



Impact of Refinery Industry on India's Economy

Sarvesh Kerkar, Dr Rajendra Jarad, Dr Mahendra Yadav, Dr Praveen Suryavanshi, Dhananjay Bhavsar, Nilambari Moholkar

D.Y Patil Institute of Technology

ABSTRACT

India's petroleum refining industry is one of the largest globally, ranking fourth in terms of capacity, with a refining capacity more than 250 million metric tonnes per annum. The country has 23 refineries, including public, private, and joint ventures, with Reliance's Jamnagar refinery being the largest in the world. The sector plays a critical role in meeting domestic energy demands, contributing to exports, and supporting economic growth. While the advanced technologies help to produce cleaner fuels, the industry faces challenges such as high crude oil import dependency, old infrastructure, and environmental concerns. Government initiatives like privatization, energy transition to biofuels and hydrogen, and compliance with Bharat Stage VI norms aim to ensure sustainability and efficiency. The industry is the foundation of India's energy strategy and economic consistency, with expansion and modernization plans shaping its future.

I) Introduction

India's petroleum refining industry is a key component of its energy sector and plays a vital role in meeting the country's energy demands. It is one of the largest in the world, with significant contributions to both the domestic economy and global oil markets. Here's an overview of the industry:

II) Key Features of India's Petroleum Refining Industry

1. Global Ranking

India is the 4th largest refining country in the world after the United States, China, and Russia, with a refining capacity of over 250 million metric tonnes per annum (MMTPA).

2. Number of Refineries

India has 23 refineries, which include 18 public sector refineries, 3 private sector refineries, and 2 joint ventures.

Public Sector Refineries: Operated by companies like Indian Oil Corporation Limited (IOCL), Bharat Petroleum Corporation Limited (BPCL), and Hindustan Petroleum Corporation Limited (HPCL).

Private Sector Refineries: Reliance Industries and Nayara Energy are key players. Reliance operates the world's largest refinery complex in Jamnagar, Gujarat.

3. Major Refinery Hubs

Jamnagar Refinery: The largest in the world, with a capacity of over 68 MMTPA.

Vadinar Refinery: Operated by Nayara Energy, with a capacity of 20 MMTPA.

Mumbai, Mathura, Paradip, and Chennai are other important refineries.

4. Product Output

Indian refineries produce a variety of petroleum products such as petrol (gasoline), diesel, kerosene, aviation turbine fuel, LPG and fuel oil.

5. Technological Advances

Many Indian refineries use advanced technologies like hydrocracking, catalytic cracking, and desulfurization to produce cleaner fuels, aligning with global environmental standards like Bharat Stage VI (BS-VI).

III) Economic and Strategic Importance

1. Domestic Demand

India is the 3rd largest consumer of crude oil globally. Refineries meet most of the domestic demand for petroleum products.

2. Export Potential

India is a significant exporter of petroleum products. Refined products such as diesel and petrol.

3. Employment and Revenue

The industry contributes substantially to GDP and provides direct and indirect employment.

4. Strategic Reserves

To enhance energy security, India has developed strategic petroleum reserves (SPRs) in locations like Vishakhapatnam, Mangalore, and Padur.

IV) Challenges

1. Dependence on Crude Oil Imports

India imports 85% of its crude oil needs, exposing the industry to global price volatility.

2. Environmental Concerns

Refineries are energy-intensive and produces major greenhouse gases.

3. Geopolitical Risks

Fluctuating international oil prices and geopolitical tensions impact operations and costs.

V) Government Initiatives

1. Privatization

The government is working on privatizing state-owned companies like BPCL to attract foreign and domestic investment.

2. Bharat Stage VI Norms

Implementation of BS-VI emission norms to reduce air pollution.

3. Expansion Plans

Refineries are being expanded, and new projects like the West Coast Refinery in Maharashtra (planned capacity of 60 MMTPA) are ongoing.

India's petroleum refining industry produces a wide range of petroleum products that cater to both domestic consumption and export markets. These products are essential for various industries, transportation, and household use. Below is a list of key petroleum products produced by Indian refineries:

VI) Crude Oil Import

India is the third-largest importer of crude oil globally, relying heavily on imports to meet 85% of its crude oil demand. Indian refineries source crude oil from a diverse range of countries to ensure energy security and cost-effectiveness. Below are the key suppliers:

+ Top Crude Oil Import Sources

1. Middle East

The Middle East is the largest supplier, accounting for over 60% of India's crude oil imports.

Iraq: The top supplier, offering a mix of light and heavy crude.

Saudi Arabia: A major supplier, leveraging its proximity and competitive pricing.

United Arab Emirates (UAE): Supplies both crude oil and refined products.

Kuwait: A consistent supplier with long-term contracts.

Iran: Historically a significant supplier, but imports have declined due to U.S. sanctions.

2. Africa

African countries contribute around 15-20% of India's imports.

Nigeria: Supplies light crude oil favored by Indian refineries.

Angola: Offers heavy crude oil.

Algeria and Libya: Smaller suppliers in the region.

3. North and South America

These regions collectively account for 10-15% of imports.

United States: Emerging as a key supplier, providing shale oil and other crude varieties.

Brazil: Supplies medium and heavy crude oil.

Mexico: Another source of heavy crude.

4. Russia

Russia has significantly increased its crude oil exports to India, especially after 2022, taking advantage of discounted prices amid geopolitical tensions. It is now a major supplier.

5. Southeast Asia and Other Regions

Malaysia and Indonesia: Occasionally supply crude oil blends.

Smaller quantities are imported from countries like Kazakhstan and Australia.

+ Use of Imported Crude Oil

Crude oil imports are critical to India's energy and economic needs. Here are the primary uses:

1. Petroleum Product Production

Crude oil is refined to produce various petroleum products used across sectors:

Transportation Fuels: Petrol (gasoline) and diesel are the most significant products, essential for vehicles, shipping, and railways.

Aviation Turbine Fuel (ATF): Crucial for the aviation industry.

Liquefied Petroleum Gas (LPG): Used for cooking in households and small businesses.

2. Industrial Uses

Crude oil derivatives serve as feedstock for industries:

Petrochemicals: Naphtha, a crude derivative, is used to produce plastics, synthetic fibers, and chemicals.

Fertilizers: Petroleum products are essential in the production of nitrogenous fertilizers.

Asphalt and Bitumen: Used in road construction and other infrastructure projects.

3. Power Generation

Fuel Oil and Diesel: Used in generators and power plants for electricity production, particularly in remote areas.

4. Export Revenue

After refining, surplus petroleum products like diesel and petrol are exported, contributing significantly to India's foreign exchange earnings.

5. Strategic Reserves

Crude oil is also stored in strategic reserves to ensure energy security during global price fluctuations or supply disruptions.

India's reliance on crude oil imports highlights its importance in maintaining the economy and energy demands, making it a vital part of the country's energy ecosystem.

VII) Export of Petroleum Products

India is a significant exporter of petroleum products, with refined products being one of the top contributors to its export basket. Indian refineries cater to a wide range of global markets, particularly in regions with high energy demands. Below are the major countries and regions that import petroleum products from India

+ Key Export Destinations

1. Asia

Bangladesh: A major importer of diesel and other refined fuels.

Sri Lanka: Imports fuel for transportation and energy generation.

Nepal: Receives petrol and diesel through pipelines and rail networks.

Singapore: Acts as a trading hub for Indian refined products.

Malaysia: Imports diesel and aviation turbine fuel (ATF).

2. Middle East

Countries like United Arab Emirates (UAE) and Saudi Arabia import refined products such as diesel and jet fuel.

3. Africa

Indian petroleum products, especially diesel, are exported to countries like Kenya, South Africa, and Mozambique.

4. Europe

Netherlands, Belgium, and other European countries import Indian refined diesel, naphtha, and other fuels.

5. North America

United States: Imports high-quality refined products such as naphtha and low-sulfur diesel

6. South America

Countries like Brazil and Venezuela import specialized petroleum products

7. Australia and Oceania

Indian products, especially aviation turbine fuel, are supplied to countries like Australia and smaller Pacific nations.

VIII) Exported Products

1. Petrol

Used as fuel for cars, motorcycles, and small machinery.

2. Diesel

The most widely used fuel in India, primarily for transportation, agriculture, and industrial machinery.

3. Liquefied Petroleum Gas (LPG)

Used as cooking fuel in households and as an industrial fuel.

4. Kerosene

Used as cooking and lighting fuel, particularly in rural areas, and as aviation turbine fuel (ATF) for jets.

5. Aviation Turbine Fuel (ATF)

Specifically refined for use in aircraft engines.

6. Base Oils

Used for manufacturing lubricants and greases.

7. Lubricating Oils

Produced for automotive and industrial machinery.

8. Wax

Used in packaging, candles, and coatings.

9. Paraffin

Commonly used in cosmetics, candles, and pharmaceuticals.

10. Hydrogen

Emerging as a product for clean energy solutions, especially green hydrogen.

These products serve diverse sectors, including transportation, agriculture, construction, and petrochemicals, making India's refining industry a backbone of the country's energy ecosystem.

IX) Key financial highlights :

+ Import

India's crude oil imports play a significant role in its energy , with the country being the world's third-largest oil importer and consumer. In FY2024 (April 2023 to March 2024), India imported 232.5 million tonnes of crude oil, which cost \$132.4 billion—a decrease from the \$157.5 billion spent in the previous fiscal year. This reduction was primarily due to lower international crude oil prices. However, import dependency slightly increased to 87.7% due to stagnant domestic production.

+ Export

India's petroleum industry plays a significant role in the country's export . In FY 24 (2023-24) (April to January), India exported petroleum products worth approximately \$70.13 billion. Europe emerged as the largest destination, accounting for a significant share, including \$10.9 billion to the

Netherlands alone. Other major export destinations include Singapore (\$5.7 billion), the UAE (\$5.4 billion), the USA (\$5 billion), and Australia (\$3.5 billion).

The refined products exported range from petrol and diesel to jet fuel and other derivatives, reflecting India's robust refinery capabilities and its strategic role in global energy markets.

X) Conclusion

India's petroleum industry plays a important role in both the country's exports and GDP. With its large refining capacity, modern infrastructure, and strategic geographic location, India has become a significant exporter of refined petroleum products such as diesel, petrol, and naphtha. The sector contributes approximately 12-15% of India's total exports, generating foreign exchange earnings and positioning India as a key player in the global energy market.

In terms of GDP, the petroleum refining industry contributes around 2.5-3%, making it a vital part of India's manufacturing and industrial sectors. This contribution impacts on other industries like employment generation, and infrastructure development. The industry's ability to meet domestic energy demands while exporting surplus products ensures both energy security and economic growth.

However, challenges such as high crude oil import dependency, global price volatility, and environmental concerns need of strategic planning. Government initiatives like promoting biofuels, diversifying crude sources, and upgrading refineries are steps toward enhancing the industry's sustainability and profitability.

In summary, India's petroleum industry is a foundation of its economic framework, significantly contributing to exports, GDP, and energy security while driving industrial and regional development.

Reference

The information provided about India's petroleum industry is based on publicly available data, industry reports, and government publications. Below are common sources and references used for similar analyses:

1. Ministry of Petroleum and Natural Gas (MoPNG) :

Annual Reports and Statistics on Petroleum Production, Refining, and Exports.

2. MoPNG Official Website :

Reports on crude oil imports, petroleum product consumption, and pricing.

3. Trade and Export Statistics

4. News Outlets and Research Articles