFICANTLY SUBDUED.

THE SUGGESTED PROJECT WOULD REDUCE TRANSPORT COSTS AND INCREASE CAPACITY UTILIZATION OF WHITE OIL PIPELINE.

THE PROJECT WAS EXPECTED TO BE OPERATIONAL BY MAR'20 WHICH HAS NOW DELAYED TO LATER HALF OF THE YEAR OWING TO THE COVID-19 OUTBREAK AND CURRENT SITUATION OF THE COUNTRY.

PIPELINE NETWORKS

Benefits

Environment Friendly

Play a major contribution in protecting the environment through reducing road congestion by substituting thousands of tank lorries

Safety

With it much of the noise, fatalities and pollution on the surface, thefts and contamination of the product also become a thing of the past. It has also drastically reduced loss through damage and pilferage

Cost Effective

Pipeline transportation is much cost effective as compared to other mediums

Faster / Efficient

Along with being cheaper pipeline transportation is faster than road tanks.

PIPELINE NETWORKS

REGULATORY REGIME

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) .
- Federal Energy Regulatory Commission

- *Since US is the largest oil producer and has an overall longest pipeline network, major associations are US driven.*

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