



Al- mustaqbal university college
Department of chemical engineering and petroleum
industries

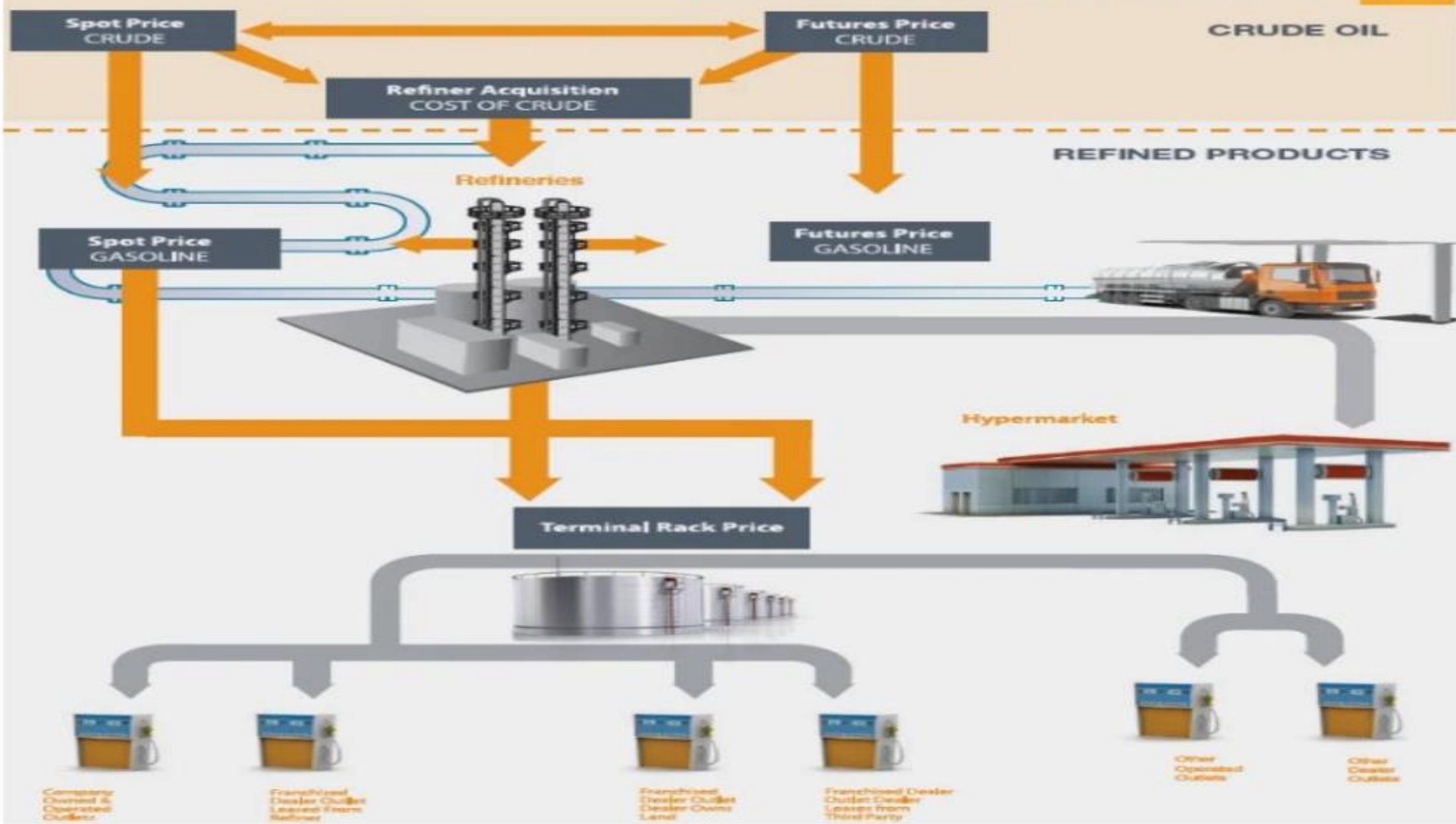


(STORAGE AND TRANSPORTATION OF PETROLEUM PRODUCTS)

M s c Sara Ibrahim m.

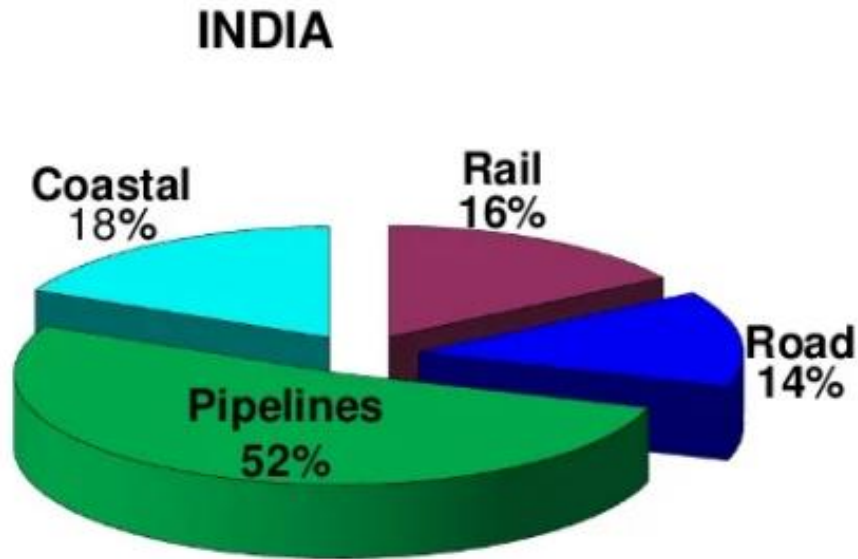
Lecture (4)

Crude Oil / Petroleum Product Transportation

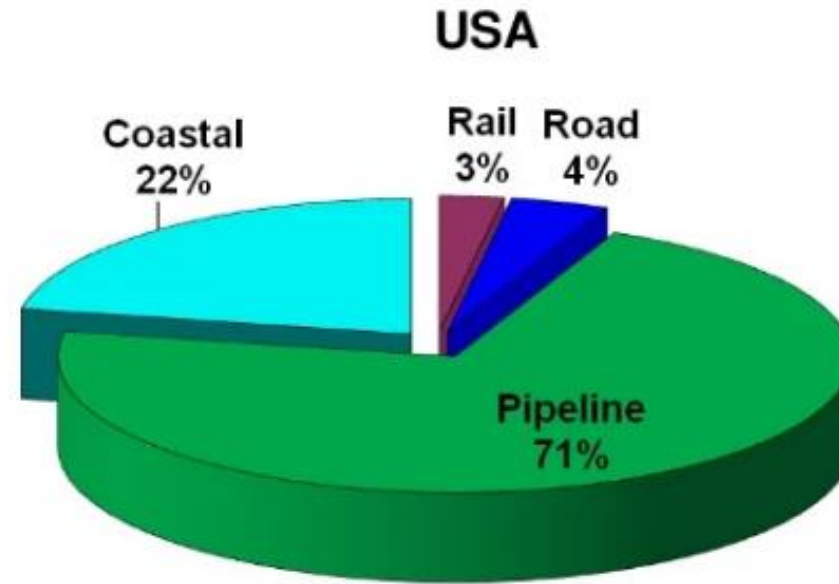


Mode wise transportation of Crude Oil and Petroleum Products.

Typical Mode Wise Transportation Crude Oil & Petroleum Products- Industry



* Source : PPAC



** Source : Association of Oil Pipelines,
http://www.aopl.org/pdf/Shift_Report_2008_FINAL1.pdf

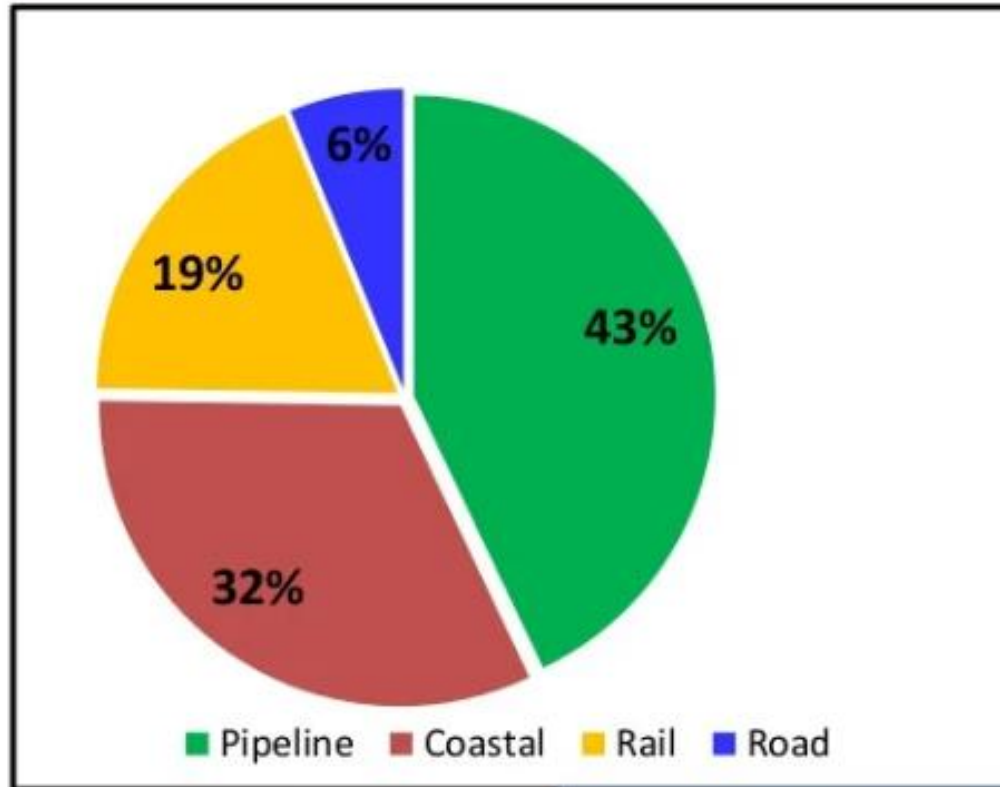
Haulage – MT-Km basis

Dependence on road and rail infrastructure is putting severe strain on these infrastructures.

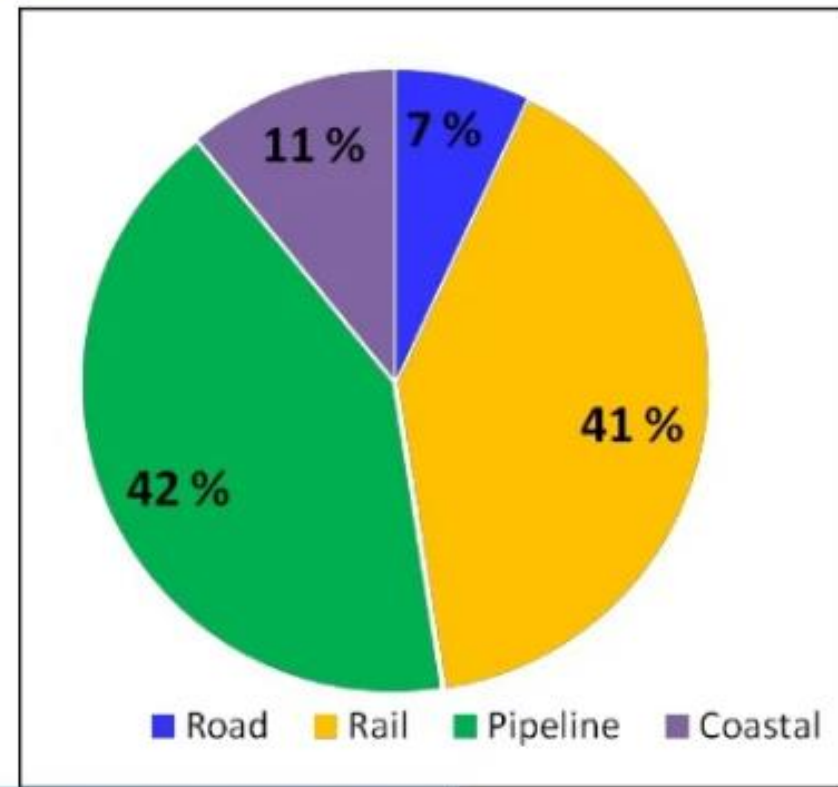
Inter-Modal Mix- Industry Vs. IOCL Petroleum products

Indian Oil Corporation
Limited

Present Transport Modal-Mix - **Industry**



Present Transport Modal-Mix - **IOCL**



Capacity (MMT) basis

CRUDE UNLOADING FROM TANKER



Tankers

OIL TRANSIT CHOKEPOINTS

About half of the world's oil production is moved by tankers on fixed maritime routes. The blockage of a chokepoint, even temporarily, can lead to substantial increases in energy costs



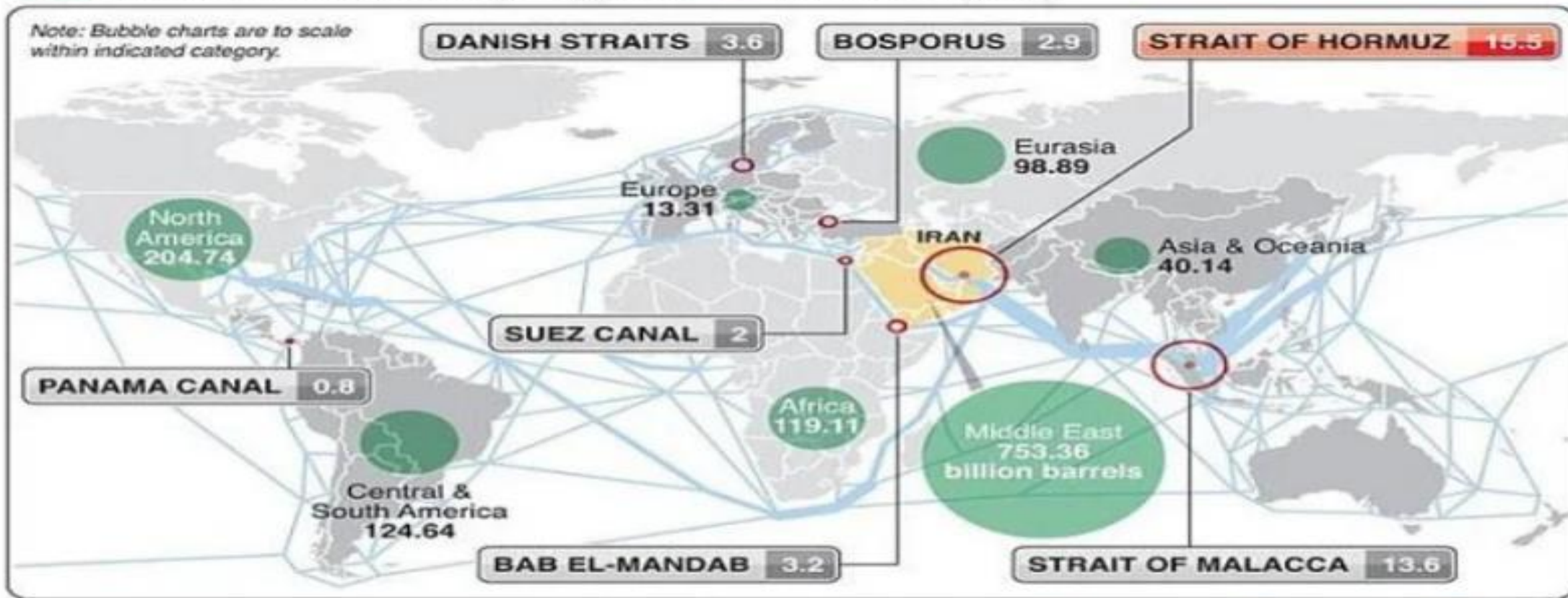
OIL TRANSIT CHOKEPOINTS

Million of barrels of oil moved per day, 2009



PROVED OIL RESERVES

Billion barrels (2010)



MAJOR OIL MOVEMENT – IN 2005, IN MILLION TONNES: — 1-100 — 101-200 — 201-300 — > 300

Jetty



Pipeline



Transportation Pipeline: Long pipe with large diameter, moving products (natural gas, petroleum products) between cities, countries, continents.

Pipeline Transportation

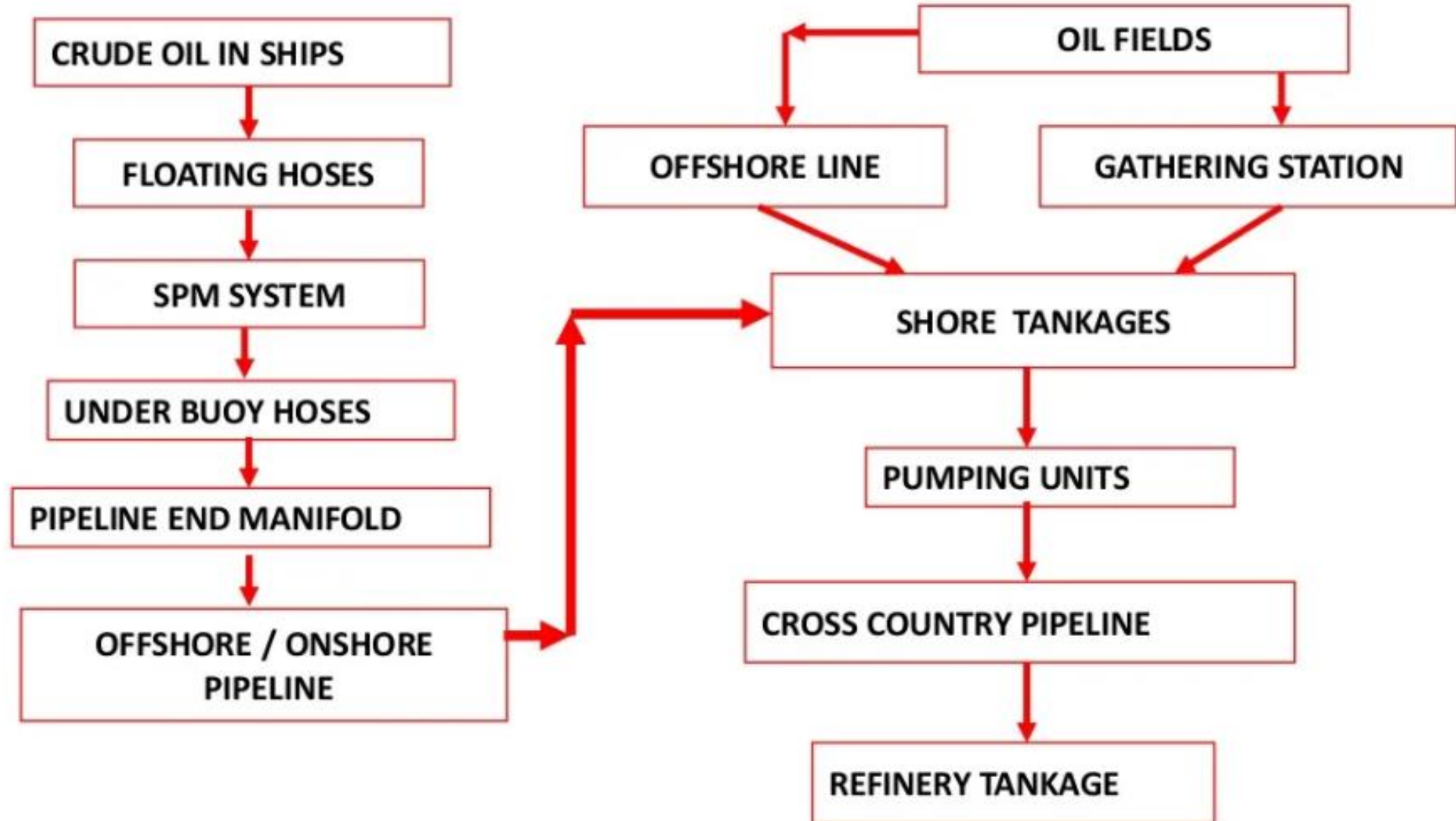
- ❑ **Transportation Pipeline:** Long pipe with large diameter, moving products (natural gas, petroleum products) between cities, countries, continents.
- ❑ Pipelines are owned by shippers or operating companies
- ❑ Land is owned by corporate, private (right-of-way) and public (federal, state, local)
- ❑ Material in pipeline is owned by the shipper.



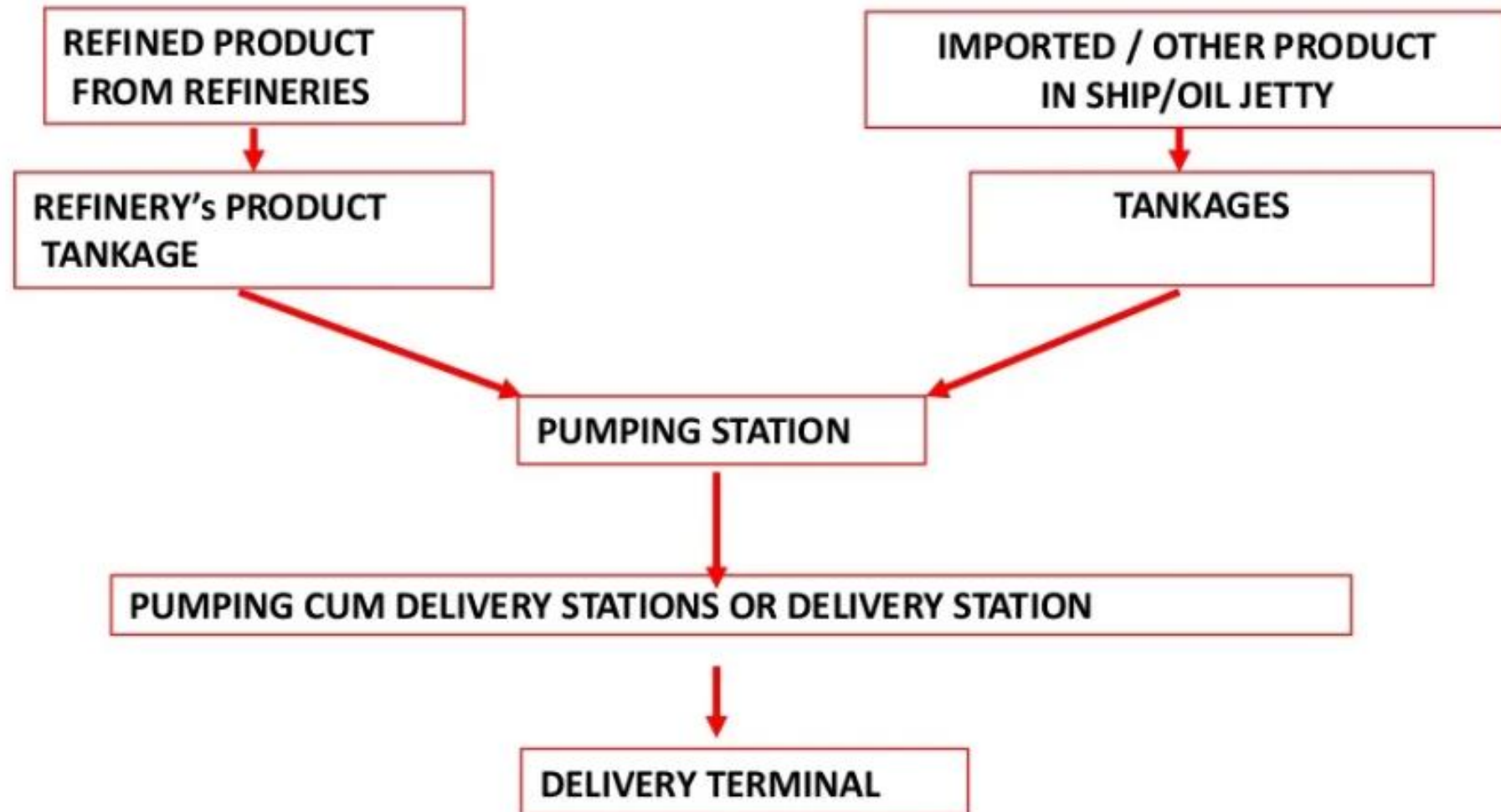
Pipelines System:

- **Crude Oil Transportation**
- **Gas Transportation**

Pipelines System: Crude Oil Transportation



Pipelines System: Product Transportation



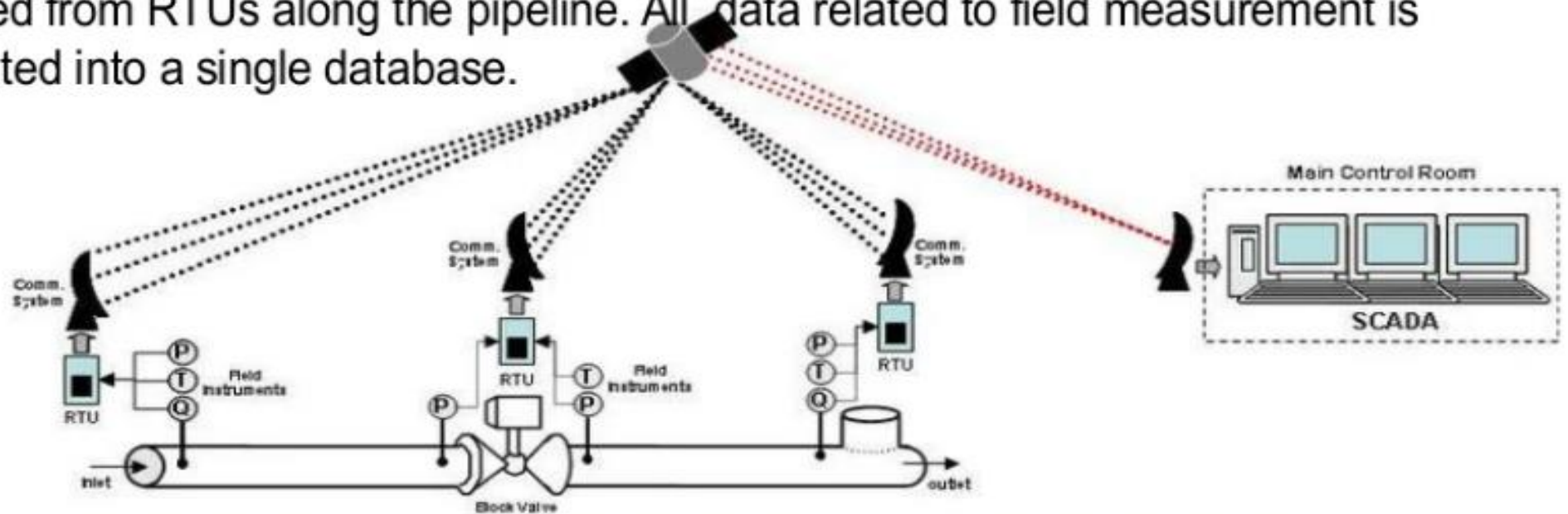
Transportation Pipeline Operation

Pipeline field devices include:

- *instrumentation,*
- *data gathering units and*
- *communication systems.*

Operating equipment is installed along the pipeline at specific locations such as injection or delivery stations, pump stations (liquid) or compressor stations (gas), and block valve stations.

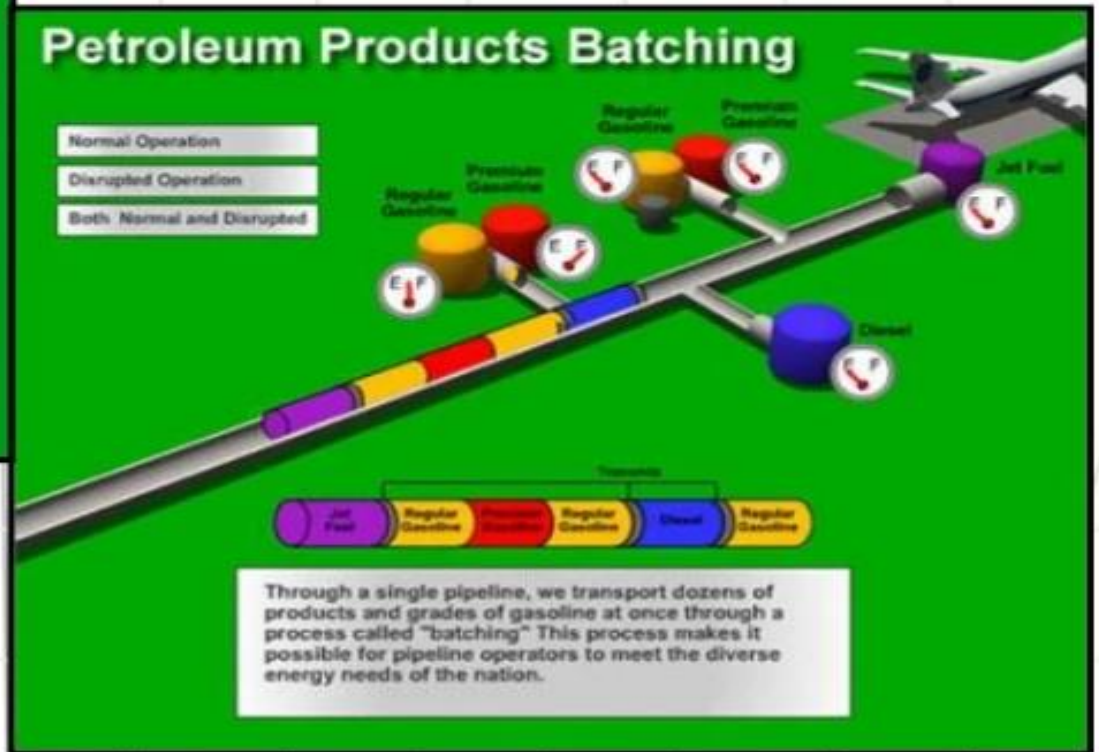
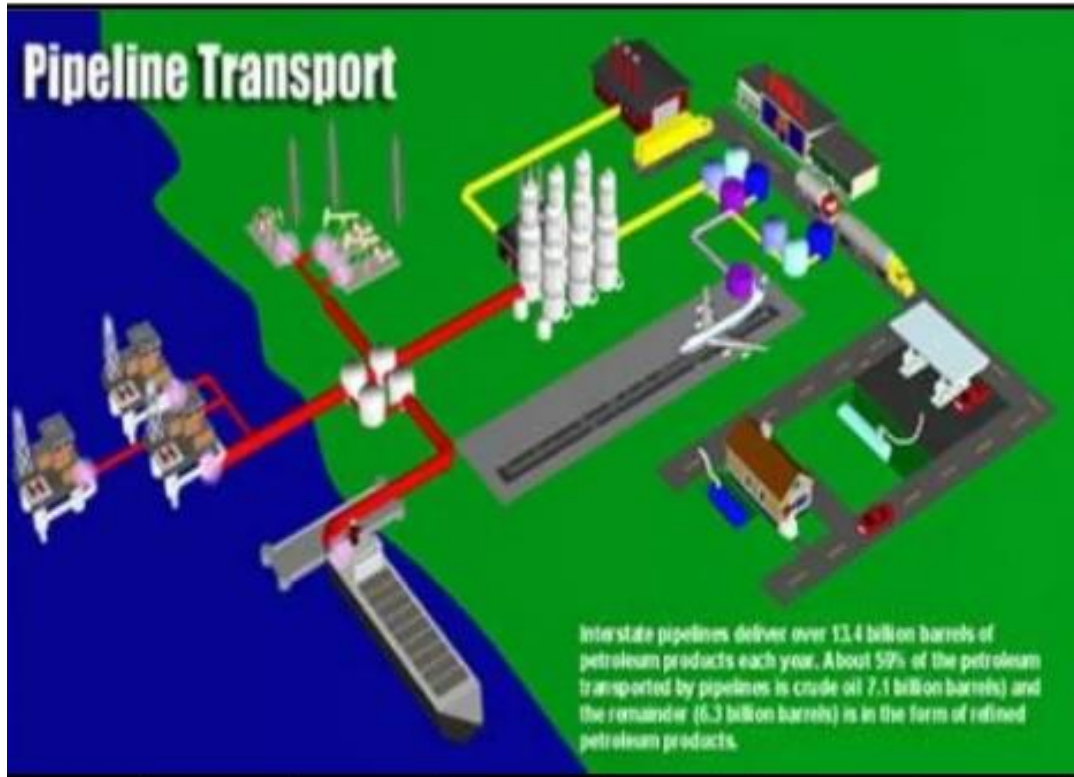
Pipelines are controlled remotely from a central control room. Pipeline operating data is transmitted from RTUs along the pipeline. All data related to field measurement is consolidated into a single database.



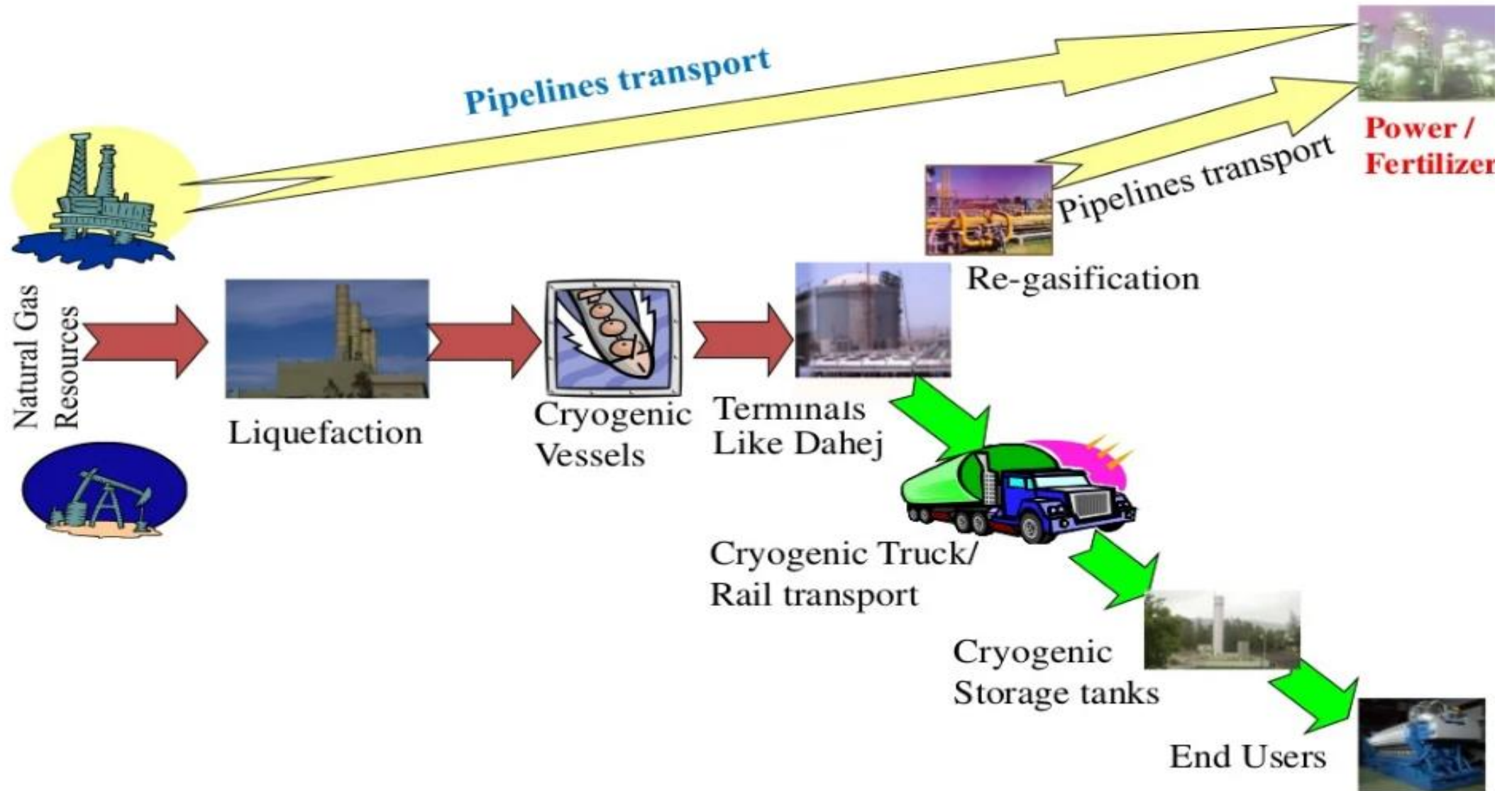
Petroleum Product Pipeline Information

- Liquid products move through pipelines at a rate of 3 – 8 miles per hour.
- Interstate pipelines deliver over 11.3 billion barrels of petroleum each year.
- 52% of the petroleum transported by pipelines is crude oil and 47% is in the form of refined petroleum products.
- Due to the significantly high volumes, liquid pipelines are the only feasible method for moving the quantities of petroleum that America requires to keep going each day.
- Replacing a modest-sized pipeline (150K barrels per day) would require:
 - **750 tanker truck loads** per day, a load delivered every 2 minutes around the clock.
 - **225-car train** to arrive and be unloaded every day.
- Pipelines have environmental and safety benefits. Compared to other transportation modes, pipelines do not congest highways and produce negligible air pollution.
- Pipelines have a lower spill rate per barrel of oil transported than competing modes of transportation, namely trucks and barges.

Petroleum Product Pipeline Operation



Gas Transmission



Natural Gas Pipeline Information

- Natural gas pipelines connected to each other would stretch to / from the moon 3X.
- **Robotic devices (pigs)** are used to evaluate the inside of a pipeline to ensure it is safe. Pigs get their name due to the squealing sound they make when they travel through the pipelines.
- Pipelines are constructed of different material depending on size, pressure requirements and use. Transmission pipes, pipes used to transport gas from supply areas to distribution centers, are made of $\frac{1}{4}$ - $\frac{1}{2}$ inch thick steel with special coating to protect against corrosion.
- Transmission pipelines are protected by an electrical shield called **cathodic protection**. This barrier is achieved by applying an electrical current to the pipeline.
- 98% of the natural gas transported / used in the US comes from North America.
- INGAA members operate over 202,000 miles of natural gas pipelines.
- Natural gas first placed in a transmission line receives a pressure of up to 1,500 psi. By the time it reaches a household piping system, pressure has been reduced to less than 0.25 psi or the pressure created by a child blowing bubbles through a straw.

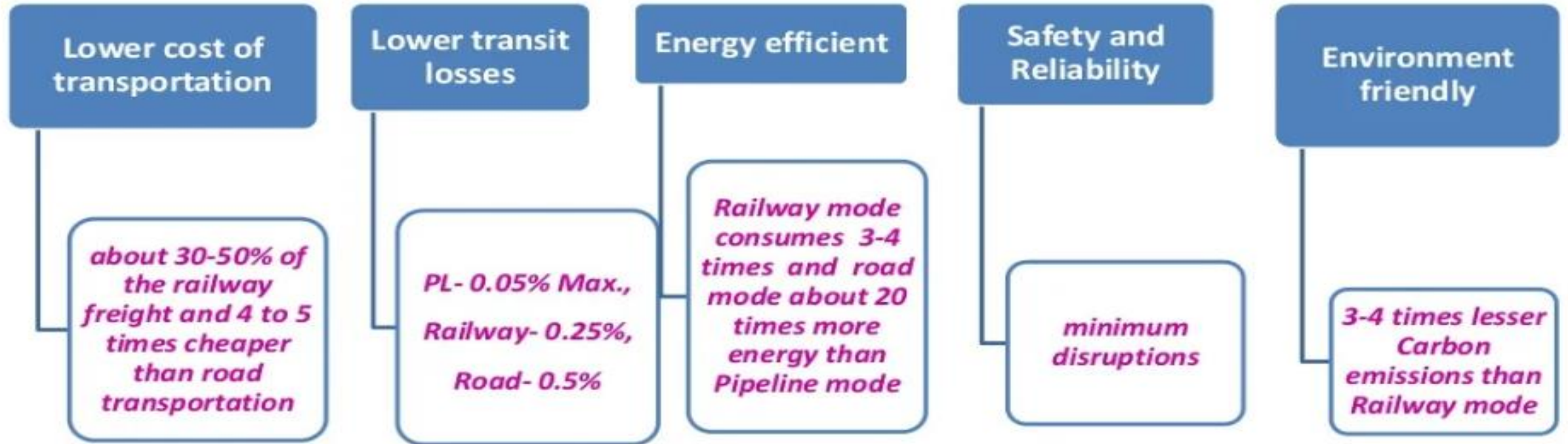
Advantages of Pipeline Transportation

- ❖ Lower cost of transportation
- ❖ Lower transit losses
- ❖ Lower energy intensiveness
- ❖ Economies of scale
- ❖ Safety and Reliability - minimum disruptions
- ❖ Environment-friendliness
- ❖ Multi-product handling
- ❖ Flexibility
- ❖ Stationary carrier
- ❖ Augmentation at low cost
- ❖ Minimal land costs
- ❖ Decongestion of surface transport systems

Pipelines are the best suited mode for transportation of large volumes of petroleum over long leads.

Typical Advantages of Pipelines

Pipeline mode of transportation has some inherent advantages over other conventional modes of transportation. Some of the salient advantages of pipeline mode is brought out on the slide.



THANK YOU