इंडियनऑयल

IndianOil

PIPELINES DIVISION

25

GLORIOUS YEARS

BUILDING UNDERGROUND ENERGY HIGHWAYS

Our Mascots

The journey continues...

As a strategic partner of both the Refining & Marketing Divisions, IndianOil's Pipelines Division is a synergistic integrator of the business ecosystem. Its pan India network of over 17,000 km plus of cross-country hydrocarbons pipelines is one of the largest in the world and has been globally benchmarked by M/s Solomon Associates, USA.

Starting its journey as a pioneer by laying India's first cross-country product pipeline east of the Suez Canal, the grand old Guwahati-Siliguri Pipeline IndianOil Pipelines has come a long way with a massive network of over 17,000 km and is all set to cross the magical figure of 20,000 km.

Over the decades, IndianOil Pipelines has gained a definitive leadership position in the country's hydrocarbon domain with numerous "firsts" to its credit- the first installation of the offshore crude oil handling facilities, the largest crude oil pipeline system feeding the inland refineries achieving ISO-9000, ISO-14000 and ISO-18000 accreditations, the first to adopt Horizontal Directional Drilling (HDD) for liquid pipelines, to name just a few. With its extensive experience in mega project implementation and operations and management IndianOil Pipelines is currently providing

Project Management Consultancy to M/s IHB (a JV of IndianOil, HPC and BPC) which is building the world's longest LPG pipeline in the world.

In the 1950s refineries in India were located on the coast, but later new inland refineries were established in high demand centers. This necessitated long distance crude and product pipelines to be constructed and IndianOil Pipelines team played a stellar role in building these cross-country underground energy highways, which catalyzed the emergence of India as the third largest oil & gas consumer in the world. Our network of energy arteries helps in keeping a billion plus Indians happy and energized. After establishing leadership in the liquid hydrocarbon pipelines, IndianOil Pipelines are not only proactively scaling up the gas pipeline network but has also emerged as a major player in the growing City Gas Distribution business.

This pictorial book portraying the various facets of Pipelines Division is dedicated to the low profile but hi octane IndianOil Pipeliners who with their incomparable passion are quietly and efficiently serving India through IndianOil in the spirit of *Pehle* Indian, *Phir* Oil.


SAMPLE POINT

Contents

Message from Chairman, IndianOil

For IndianOil, being the 'Energy of India' is not only about fueling India's phenomenal growth saga; but also about ushering in a new dawn of sustained prosperity built on the tenets of green commitment and social justice. This national energy mandate is the prime mover of IndianOil's aspirational journey path. For over six decades now, the IndianOil energy soldiers have been unravelling new horizons of fueling excellence and bolstering the energy security of the entire country, from the bustling metros to the remotest villages and difficult-most terrains. And a critical cog in our energy network has been our expansive network of Pipeline Network, serving as the energy veins of an ascendant India, helping the fuel reach end-users from Gujarat to Guwahati in the most environmentally friendly manner.

The remarkable expansion of IndianOil's pipelines business is a tale of grit, determination and relentless focus on excellence with which our Pipeliners have risen over challenges and converted roadblocks into opportunities. Many of our landmark pipeline projects provide eternal glimpses of how the passion of IOCians can move the proverbial mountains to offer landmark energy solutions. Today, the 17,000 KM-plus network of Pipelines is the definitive edge that empowers IndianOil to steward its service mission of 'Pehle Indian Phir Oil' forward.

This Coffee Table Book is a literary and artistic salute to the remarkable journey of IndianOil Pipelines and a celebration of the significant milestones we achieved along the way. I extend hearty greetings to the Pipelines Division for bringing out this prestige Publication-Building Underground Energy Highways that will serve as a historical journal, especially for young readers.

Happy Reading!

Shrikant Madhav Vaidya

New Delhi
4th January 2023

Message of Director (Pipelines)

Dear Colleagues,

It is an emotional moment for me as I pen my thoughts for this special publication that chronicles the glorious saga of IndianOil Pipelines. I am indeed grateful and proud to have participated and witnessed the tremendous transformational journey of Pipelines Division in our continuing endeavour to create seamless business synergy for the Corporation.

If there's one industry that has enabled modern civilization it is the Oil & Gas industry, and if there is a conjoined industry that has made it possible it is the Pipeline industry. Like a body cannot function without arteries and blood, a modern society too cannot function efficiently without the energy flow made possible through pipelines.

This book gives glimpses of the extraordinary range of works we Pipeliners do for the Nation and for IndianOil. As we are in the 25th year of our distinct identity as IndianOil Pipelines Division it is apt to document our historic journey of building the underground energy highways for the nation.

It was in 1962 that as part of the then Indian Refineries Ltd that we began by building the first petroleum products pipeline east of the Suez canal. And since then we have not looked back. Today our assets include a nationwide network of over 17,000 km network of crude oil, petroleum product and gas pipelines. I am privileged to lead the 3000 plus IndianOil Pipeliners who will soon be crossing the magical figure of 20,000 km of our pipeline expanse.

Pipelines are optimal integrators of the business eco-system of IndianOil. Whether it is cost-effective placement of wide variety of crude oils at our Refineries or evacuation of finished product from Refineries to our Marketing terminals, IndianOil Pipelines are an efficient and environment friendly business enabler. We are constantly realigning our strategy in sync with organisational and national priorities and with our vast experience we have successfully earned our credentials as a leader in conceptualising, building and efficiently operating a world-class system of hydrocarbon pipelines. In fact, we are now expanding in a big way in natural gas pipelines and have also emerged as a major player in the City Gas Distribution (CGD) business. Our definitive expertise in the hydrocarbon pipeline business has also made us a provider of Engineering & Project Management Consultancy (EPMC) services a testimony of our high calibre & stature in the industry.

The secret behind the continuous success of IndianOil pipeliners is their extraordinary courage and passion. Quiet and low profile, they speak best with their work. The typical IndianOil pipeliner is sincere and imbued with our core values of Care, Innovation, Passion & Trust.

Pipeline sector is a quintessentially, field oriented industry, which requires alertness and agility of a very high order and we are amply blessed with these attributes. Every day we work hard, towards our purpose with single minded focus.

In all our core functions – Projects, Construction , Operations, or support functions like HS&E, M&C department, Finance and HR, the symbiotic chemistry that exists between them is truly magical.

Our workforce across hundred plus field locations are the lifeline of our business and it is they who keep the show running. Kudos to them.

With many ongoing projects nearing completion, it is our collective responsibility to ensure that we complete all our projects within the timelines, without any cost overruns. We are also aggressively scaling up our gas business, and more opportunities are coming our way. For seamless operations, we have a tremendous responsibility to keep our assets in good health and secure energy needs of the country reliably. As the energy landscape undergoes rapid change, we must be ready and agile to grab all opportunities of growth.

We IndianOil Pipeliners have an innate capacity to deliver results even in the face of tremendous odds. This is because we are a right blend of experience and young talent. Today, I say with tremendous pride and confidence that we will continue to achieve bigger milestones for catalysing the growth of IndianOil.

D S Nanaware
Director (Pipelines)

7th January 2023

At the Helm IndianOil Pipelines

N N Kashyap
Managing Director (Refineries)
01.09.1964 - 31.07.1966

M Gopal Menon
Director (Pipelines)
11.03.1965 - 05.09.1966

Maj. Gen. Sardanand Singh
Managing Director
(Refineries & Pipelines)
09.08.1966 - 30.06.1970

C R Dasgupta
Managing Director
(Refineries & Pipelines)
01.07.1970 - 10.05.1974

R N Bhatnagar
Managing Director
(Refineries & Pipelines)
20.05.1974 - 03.04.1977

T K Sinha
Managing Director
(Refineries & Pipelines)
04.04.1977 - 30.09.1984

K K Malhotra
Director (Refineries & Pipelines)
05.12.1984 - 31.08.1985

S K Nayak
Director (Refineries & Pipelines)
01.09.1985 - 18.08.1988

T S Krishnamurthi
Director (Refineries & Pipelines)
27.09.1988 - 31.12.1991

A P Chaudhri
Director (Refineries & Pipelines)
27.03.1992 - 31.12.1994

A K Arora
Director (Refineries & Pipelines)
24.01.1995 - 06.01.1998
Director (Refineries)
07.01.1998 - 31.03.2003

S N Jha
Director (Pipelines)
07.01.1998 - 31.08.2001

A M Uplenchwar
Director (Pipelines)
01.09.2001 - 31.07.2007

P K Chakraborti
Director (Pipelines)
01.08.2007 - 31.08.2009

K K Jha
Director (Pipelines)
01.09.2009 - 31.01.2012

V S Okhde
Director (Pipelines)
01.02.2012 - 31.01.2015

Anish Aggarwal
Director (Pipelines)
01.02.2015 - 31.03.2018

Sanjiv Singh
Chairman, IndianOil
with additional charge as
Director (Pipelines)
01.04.2018 - 13.08.2018

Akshay Kumar Singh
Director (Pipelines)
14.08.2018 - 31.01.2021

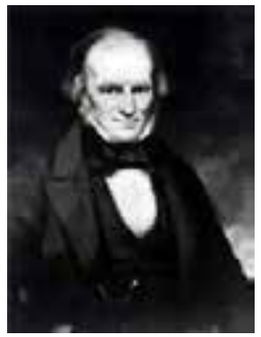
Shrikant Madhav Vaidya
Chairman, IndianOil
with additional charge as
Director (Pipelines)
01.02.2021 - 27.12.2021

D S Nanaware
Director (Pipelines)
from 28.12.2021

A Brief History of
Oil & Gas Industry

Drake Well - The first oil well drilled in the world

The triumvirate who created the world's most powerful industry - Oil



James Young

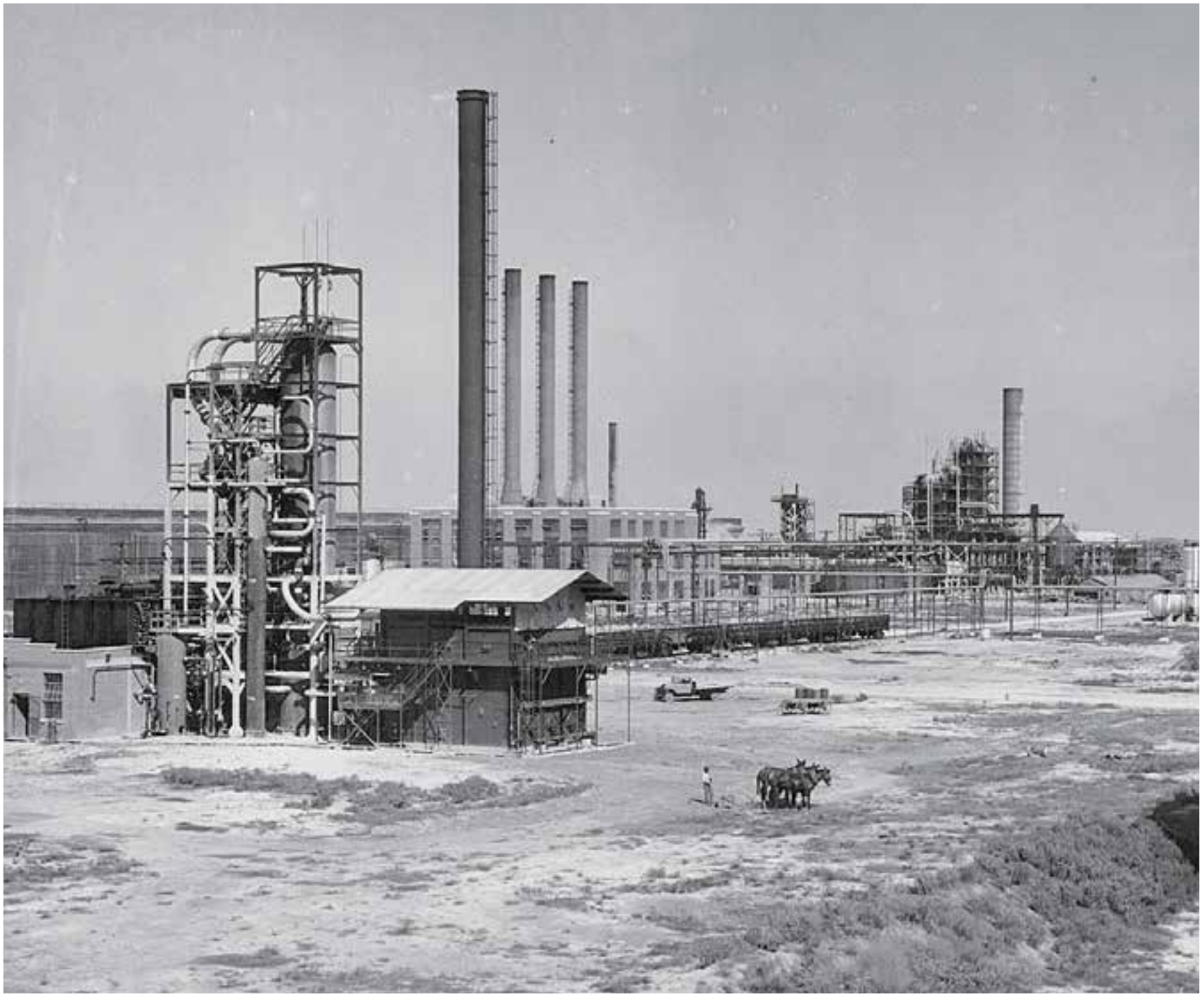
Col Edwin Drake

John D. Rockefeller

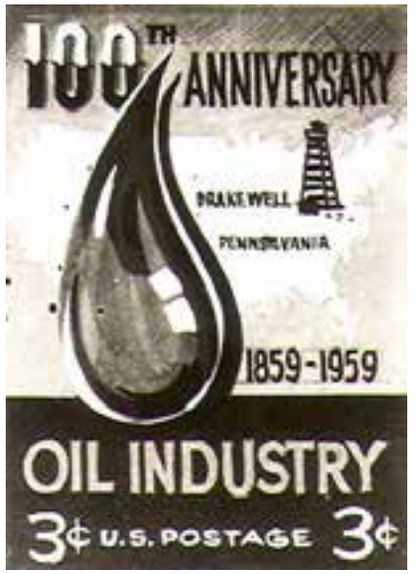
> *What a Blessing Oil has been to mankind.*
> *- John D. Rockefeller*

Oil has been known to man since ancient times. In the modern times however, it is ubiquitous and has found a permanent position in the lives of people across the world. Our civilization depends more heavily on oil than any other commodity. Its widespread availability and use rose in prominence during the First World War and ever since then the world has continued to depend more and more heavily on it for a wide range of products and services, among which transportation is the most important. The history of oil can be traced back to the dawn of civilization. One of the earliest civilisations that developed in Mesopotamia used asphalt obtained from hand dug pits for caulking boats, medicinal and ornamental purposes.

The history of oil makes for spectacular reading. The 20th century witnessed its phenomenal rise. The Allies defeated Nazi Germany and won the Second World War, riding on the back of oil. International trade boomed after the Second World War and oil fuelled the rise of multinational and transnational corporations across the world.



A picture of an old refinery in the United States



Two postal stamps released in the United States to mark hundred years of oil dominance

The internal combustion engine resulting in the car boom in the US fuelled the phenominal rise of the oil industry

Transportation of oil has been pivotal in making it the fuel of modern civilization

The first oil well was thought to have been dug in Iran in about 500 BCE, while the Chinese are believed to have drilled for oil with bamboo tubes and bronze drill bits as early as 200 BCE. Originally, oil was collected from natural surface seepages and shallow pits and for hundreds of years was used mainly for lighting, medicinal purposes, waterproofing, or as lubricant.

The modern history of the oil and gas industry started in 1847, with a discovery made by Scottish chemist James Young. He observed natural petroleum seepage in the Riddings coal mine and from this seepage distilled both a light thin oil suitable for lamps and a thicker oil suitable for lubrication. Following these successful distillations, Young experimented further with coal and was able to distil a number of liquids including an early form of petroleum. He patented these oils and paraffin wax, also distilled from coal, in 1850. Young wasn't the only scientist making discoveries about coal in the 19th century. In 1846, Canadian geologist Abraham Pineo Gesner refined a liquid from coal, oil shale and bitumen that was cheaper and burned more cleanly than other oils. He dubbed this liquid 'kerosene' and founded the Kerosene Gaslight Company in 1850, using the oil to light the streets of Halifax and later the US.

The famous Spindletop gusher that ushered in the oil age in the United States

The first modern oil well

The first modern oil well in America was drilled by Edwin Drake in Titusville, Pennsylvania in 1859. This led to the Pennsylvania ‘Oil Rush’, making oil one of the most valuable commodities in America. The late 18th century and the early 19th century marked the creation of major oil companies that still dominate the oil and gas industry today. John D. Rockefeller founded the Standard Oil Company in 1865, becoming the world’s first oil baron. Standard Oil quickly became hugely profitable, controlling about 90% of America’s refining capacity and a number of its gathering systems and pipelines. ExxonMobil, one of Standard’s successors after it dissolved in 1911, is still one of the world’s companies. In Russia, the Rothschild family commissioned oil tankers from British trader Marcus Samuel to expand their oil operations and reach more overseas customers. Samuel’s first vessel, the Murex named after a sea snail – became the first oil tanker to pass through the Suez Canal connecting the Mediterranean Sea to the Red Sea. The Murex became the flagship vessel of Shell Transport and Trading, which eventually merged with Royal Dutch Petroleum to become Royal Dutch Shell.

Pipelines have been a part and parcel of the oil industry right from the begining

The Oil Age

In the late 20th century, changes in the oil market moved influence from generally oil-consuming regions such as the US and Europe to oil-producing countries. Iran, Iraq, Kuwait, Venezuela and Saudi Arabia formed the Organization of the Petroleum Exporting Countries (OPEC) in 1960 in response to multinationals in the “Seven Sisters” including ExxonMobil – at the time split into Esso and Mobil – Shell and BP, which operated from oil-consuming countries. Today, OPEC has 15 member countries, accounting for approximately 44% of global oil production and over 80% of the world’s oil reserves. The 1980s saw a significant glut in oil following the 1970 energy crisis. Petroleum production peaked in the 1970s, which caused a sharp rise in oil price and a subsequent decrease in demand. Oil-producing countries suffered during this glut, with OPEC struggling to maintain high oil prices through decreasing oil production. The dissolution of the Soviet Union can also be attributed in part to its loss of influence as an oil producer. The oil and gas industry at present is undergoing a transition phase and the stress is on reducing carbon intensity as environmental concerns come to centre stage across the world. The worldwide oil & gas sector is responding in a big way by reducing its carbon footprint through innovation & technology and by increasingly adopting renewable sources of energy.

First Pipeline of World

The first really long-distance pipeline, a 6” buried one 125 miles in length, was built in Pennsylvania, from Cornwallis to Williamsport, in 1879. Its extension eight years later included an 8 mile underwater section across the sea-bed of Newark Bay.

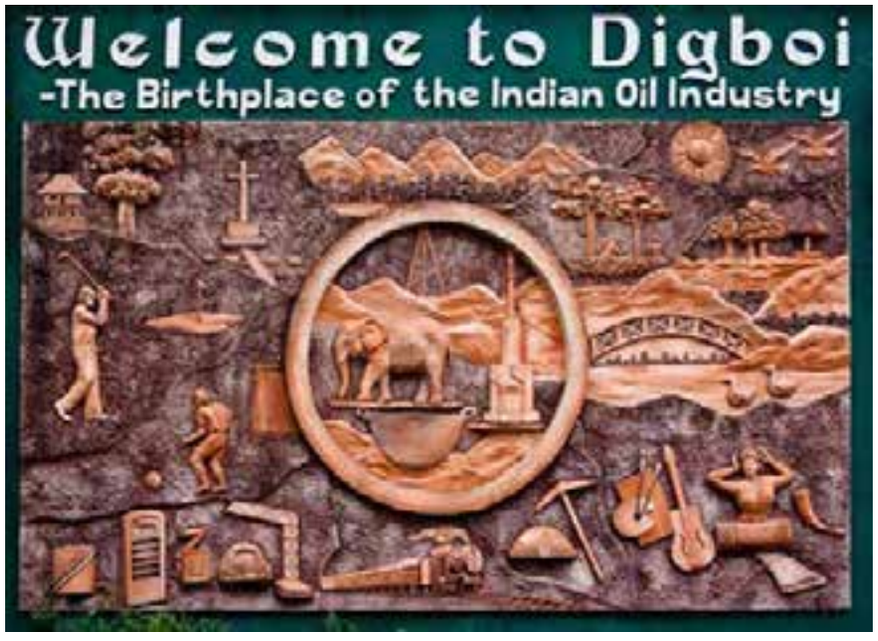
History of

Oil & Gas Sector in India

“There can be no freedom for the country’s economy or its defence unless the oil industry is owned and controlled by the state.”

- Keshav Dev Malviya, Father of Indian Oil Industry

Digboi’s first commercial oil well, now preserved as a monument, began production in November 1890



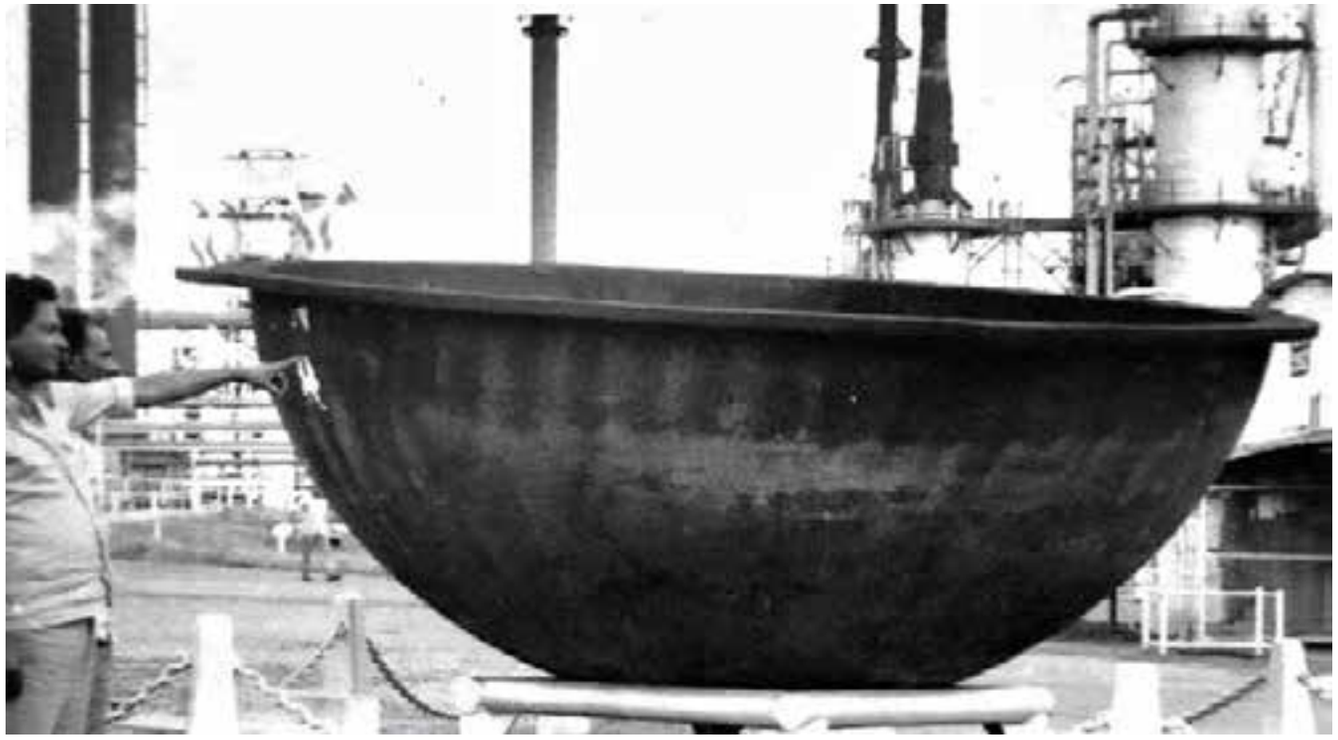
The story of the petroleum industry in India can be traced to the world’s oldest running refinery, at Digboi, in Assam. Set up in 1901, it had a modest refining capacity of 25,000 metric tonnes per annum (MTPA). Prior to this, kerosene was imported into the country since the 1860s, mainly for purpose of illumination. The growing demand for petroleum products outmatched the capacity of Digboi and the shortfall was met through imports by foreign companies operating in India. These included Burmah Oil Company, Stanvac, Burmah Shell, Caltex and Indo-Burmah Petroleum Company. On the eve of Independence, the oil industry was entirely in the hands of these multinationals.

Following Independence, the Indian leadership firmly believed that political sovereignty without economic self-reliance was unfeasible. The public sector was assigned the dominant role to power the rapid industrialisation and growth of the nascent nation. This was reflected in the provisions of the New Industrial Policy Resolution of 1956 and the Second Five Year Plan (1956-61). Pandit Jawaharlal Nehru, the first Prime Minister, envisioned self-sufficiency in the strategic petroleum sector as integral to the building of a new assertive and confident India. The foundations of an indigenous petroleum industry were laid in the 1950s and 1960s. Having formed the Oil & Natural Gas Commission in 1956 for undertaking upstream activities of oil exploration & production, Keshav Dev Malaviya, widely respected as the father of the Oil industry in India, focussed his attention on the downstream refining and marketing sector.

On 1st September 1964, Indian Refineries Ltd. was merged with Indian Oil Company Ltd. to form a vertically integrated entity, Indian Oil Corporation Ltd., straddling both refining and marketing functions. While announcing the historic merger, Prof Humayun Kabir, the then Union Minister of Petroleum and Chemicals, hoped that IndianOil would soon handle at least half of the trade in petroleum products. His hopes materialised within five years. Every year, 1st September is celebrated as IndianOil Day across the Corporation.

The use of pipe for oil transportation started soon after the drilling of the first commercial oil well in 1859 by Colonel Edwin Drake. The pipeline used in the early years of the oil industry were short in length and quickly assembled to get oil from drill holes to nearby tanks or refineries, often fabricated from logs or wood planks. These were developed to replace transport in wooden barrels loaded on wagons drawn by mules. As the oil and pipeline businesses grew, the type of material for pipes improved from wood, to wrought iron, to steel. The first successful metal pipeline was completed in 1865 and transported 80 barrels per hour of crude oil over an 8 km route in Western Pennsylvania.

The transportation of oil in India was mostly through road and rail in drums. Over a period of time, transportation of bulk quantity of petroleum products by rail and road became quite cumbersome due to heavy traffic. The industry was hungry for an efficient and cost-effective transportation system and pipeline transportation was found to be the most economical and environment friendly mode. India's first pipeline was laid to transport crude oil discovered in the Digboi oil fields to Digboi Refinery in Assam during 1901. The first major cross-country crude oil pipeline stretching from the Nahorkatiya and Moran oilfields in Assam to Guwahati Refinery was commissioned by Oil India Limited (OIL) during 1962 and was later extended to Barauni Refinery during 1964.



'The Still' precursor of petroleum refining, used to treat crude oil around 1890s, exhibited inside Digboi Refinery - Huge cast iron cauldron on 9 feet diameter

Indian postage stamps marking the milestones of oil industry

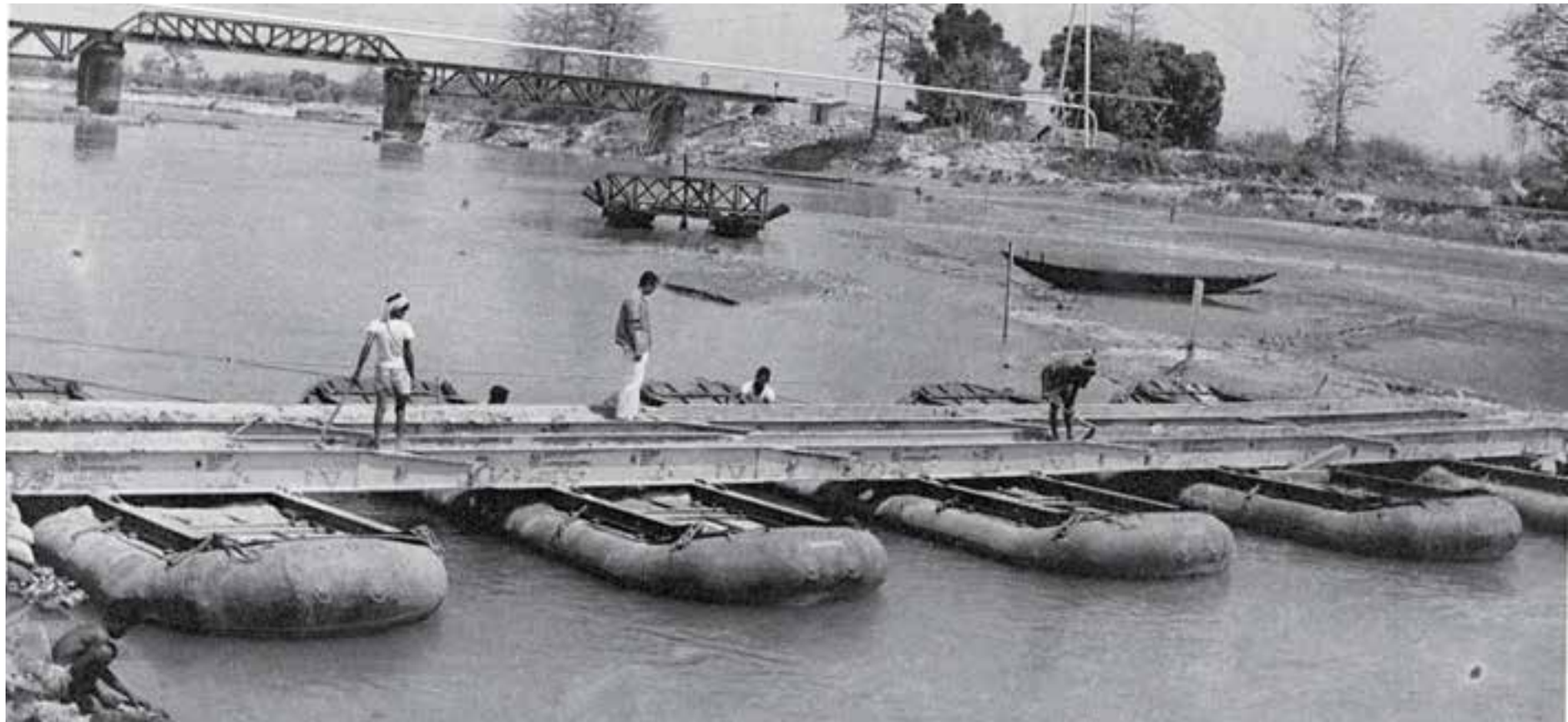
Guwahati-Siliguri Pipeline - First multi-product pipeline of India

The first multi-product petroleum pipeline of India was constructed from Guwahati Refinery in Assam to Siliguri Terminal in North Bengal by Indian Refineries Limited. Bechtel International Corporation of USA was appointed as consultants for the pipeline project who submitted the study report in February 1962. 60 Indian and 62 foreign technical personnel were engaged to lead a workforce of 700 unskilled personnel. The journey along the 435 km pipeline route from Guwahati to Siliguri was through evergreen meadows, rivers and valleys amidst beautiful hills in the difficult terrain of North-Eastern India. The experience during the construction of pipelines was unique and tough. The construction engineers would often have close encounters with wild animals like tigers, elephants in the thick forests. The construction challenges involved 29 submerged river crossings, 25 rail bridges and two aerial crossings, through inhospitable terrain. However, the project was completed in exactly 18 months on August 31, 1964, under the dynamic Mr Gopal Menon, an Indian Civil Services officer. The pipeline was successfully commissioned on October 24, 1964, by pumping Motor Spirit from Guwahati Refinery to Siliguri terminal. Mr O. V. Alagesan, Union Minister of State for Petroleum and Chemicals dedicated the pipeline to the nation on December 20th, 1964.

The Guwahati-Siliguri Pipeline put India on the world map of hydrocarbon pipelines as it was the first of its kind project east of the Suez Canal. The construction and commissioning of the pipeline opened up a new chapter in the history of petroleum pipelines in India. Laid at a cost of ₹ 6.80 crore, the initial design capacity of the 8-inch, 435 km pipeline was 0.481 million metric tonnes per annum. At that time, apart from the originating and terminating stations at Guwahati and Siliguri, there were two intermediate stations at Bongaigaon and Madarihat.

Vignette moments of construction activities of India's first petroleum product pipeline, Guwahati - Siliguri Pipeline

Laying of pipelines for transporting refined petroleum products involves cumbersome operations. Trained elephants were utilised in Assam to ferry pipelines across the rivers



River crossing work in progress

Glimpses of construction and laying of pipeline infrastructure

IndianOil Pipelines, Today

We are among the world's largest petroleum pipeline networks, ensuring safe, cost-effective, energy-efficient and environment-friendly transportation of crude oil and petroleum products across our network spanning over 17,000 km. During 2021-22, our crude oil pipelines achieved throughput of 48.53 MMT Product pipelines achieved throughput of 34.25 MMT and gas pipelines achieved highest ever throughput of 2,985 MMSCM.

Investment approval for projects received about ₹ 18,000 crore - New Mundra Panipat Crude Oil pipeline, pipelines connecting Kamarajar Port, Vallur Terminal and CPCL at Chennai and CGD projects in 9 geographical areas (GAs).

Product Transfer Pipelines

Guwahati - Siliguri Pipeline

The first cross country pipeline of IndianOil, Guwahati-Siliguri Pipeline (GSPL), a 435 Km long Pipeline was commissioned in the year 1964, which was designed by Bechtel, USA and constructed by Snam Progetti, Italy. It was the first product pipeline to be built on the east of Suez.

Haldia - Mourigram - Rajbandh - Barauni Pipeline

HMRBPL Haldia

526 Km Long Haldia-Barauni Pipeline (HBPL), commissioned in 1967, exemplifies IndianOil's expertise in system modification and pipeline hydraulic engineering through which service of the originally designed crude oil pipeline was changed to petroleum product pipeline.

Barauni - Kanpur Pipeline (BKPL), a 1227 km long Pipeline was commissioned in 1966, used for transportation of petroleum products from Barauni Refinery, Haldia Refinery and Coastal input at Haldia.

Koyali - Ahmedabad Pipeline

Koyali - Ahmedabad Pipeline (KAPL), a 79 km long Pipeline, laid in the state of Gujarat was commissioned in 1966, which was again Designed and constructed by Snam Saipen, Italy.

Multi-Product Pipelines

- Guwahati Siliguri Pipeline, Length: 435 km, Capacity: 1.4 MMTPA, Year of Commissioning: 1964.
- Koyali Ahmedabad Pipeline, Length: 79 km, Capacity: 1.1 MMTPA, Year of Commissioning: 1966/2017.
- Barauni Kanpur Pipeline, Length: 1227 km, Capacity: 3.5 MMTPA, Year of Commissioning: 1966/2003/2019.
- Haldia Barauni Pipeline, Length: 526 km, Capacity: 1.25 MMTPA, Year of Commissioning: 1967/2014.
- Haldia Mourigram Rajbandh Pipeline, Length: 277 km, Capacity: 1.35 MMTPA, Year of Commissioning: 1972.
- Panipat Delhi Pipeline, Length: 189 km, Capacity: 3 MMTPA, Year of Commissioning: 1982/2012.
- Mathura Delhi Pipeline, Length: 147 km, Capacity: 3.7 MMTPA, Year of Commissioning: 1982.
- Panipat Ambala Jalandhar Pipeline, Length: 495 km, Capacity: 3.5 MMTPA, Year of Commissioning: 1982/2003/2019.
- Koyali Sanganer Pipeline (Incl. JPNPL), Length: 1644 km, Capacity: 5 MMTPA, Year of Commissioning: 1996/2003/2019.
- Panipat Bhatinda Pipeline, Length: 219 km, Capacity: 3 MMTPA, Year of Commissioning: 1996/2021.
- Mathura Tundla Pipeline extended upto BKPL-Gawaria, Length: 311 km, Capacity: 4.0 MMTPA, Year of Commissioning: 2003/2022.
- Panipat Rewari Pipeline, Length: 155 km, Capacity: 2.1 MMTPA, Year of Commissioning: 2004/2014.
- Chennai Trichy Madurai Pipeline, Length: 683 km, Capacity: 2.3 MMTPA, Year of Commissioning: 2005/2012.
- Koyali Dahej Pipeline, Length: 197 km, Capacity: 2.6 MMTPA, Year of Commissioning: 2006.
- Panipat Jalandhar LPG Pipeline, Length: 280 km, Capacity: 0.7 MMTPA, Year of Commissioning: 2008/2018.
- Chennai Meenambakkam ATF Pipeline, Length: 95 km, Capacity: 0.18 MMTPA, Year of Commissioning: 2008.
- Devangonthi Devanhalli ATF Pipeline, Length: 36 km, Capacity: 0.66 MMTPA, Year of Commissioning: 2008.
- Koyali Ratlam Pipeline, Length: 265 km, Capacity: 2 MMTPA, Year of Commissioning: 2009.
- Panipat Bijwasan ATF line, Length: 111 km, Capacity: 1 MMTPA, Year of Commissioning: 2010/2022.
- Mathura Bharatpur Pipeline, Length: 21 km, Capacity: 1.2 MMTPA, Year of Commissioning: 2010.
- Chennai Bangalore Pipeline, Length: 290 km, Capacity: 2.45 MMTPA, Year of Commissioning: 2010/2012.
- Paradip Raipur Ranchi Pipeline, Length: 1073 km, Capacity: 5 MMTPA, Year of Commissioning: 2016/2017.
- Paradip Haldia Barauni Motihari LPG Pipeline, Length: 1468 km, Capacity: 3.5 MMTPA, Year of Commissioning: 2017/2022.
- Mourigram-Kolkata ATF Pipeline, Length: 27 km, Capacity: 0.2 MMTPA, Year of Commissioning: 2018.
- Lucknow ATF Pipeline, Length: 6 km, Capacity: 0.21 MMTPA, Year of Commissioning: 2022.

NRPL, Panipat

SRPL, Madurai

ERPL, Barauni

SRPL, Bangalore

ERPL, Patna

Pipeline area of ERPL, Jasidih

SRPL, Sankari

NRPL Jalandhar Station

MLPU Shed ERPL, Haldia

WRPL, Sidhpur

WRPL Jamnagar

WRPL, Beawar

SRPL, Trichy

ERPL, Bolpur

WRPL, Kot

ERPL, Betkuchi

WRPL, Sendra

NRPL, Sangrur

ERPL, Durgapur

WRPL, Jamnagar

SPM Systems at

Vadinar & Paradip

SPM at Vadinar

Vadinar, a tiny coastal village in the Gulf of Kutch, Gujarat, with its adjoining placid cove, was discovered by IndianOil in the early 1970s as the ideal setting with a secluded sea. It was here, where the sea mingles with the shoreline, that India's first SPM (Single Point Mooring) was commissioned in 1978, without much fanfare, even though it was a major industry milestone in India. After 44 years of consistent competences, Vadinar, today, is a well-established mother station, supplying imported crude oil requirement to three major inland refineries of IndianOil at Koyali, Mathura and Panipat.

To feed the ever-hungry IndianOil refineries from Vadinar, IndianOil owns and operates two offshore floating terminals, simply labelled SPM-I and SPM-II. The second SPM was commissioned almost

Corrosion Inhibitor Injection System for offshore pipelines from SPM, Vadinar

PLEM lowering at Vadinar

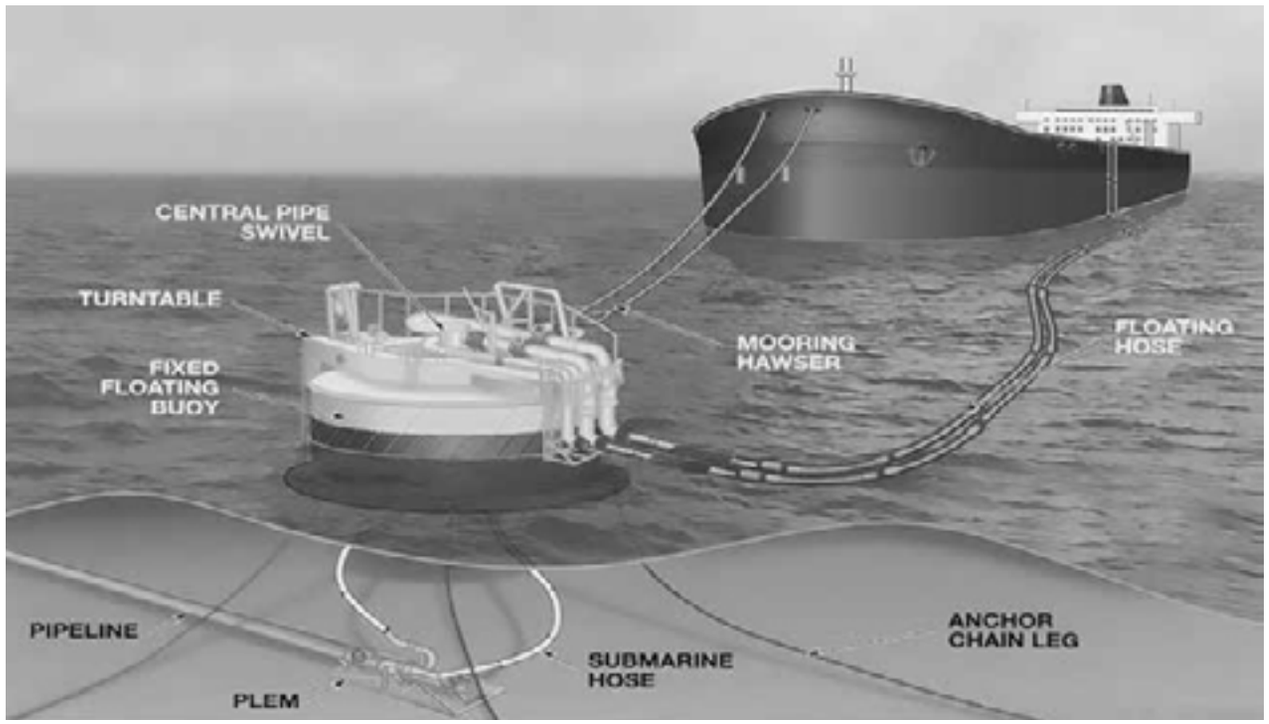
SPM at Vadinar

20 years after the first, in 1997and together, the sophisticated SPMs, as floating monolith terminals, work in tandem 24/7 on the high seas. Apart from the two, there is one spare SPM buoy, which has been kept idle, to deal with any unforeseen exigencies. Located on the Arabian Sea, five kilometres off the Vadinar coast, these monolith SPMs float like red cherries on champagne, constantly bobbing with the tidal waves. Each SPM is a massive 250-tonne floating buoy, with a diameter of 50 feet and 16 feet in height, anchored with six solid steel chains to the seabed.

A complex design allows them to deftly handle liquid cargo, such as crude oil and petroleum products, from gigantic seafaring oil tankers, especially a VLCC (very large crude carrier), equalling five football fields, that transports imported crude oil from across the globe to Vadinar.

MT Netaji Subhas Bose was the inaugural tanker which was berthed on newly installed SPM-1 berth at IndianOil Vadinar Terminal on 24th August 1978. The 236 metre long tanker MT NS Bose was owned and operated by Shipping Corporation of India and brought on board Bombay High Crude oil

Onshore, Vadinar, IndianOil has a vast crude oil tank farm of 18 large tanks, with a total capacity of 1.22 MMT, located on a sprawling 260-acre site. The 2660 km long Salaya-Mathura Pipeline, which commences from Vadinar, is the lifeline connecting the three inland IndianOil refineries. First, the main pipeline branches off at Viramgam in Gujarat, through a smaller pipeline, to deliver crude oil to Koyali Refinery in Baroda. Further, the pipeline branches off at Chaksu in Rajasthan to Mathura (Uttar Pradesh) and Panipat (Haryana) Refineries. IndianOil also has a crude oil storage tank farm in Viramgam, Gujarat and another storage tank farm at Chaksu, which is utilized as per need.



Graphic showing the Single Point Mooring system which is the most popular way of unloading imported crude oil from VLCC.

- 18 Crude Oil Tanks- each of 85000 KL capacity / 79.5m diameter x 18.1m height
- 3 Fire water tanks- each of 12000 KL capacity / 32m diameter x 16.5m height
- Tank SS-01 to SS-10 were commissioned in year 1978-82
- Tank SS-11,12,12A were commissioned in year 1993-94
- Tank SS-14 to SS-18 were commissioned in year 2013-14
- Tanks are divided into EVEN series (SS-02,04,06,08,10), ODD series (SS-01,03,05,07,09), MCO series (SS11,12,12A) and New Tank Farm (SS-14,15,16,17,18)

A view of Vadinar Crude Oil Terminal (storage tanks)

SPM at Paradip

On the East Coast, Pipelines Division owns and operates one of the largest offshore oil terminals in India, comprising of three Single Point Mooring System, for unloading crude oil tankers for supplying of crude oil to IndianOil Refineries in the eastern part of the country. The first SPM was commissioned on 28th December 2008 Around 40% of annual requirement of Crude oil for our refineries is being met through this Energy Gateway of Eastern India. The crude oil unloaded through the system is being stored in 20 tanks of 60000 KL each at Pipeline terminal for further transportation and processing at our refineries in Haldia, Barauni, Bongaigaon and partly for Guwahati refinery through 30" Paradip Haldia Barauni Pipeline. The crude through the SPM system also meets the requirement of IndianOil's most modern and complex Paradip refinery using 18 tanks of 60000 KL each at Paradip refinery.

Very Large Crude oil Carrier (VLCC)

North Oil Jetty at Paradip

- PARADIP, the largest tank farm of IndianOil in terms of area
- 20 floating roof tanks of 60,000 KL each.
- Out of the 20 tanks, 12 tanks are connected for Direct AVU feeding of PARADIP refinery
- Crude oil received in these tanks are pumped to East Coast refineries through Paradip Haldia Barauni Pipeline

A view of Paradip tank farm area

SPM system at Paradip are CALM buoy comprises a cylindrical buoy body of approximately 11.0 m diameter and 5.2 m height, from the bottom of the hull to the top deck level. Three SPM systems installed off Paradip port in the Bay of Bengal are at a distance of 22 km from the shore. Our SPM terminal is designed and constructed for unloading of crude oil and are installed at a depth of 32 meters. The SPM Terminal System is designed to provide secure moorings for tankers of up to 320,000 DWT. The CALM system is a mooring system suitable for the open sea, which enables a tanker to weathervane around a single point mooring in response to wind, current and wave actions, while it continues offloading operations. Using the CALM system, a vessel can remain moored and continue cargo transfer operations in conditions that would compel a conventionally moored tanker to vacate its berth.

Description	Paradip	Vadinar
No of SPMs	3	2 + 1 spare buoy
Size of Offshore Line	48”	42”
Total Length - Sub Sea Pipelines	92 km	25 km
Year of Commissioning	SPM-I : 2008	SPM-I : 1978 SPM-II : 1997
	SPM-II : 2012	
	SPM-III: 2013	

Lifting in progress of Extended Portion of Pipeline for Route at Paradip

SPM infrastructure

Paradip PLEM being lowered to Sea

Welding is in progress at Paradip

Master of the ship welcoming Chairman aboard the MT Yio

6000th Crude Oil Tanker
at IndianOil Vadinar

Chairman lauds the Spirit of Vadinar as IndianOil Vadinar berths the 6000th crude vessel - MT Yio

On a momentous day when Western Region Pipelines (WRPL), Vadinar reached a historic milestone with the berthing of its 6000th tanker, Mr S M Vaidya, Chairman, saluted the indomitable spirit of IOCians of Vadinar who have quietly but significantly contributed to the energy security of the nation for over four decades since its commissioning on August 24, 1978. Addressing a vibrant gathering of IOCians, in the presence of Mr D S Nanaware, Director (Pipelines) and other important stakeholders, Mr Vaidya highlighted the role of Vadinar and other energy gateways like Mundra and Paradip that play a pivotal role in enabling IndianOil to fulfill its obligations towards meeting 50% of the petroleum demand of the country.

Saluting the Spirit of IndianOil Vadinar aboard the 6000th tanker MT Yio

On the morning of October 17, 2022, Chairman, accompanied by Director (Pipelines); Mr Chinmay Ghosh, ED, WRPL, and other senior officials boarded a tugboat Lotus star at the Vadinar jetty to travel to the MT Yio, the 330 metre-long VLCC, carrying 3 lakh kilo litres of Basrah crude from Iraq.

A memorable pic aboard MT Yio

A closer view of the Aft position of MT Yio

Chairman being explained the decanting process

The tank farm area on MT Yio

37

Aboard the MT Yio, the Chairman and IndianOil dignitaries were accorded a warm and cordial welcome by the Master of the MT Yio Captain, Mr Modak Laique Ali Mohammad, an Indian and his multi-national team. He and his team were all happy and proud for becoming the lucky 6000th tanker at IndianOil's Vadinar terminal, the first receiving SPM system of India. Amidst a lot of merriment, Mr Vaidya cut a special cake to mark the landmark event that also marks a cumulative receipt of over 735 MMT of crude at our Vadinar facility. The IndianOil delegation led by Chairman was taken around the key areas of the VLCC, and the entire unloading process was explained in detail by the concerned marine officials.

The day also took a nostalgic turn when Chairman spoke on a videocall with Mr. Paramjit Singh, the first undersea diver who in 1978 inspected MT Netaji Subhas Bose, the first vessel that berthed at IndianOil's SPM facility at Vadinar.

735 MMT Crude Oil handled at SPMs at Vadinar till bearthing MT Yio, 6000th Tanker.

Chairman on a videocall with Mr Paramjit Singh who received the first oil tanker in 1978

Mr. Paramjit Singh
Diving Suptd., SPM maintenance team

SPM system that received the 6000th tanker at Vadinar

Mr. S M Vaidya, Chairman, IndianOil and Mr. D S Nanaware, Director (Pipelines) with Team Vadinar

Crude Oil

Pipelines

- Salaya-Mathura Pipeline (SMPL): The 2660 km long pipeline originates from Salaya near Vadinar in Jamnagar district on the coast of Gujarat and feeds three IndianOil Refineries at Koyali in Gujarat, Mathura in Uttar Pradesh and Panipat in Haryana. Vadinar - Viramgam : 550 km, Viramgam - Koyali : 148 km, Viramgam - Chaksu : 1340 km, Chaksu - Mathura : 243 km, Chaksu - Panipat : 354 km, 25 km at Vadinar offshore

- Paradip-Haldia-Barauni Pipeline (PHBPL): The 1447 km long pipeline originates from Paradip in Odisha to bring crude oil to IndianOil's refineries at Haldia in West Bengal, Barauni in Bihar, Bongaigaon (through Oil India Limited's pipeline from Barauni) and part requirement of Guwahati by rake from Barauni Refinery in Assam. In addition, the pipeline system includes 92 long offshore and online pipeline from three Single Point Mooring systems to the tank farm in Paradip. In PHBPL, the sectionwise length are Paradip - Haldia : 338 km, Haldia - Barauni : 998 km, Paradip offshore : 92 km, Haldia Jetty line : 19 km.

S. No.	Pipeline	Year of Commissioning	Diameter (inch)	Length (km)	Capacity (MMTPA)
1	Salaya Mathura Pipeline	1978/2015/2016	42/28/24	2660	25
2	Mundra-Panipat Pipeline	1996/2006	28/22	1194	8.4
3	Paradip Haldia Barauni Pipeline	1999/2009/2012/ 2015/2016	48/36/30/18	1447	15.2
	Crude Oil Pipelines (Total)			**5301**	**48.60**
	Total IndianOil Pipelines (Liquid)			**14,962**	**96.55**

- Mundra - Panipat Pipeline (MPPL): 1194 km long pipeline was commissioned to transport crude oil from Mundra on the Gujarat coast to IndianOil's refinery at Panipat in Haryana. MPPL consists of a 74 km long pipeline from Mundra to Churwa which is the hook up point of MPPL to the existing system of Kandla-Panipat section of erstwhile Kandla-Bhatinda Pipeline near Gandhidham.

ATF Pipeline laying inside Chennai Airport

ATF Pipelines

IndianOil operates 5 dedicated pipelines for ATF positioning at Air Fueling Stations, these are CPCL Manali Refinery to Chennai Airport pipeline (Length 95 km), Bengaluru Terminal to Bengaluru Airport Pipeline (Length 36 km), Mourigram terminal to Kolkata Airport pipeline (Length 27 km) and Lucknow Terminal to Lucknow Airport pipeline (Length 6 km). In addition to these there is a dedicated cross country ATF pipelines for positioning ATF from Panipat Refinery to Delhi Airport pipeline (Length 111 km) and ATF along with other white oil products is also transported through ten other multi-product cross country pipelines namely Koyali-Ahmedabad Pipeline, Koyali-Sanganer Pipeline, Koyali-Ratlam Pipeline, Panipat-Ambala-Jalandhar Pipeline, Mathura-Delhi Pipeline, Paradip-Raipur-Ranchi Pipeline, Haldia-Mourigram-Rajbandh Pipeline, Haldia-Barauni pipeline, Chennai-Trichy-Madurai Pipeline and Chennai-Bengaluru Pipeline. More dedicated ATF pipelines are also under construction for Bhubaneshwar airport and Mumbai airport.

ATF Seperator Filter at PRRPL, Raipur

ATF Seperator Filter at NRPL, Bijwasan

LPG

Pipelines

IndianOil owns two cross-country LPG pipelines, namely Panipat-Jalandhar Pipeline (Length 280 km) and Paradip-Haldia-Barauni-Motihari Pipeline (Length 1468 km). Panipat-Jalandhar Pipeline, commissioned in the year 2008, is the first LPG pipeline of IndianOil, for supplying LPG from Panipat Refinery to Nabha and Jalandhar terminals in Punjab. Section of Paradip-Haldia-Barauni-Motihari LPG Pipeline was initially commissioned in the year 2017, with LPG input facility from Paradip Refinery, Haldia Refinery and IPPL Haldia with delivery terminals at Balasore, Haldia, Budge-Budge, Kalyani and Durgapur. The pipeline is now extended for delivery at Banka and Patna. This pipeline would soon be delivering LPG to Muzaffarpur and Motihari plants with commissioning of the remaining sections.

LPG Delivery Station, PJPLNabha

LPG Delivery Station, PJPLNabha

R-LNG at Ennore

R-LNG
Pipelines

ETBPNMTPL - Longest Gas Pipeline

- Pipelines Division has also ventured into Gas Pipelines also in a big way. Dadri-Panipat Regasified Liquified Natural Gas (R-LNG) Spur Pipeline (DPPL), a 30-inch diameter, 141 km long spur line from the terminal of GAIL's pipeline network at Dadri in Uttar Pradesh to Panipat Refinery for the supply of R-LNG was commissioned in 2010. It also supplies R-LNG to Panipat Refinery & Naphtha Cracker Plant, National Fertilizer Limited, Panipat, Micro-Polypet and NTPC Dadri.

- Ennore-Tuticorin-Bengaluru R-LNG Pipeline (ETBPL) is partly commissioned. Ennore Manali section of ETBPL was commissioned in 2019, whereas Ennore to IP-101 and SV-103 (Thiruvallur) to Bengaluru receipt terminal along with associated spur lines got commissioned in 2022. The pipeline supplies R-LNG to Chennai Petroleum Corporation Limited, Tamil Nadu Petrochemical Limited, Madras Fertiliser Limited & Manali Petrochemical Limited.

R-LNG at Ennore

Pipeline Infrastructure including Pump Shed, Tank Farms, Piping

Pipelines Ahead

To meet India's growing energy demand, IndianOil is creating additional refining capacity involving expansion of some of the existing Refineries and setting-up green field Refinery near Chennai. To meet the additional crude oil demand of refineries and to evacuate the products in an efficient, reliable, and cost-effective manner, Pipeline infrastructure will be required. Cross-country pipelines are globally recognized as the safest, cost-effective, energy-efficient, and environment-friendly mode for transportation of crude oil and petroleum products.

As a pioneer in pipelines in the country, IndianOil is presently managing one of the world's largest oil pipeline networks. Currently, Pipelines Division is operating and maintaining more than 17,000 km long network of pipelines with an installed capacity of 55.4 MMTPA for products, 48.6 MMTPS for crude oil and 48.7 MMSCMD for natural gas.

Existing pipeline network provide connectivity to about 48% of IndianOil Marketing Depots, 40% of LPG Bottling plants and 5 major airports apart from feeding crude oil requirement of all Refineries. The pipeline network transports about 60% of refinery outputs that is likely to increase to 65% post commissioning of ongoing pipelines projects. Further, to increase this share to 80%, about 7000 km of product pipelines with 25 MMTPA capacity is planned during the next 10 years. Considering expected growth in Aviation sector, dedicated ATF pipelines to connect major airports are also planned.

IndianOil is expanding its Natural Gas pipeline network to meet the ambitious target of GoI for increasing Natural Gas share in primary energy mix to15% by 2030 from 6.3% currently. Apart from developing network in Tamil Nadu and Karnataka, Division plans to expand further across India with 3000 km of natural gas pipelines having a capacity of 30 MMSCMD. As part of IndianOil's concerted efforts to expand the gas business across the country, CGD networks are being created to emerge as a dominant player in the CGD market. Roadmap for conversion of few existing petroleum product pipelines to Natural Gas service has also been developed.

As a part of IndianOil's digital drive, Pipelines Division has made great strides by digitizing its entire O&M data which are being centrally monitored and analyzed. Based on this data, IndianOil has been successfully maintaining the reliability of its aging pipelines some of which are more than 5 decades old.

To leverage the vast experience and expertise in engineering, design, construction, O&M of various hydrocarbon pipelines, efforts are being undertaken to emerge as a reputed EPMC service provider.

Hydrogen is considered as the Fuel of the future which will be game-changer for creating the carbon-neutral societies of tomorrow. Pipeline Division is aggressively venturing into the field of Hydrogen and readying its infrastructure for transportation of Hydrogen through cross-country pipelines. Such initiatives would ensure to reduce carbon footprint and contribute towards achieving IndianOil's Net Zero target by 2046.

India's First

Transnational Pipeline

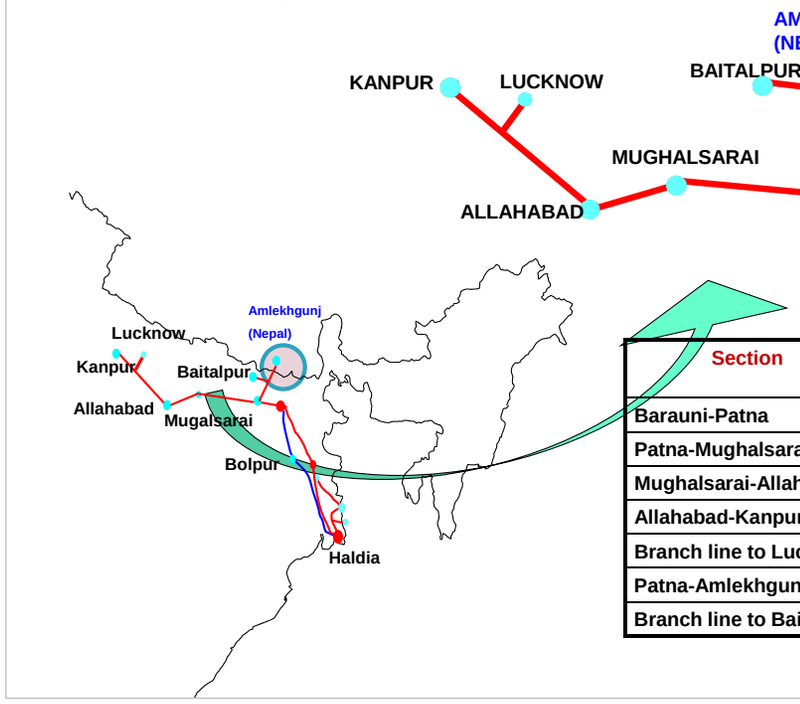
Prime Minister, Mr Narendra Modi and Prime Minister, Mr KP Sharma Oli jointly inaugurated the Motihari - Amlekhgunj petroleum pipeline on 10-9-2019.

Speaking on the occasion, Prime Minister Oli expressed appreciation for early implementation of this important connectivity project, completed much ahead of schedule.

During the inauguration, Prime Minister Modi said that the 69-km Motihari-Amlekhgunj pipeline, having a capacity of 2 million metric ton per annum, will provide cleaner petroleum products at affordable cost to the people of Nepal. He welcomed the announcement made by Prime Minister Oli to reduce the price of petroleum products.

Prime Minister Modi noted that regular exchanges at highest political levels have laid down a forward looking agenda for expanding India-Nepal partnership. He expressed confidence that bilateral relations between India and Nepal will continue to further deepen and expand across diverse sectors.

First Transnational Pipeline



Section	Dia (inch)	Length (km)
Barauni-Patna	20/12	221
Patna-Mughalsarai	12	209
Mughalsarai-Allahabad	12	162
Allahabad-Kanpur	12	197
Branch line to Lucknow	12	68
Patna-Amlekhgunj	12	268
Branch line to Baitalpur	10	102

- This pipeline is India's first transnational oil pipeline.
- The Motihari - Amlekhgunj Pipeline was built by IndianOil and commissioned on 19.7.2019 in just 15 months.
- Completed 8 months ahead of schedule the pipe was built at a cost ₹324 crore. 36 km of the 69 km pipeline is within Nepal.
- The pipeline with a capacity of 2 MMTPA will transport fuel from Barauni refinery to Amalekhgunj in Nepal, from Motihari, near Raxaul in Bihar.
- The pipeline has considerably reduced the cost of transporting fuel to landlocked Nepal from India and has enhanced the energy security of Nepal. The project will also help deepen India-Nepal Bilateral Relationship.

Handing over first sample from the Motihari - Amlekhganj Pipeline

Major

Ongoing Projects

In a dynamic business environment, future of any organization is dependent on effective execution of its strategic growth plans. In order to expand our distribution and logistics network, several large projects are in the completion stage. Timely completion of these projects within the approved cost is of utmost importance for leveraging the capital deployed and giving the Corporation an edge over the competitors through cost-effective positioning of products. IndianOil Pipelines is endeavouring to do everything needed to complete the ongoing projects and cross the milestone of 20,000 km by March 2023. As IndianOil has already planned refinery projects to increase its refining capacity, we at Pipelines are preparing to expand our network and capacity commensurate with the expansion plans of the Refineries Division.

Lowering of Pipelines

As on 1st January, 2023

S. No.	Pipeline	Length (km)	Capacity (MMTPA)
Ongoing Products Pipelines Projects Excluding LPG			
1	Vijayawada-Hyderabad section of Paradip-Hyderabad Pipeline	254	0.00
2	Koyali-Ahmednagar-Solapur Pipeline	747	5.00
3	Conversion of 18" Crude oil Pipeline to Product Pipeline*	516	3.40
4	Paradip-Somnathpur-Haldia Product Pipeline	344	4.60
5	Product pipeline from CBR to Asanur	139	4.50
6	ATF Pipeline Jatni terminal to Bhubneswar AFS	19	0.12
7	POL Pipelines in Common Corridor Pipelines-Chennai	48	0.00
8	Re-routing of BKPL for connectivity to proposed terminal at Mirzapur	12	0.00
9	Branch pipeline on PRRPL to Meramandalli CUF	37	1.00
10	ATF Pipeline from JNPT to Navi Mumbai International Airport	22	4.45
Total (Products Pipelines Excluding LPG)		**2138**	**23.07**
Ongoing LPG Pipelines Projects			
1	Hathidah-Muzaffarpur section of PHDPL-Aug & extension up to Patna and Muzaffarpur	129	0.00
2	Muzaffarpur Motihari LPG Pipeline	107	1.45
Total (LPG Pipelines)		**236**	**1.45**
Ongoing Crude Pipeline Projects			
1	Augmentation of PHBPL and laying of 30" Haldia- Barauni Crude Oil Pipeline	517	5.20
2	Augmentation of SMPL crude oil pipeline systems for J-18	0	10.00
3	New Mundra Panipat Crude Oil Pipeline for P-25	1033	17.50
Total Crude Pipelines		**1550**	**32.70**
Ongoing Gas Pipelines Projects			
1	Ennore-Thiruvallur-Bengaluru-Puducherry-Nagapattinam-Madurai-Tuticorin Pipeline	1159	1 MMSCMD
Total Gas pipelines		**1159**	**1 MMSCMD**
Pipeline Projects Under Consideration			
1	Guwahati-Silchar Imphal Pipeline	551	1.50
2	Extension of Asanur-Sankari Section of CTMPL up to Irugur	120	0.00
3	Devangonthi-Chitradurga Pipeline	232	1.00
Summary			
Ongoing Liquid and Gas Pipeline Projects			
1	**Total Crude Oil Pipeline**	**1550**	**32.7 MMTPA**
2	**Total Produts Pipeline including LPG**	**2374**	**24.52 MMTPA**
3	**Total Gas Pipeline Projects**	**1159**	**1 MMSCMD**

** Effective reduction in equivalent crude oil pipeline length.*

Horizontal Directional Drilling (HDD)

Construction

Construction is the most visible core function of IndianOil Pipelines. Over the years this function has helped build our vast network of crude, product and gas pipelines. Adoption of changes in construction technology have been adopted regularly by IndianOil and has sustained our leadership position.

We are now increasingly using the Horizontal Directional Drilling (HDD) technique which greatly reduces bottlenecks while laying petroleum pipelines. We were the first Indian company to use HDD technology in liquid hydrocarbon in 1994 on the Kandla Bhatinda Pipeline. HDD involves the use of a directional drilling machine, associated attachments and accessories to accurately drill along the chosen bore path and back ream the required pipe.

Transportation of Pipes

Trenching in progress

Mainline welding in progress

Under HDD technique for river crossings, the pipelines are hauled well below the scour depth of the river. In the year 2019, under Paradip Hyderabad Pipeline (PHPL) Project, IndianOil Pipelines crossed the Godavari River through HDD Technique with highest ever total HDD length of 3.1 km. Semi-automatic technology is being used in the ETBPL Gas Pipeline Project and Automatic Welding will be used in the New Mundra Panipat Pipeline project.

Stringing in progress, Vijayawada

Lowering of pipeline in progress

The control methodology, with the implementation of the Supervisory Control and Data Acquisition System (SCADA) in the pipelines industry makes remote operation of the pipelines possible, requiring fewer manual interventions by automating man processes and enhancing the safety in the operation of the pipelines. Further modern leakage or pilferage detection systems have made the pipeline transportation even more reliable, safe and environment friendly.

Horizontal Directional Drilling (HDD) Rig

Mainline Lowering in Progress, Vijayawada

The introduction of Calliper Pigging or Electronic Geometric Pigging (EGP) has brought another point to be considered during construction. The many challenges that Pipelines Construction teams have to surmount are difficulty in land acquisition for RoU due to increase in population density leading to construction of houses/ industries coming up in the cultivation fields, stringent environmental norms and opposition from vested activists is another challenge. Our construction teams are like the infantry brigade as they bravely build the basic infrastructure of our pipelines system.

Mainline Lowering in Progress, Vijayawada

Pipelines Division started to improve the construction for a safer tomorrow with use of Technology, remotely harnessing efficiency and productivity to meet the demands of a roaring future.

- Pipelines shifted from field coating of bare pipes to plant coating of pipes which carried out in strict compliance of coating parameters that improved the quality of coating of mainline pipes
- It shifted from laying of pipelines across Roads through boring high precision Horizontal Directional Drilling (HDD) for its pipelines
- With further improvement in Technology, it started to use Intersect Horizontal Directional Drilling for critical crossings where there are high chances of collapse like in loose bolder mixed soils. In this case the HDD is carried out through 2 pilot holes from 2 sides with use of 2 drilling machines
- Remote operations of pipelines through the Control Methodology, with the implementation of the state-of-the-art Supervisory Control and Data Acquisition System (SCADA) Technology
- Pipelines further started confirming any dent or change in geometry of mainline pipe through use of Calliper Pigging or Electronic Geometric Pigging (EGP). This is carried out upon completion of Hydro-test of pipelines

Welded Section, Vijayawada

Pipe bending in progress

RoU Opening & Handling

For executing a cross country pipeline project emanating from Refineries/ import terminals to demand centres, Right of Use (RoU) of private land is acquired under Pipelines & Minerals Act 1962 for all pipeline construction activities for the transportation of petroleum/ minerals.

Subsequent to Detailed route & cadastral survey, Competent Authority (CA) nomination is done u/s (under section)-2 of PMP Act. through publication of Gazette. Details of land as per cadastral survey data is published in gazette u/s - 3(1) on recommendation of CA as intention of the Corporation to acquire the right of use of the land. All the concerned owners are given notice for the same and written objections, if any of the owner are invited within the period of 21 days from the date of notice serving. In case of complain, the CA carries out objection hearing and gives his verdict. For all plots where no objections are received or objections received have been heard and disposed by CA, CA recommends for acquiring RoU u/s - 6(1) of PMP Act 1962. Finally, all the land published under section 6(1) are declared as Right of Use (RoU) for carrying out construction of Petroleum Pipelines.

Negotitation with Villagers at RoW under SRPL in the presence of Distt. Administration

Operations

Operations Management is the core function in Oil & Gas Pipelines. Operations teams have to ensure continuous flow in our system. In IndianOil Pipelines we call it Aviral Pravah which is the core objective of each IndianOil Pipeliner.

Our operations people work quietly, efficiently conforming to all SOPs to deliver quality products safely to Refineries and refined products to our nationwide network of depots and terminals. From receipt of crude oil through our SPM systems in Vadinar, Mundra and Paradip to transporting it to our Refineries & then subsequently carrying the petroleum products to distribution points like depots and terminals and finally reaching the end consumer, IndianOil Pipeliners can take justifiable pride in their distinctive contribution in the overall logistic system of IndianOil.

Operations Performance

(MMT)

Throughput	2018-19	2019-20	2020-21	2021-22	2022-23 (Apr-Dec)
Product Pipelines	36.53	37.13	31.53	34.25	30.39
Crude Pipelines	51.33	47.43	44.03	48.53	39.66
Total	87.86	84.56	75.56	82.78	70.05

Control Room SERPL, Paradeep

On spec quality assurance is a passion with IndianOil Pipeliners

Operations team in Pipelines essentially by unifying data silos and leveraging their operational insights are always agile and alert to detect leaks and ensure continuous flow to promote more efficient and economical movement of hydrocarbons endeavouring higher pipeline throughputs with safety and environmental consciousness. Our goal is to enable agile, efficient and responsive operations. It is a matter of pride that our Operations team is always ahead of not only our competitors but also its own previous performance which is the hallmark of a leader.

Transmix Separator Plant at Mohanpura

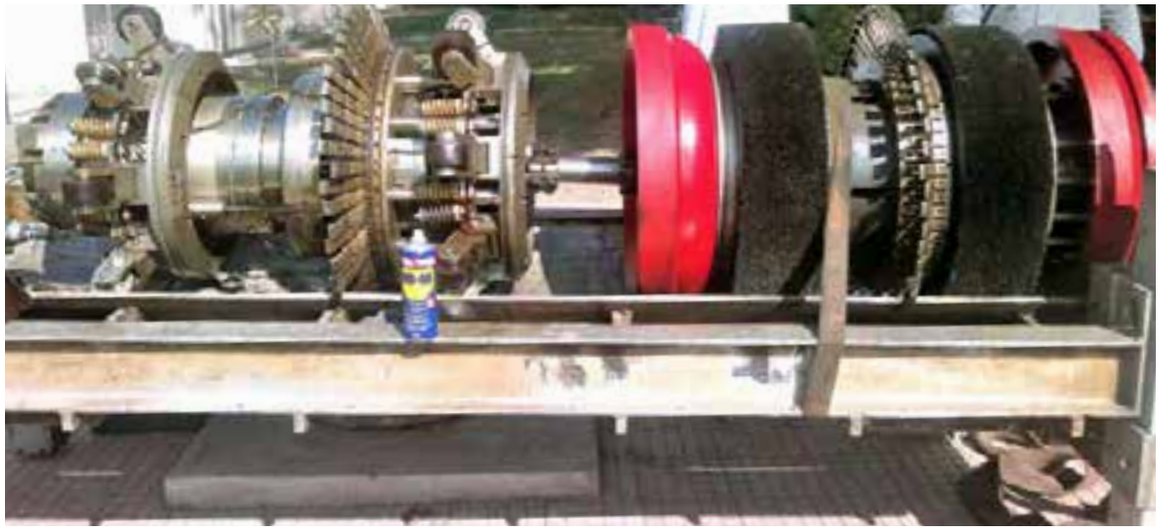
Pipelines Division has successfully installed and commissioned Transmix Separator Plant at Mohanpura, an indigenous technology developed by IOCL. This is the first such project in India that will have the capability to process the interface generated during transportation of High-Speed Diesel & Motor Spirit and separating it by fractional distillation to split the interface into near High Speed Diesel & near Motor Spirit for blending in base product at the same location itself. This is a first such project to be conceptualized and implemented.

Maintenance & Inspection

Use of Portadeck Mat in water logged area

With more than 17,000 km of cross-country pipeline network, 6 crude oil tank farms and 2 Single Point Mooring (SPM) terminals at Vadinar and Paradip, the IndianOil Pipelines manages a huge, diversified and complex infrastructure eco-system. Maintenance and Inspection function is responsible for Asset Integrity Management to ensure pipelines and equipment perform effectively, reliably and efficiently across their life cycle from design phase to decommissioning and replacement. If not done already, the processes are fast converging to Artificial Intelligence and Machine Learning in our endeavour towards automation. Our new Centralised Integrity Management System is a large data mine which helps to draw meaningful interpretations fast, while simultaneously conforming to HSE legislations.

All preventive and breakdown maintenance activities including spares management, mainline maintenance of our entire network including crossings with other utilities in the wake of wide spread infrastructure development and emergency handling preparedness Onshore and Offshore are also M&I responsibilities in addition to routine Operation and Maintenance of all Offshore activities. With continuous addition of new infrastructure to our enormous and diverse infrastructural base, it is imperative to keep our assets in shipshape condition. Almost 29% of our pipeline network is more than 25 years old and our first pipeline Guwahati-Siliguri Pipeline is in its 58th year of service, we are cautious with respect to operation and maintenance of our ageing assets. At the same time, we are moulding our maintenance practices in such a manner that it covers both new and old assets as per their specific maintenance philosophies.



Combo Intelligent PIG with AMFL & Caliper Technology

Mainline Engine Maintenance

Pipeline Intrusion Detection & Warning System (PIDWS)

Indian Oil Corporation Limited owns and operates a large network of oil and gas cross-country pipelines throughout the country. Despite having latest leak detection systems installed across the locations like Real Time Transient Model based models, IOCL has continuously been witnessing a number of pilferages attempts across all its pipelines.

For all round protection & monitoring of large pipeline networks, the pipeline locations are equipped with RTTM based leak detection systems which are now gradually being complemented with PIDWS / NPW based system; PIDWS being a relatively newer concept as compared to RTTM & NPW based LDS models offers best efficiency in terms of prevention of such pilferage attempts.

PIDWS works on the principle of coherent reflection technique called Coherent Optical Time Domain Reflectometry (C-OTDR) in which a pulse of light is transmitted into an optical fibre which gets reflected back from points (impurities) along the entire length of the fibre. These reflections are caused by a phenomenon known as ‘Rayleigh backscatter’. The reflected pulses are then received back at the source end by an OTDR detector & analysed.

Coat & Wrap during mainline maintenance

Mainline engine

Weld Plus End Connector

The major highlighting features of PIDWS are:

- Display of Pipeline RoW
- Network over Google map
- Display of Alert/Alarm window including Historical events along with Time vs Chainage (Channel) event waterfall in GUI form for better understanding & analysis of PIDWS alerts.
- Audio alerts of PIDWS
- System Alerts/Alarms on dedicated headphones & Bass amplified audio systems.

PIDWS can also track and generate alerts for following activities:

a) Movement of Personnel / Machinery / Vehicle etc. along or across the RoW

b) Manual Digging over RoW

c) Mechanized operations of Heavy Machinery like drilling/digging etc.

Apart from these events/alarms of Vehicle movement, Personnel walking and other activities taking place in Pipeline RoW, PIDWS can also track other important events like:

a) Movement of Scrapper PIG.

b) Events of sudden Pressure drop (Generation of Negative Pressure Wave) & precise location of Pressure drop in the Pipeline can also be tracked by the system.

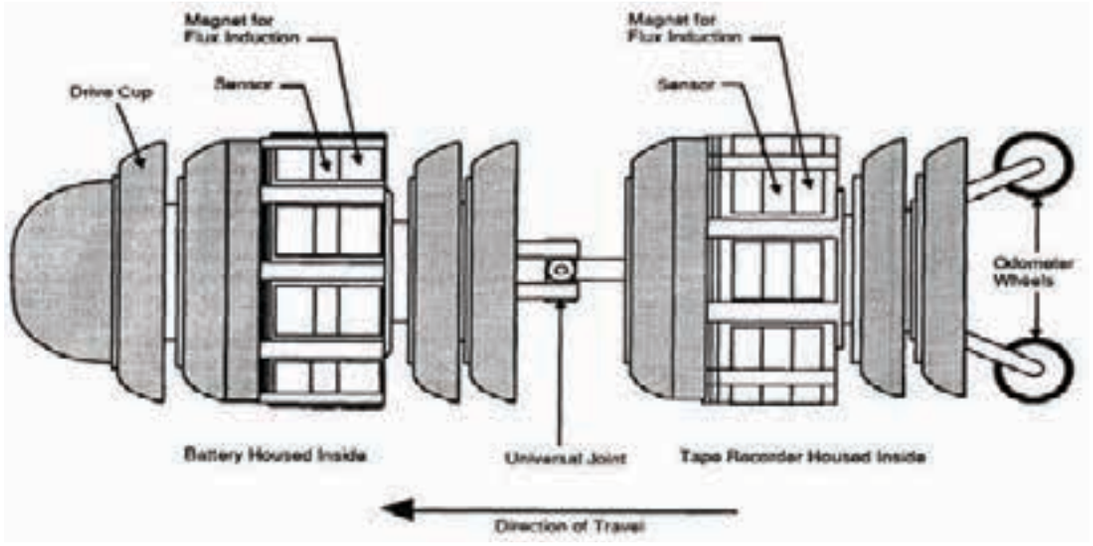
c) Speed of movement of personnel/vehicle/NPW/Scrapper Pig etc. along the ROW.

In addition to above system, Negative Pressure Wave based Leak Detection System and Pipeline Intrusion Detection System & Warning System have also been installed across various IOCL Pipeline locations for effective monitoring of Pipelines & prevention of such pilferage attempts.

Intelligent PIG

Evolution of Intelligent Pigging

Pipeline pigs are acronym for Pipeline Inspection Gauge. From the first pig run exclusively for pipeline cleaning to todays In-Line Inspection tools, pigs have come a long way. Smart pigs (in-line Inspection or intelligent pigs) carry ultrasonic or magnetic-flux leakage measuring instruments to monitor pipeline condition. The smart pigs have onboard battery, data recorder, electronics, inertial navigation system and odometer. Smart pigs are designed to identify metal loss, cracks, bore reduction, other flaws and features of pipeline.



Smart pig 1960's. Source : Tuboscope Inspection Company

Worlds first smart pig was introduced by Tuboscope in year 1965. It was named 'Linalog' metal loss tool. Since then there have been many advancements and a wide range of smart pigs are available in the market today.

IndianOil's first smart pig run was in year 1984-85 in HMRPL. The technology was primitive and was only able to indicate metal loss in terms of percentage of pipe wall thickness without discriminating between external or internal corrosion. Later in 90's, relatively advanced versions of smart pigs were run in 12"HMR, 24" VC(SMPL) and 42" Vadinar offshore pipeline.

IndianOil's first smart pig developed indigenously by its R&D team was run successfully in in 12" BKPL in year 2007.

The first generation smart pig - 12" IPIG tool developed by IOCL R&D

As on date, IOCL uses a variety of smart pigs viz Caliper pigs with inertial navigation system, Axial / Circumferential Magnetic Flux Leakage tools and Ultrasonic compression / shear wave tools.

Caliper tools used to detect bore reduction and other geometry related anomalies

Axial MFL tools used to detect metal loss anomalies in pipeline

Circumferential MFL tools used to detect axially oriented metal loss and lone seam crack like anomalies

Ultrasonic shear wave tool used to detect cracks and crack like anomalies in pipelines

Drone Surveillance

Oil and gas pipelines include crude oil pipelines, finished product pipelines and natural gas pipelines. The geographical span of oil and gas pipelines is large, and the total mileage of oil and gas pipelines continues to grow. The need to strengthen pipeline safety inspection and management is more urgent and therefore, the use of drones for inspection has gradually become an application trend in the international oil and gas industry.

Aside from collecting high-resolution images, drones carry technology such as gas-detection sensors or thermal cameras. These are used to ensure everything is working correctly. Thermographic cameras can detect if pipe insulation is thinning or damaged, so fixes can be applied before they rupture.

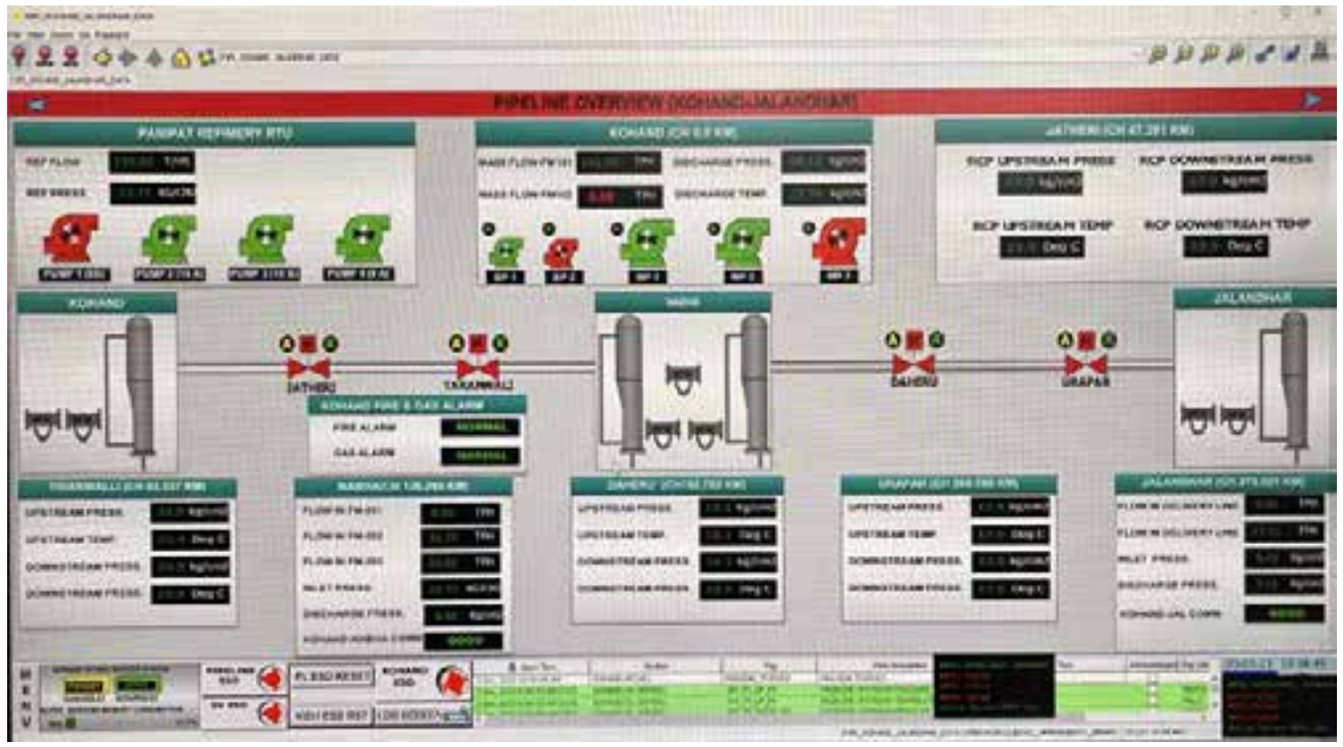
Drone surveillance

Drone surveillance

Communications & Systems

A robust and secure communication set up is of utmost importance to continuously monitor critical parameters of underground petroleum pipelines such as pressure, temperature, flow and density. In the initial years, IndianOil Pipelines used to rely on microwave-based frequency spectrum for monitoring all critical parameters, transmitting critical data to control centres for establishing dedicated communication among the various pipeline installations. Then came Optical Fibre Networks. IndianOil commissioned India's first Optical Fibre Cable (OFC) Network on its pipeline from Kandla (Gujarat) to Bhatinda (Punjab) in the year 1996. Optical fibre-based communication system offers humongous bandwidth and greater speed and data security by improving confidentiality and data integrity. It was a game changer for the industry.

Successful commissioning and operation of such a large Optical Fibre based communication system galvanized the attention towards data security in petroleum pipelines and brought in a revolution in perception of data transmission in India's Oil & Gas Industry. Till now, IndianOil has commissioned over 9000 km of OFC networks, a big feat by any standards. Indian Oil Corporation realises the importance of state-of-the- art communications and is continuously leveraging latest technologies.



Supervisory Control and Data Acquisition (SCADA) Systems

These are used for controlling, monitoring, and analyzing industrial devices and processes. The system consists of both software and hardware components and enables remote and on-site gathering of data from the industrial equipment. In that way, person seating in control room can remotely manage industrial/process sites including site at remote locations i.e. it mainly allows to:

- Control industrial processes locally or at remote locations
- Monitor, gather, and process real-time data
- Directly interact with devices such as sensors, valves, pumps, motors, and more through human-machine interface (HMI) software
- Record events into a log file

The basic SCADA architecture begins with programmable logic controllers (PLCs) or remote terminal units (RTUs). PLCs and RTUs are microcomputers that communicate with an array of objects such as factory machines, HMIs, sensors, and end devices, and then route the information from those objects to computers with SCADA software. The SCADA software processes, distributes, and displays the data, helping operators and other employees analyze the data and make important decisions.

City Gas

Distribution

IndianOil has entered the CGD domain to tap its huge potential. Piped Natural Gas has many advantages over LPG so domestic households are moving towards PNG which provides continuous fuel supply.

With the phasing out of fuels like Furnace Oil and HSD etc larger industrial units are also preferring PNG. In the Transport sector, CNG is becoming increasingly popular and hence it is being scaled up by IndianOil in a significant way.

CNG Fueling

IndianOil's journey in CGD Business

2005
Green Gas Ltd., a JV was formed with GAIL for Lucknow & Agra GA

2008
Formation of IOAGPL

2013
2nd Round Bidding
Allahabad & Chandigarh GA awarded to IOAGPL

2015
4th Round Bidding
Panipat, Daman & Ernakulam GA Awarded to IOAGPL

2015
5th Round Bidding
Udham Singh Nagar & Dharwad GA awarded to IOAGPL

2017
8th Round Bidding
South Goa & Bulandshahr GA Awarded to IOAGPL

2018
9th Round Bidding & IndianOil's Standalone entry in the CGD business
IOCL secured 8 GAs on its own and 11 GAs through JVCs

2019
10th Round Bidding
9 GAs awarded to IOCL and 1 GA to IOAGPL

2022
11th Round Bidding
IOCL bags 9 high potential GAs and establishes itself as a dominant player in CGD business

IndianOil's Journey in CGD Business:

- **2018**
  - IndianOil entered into CGD business on standalone basis
  - IndianOil was awarded 8 Geographical Areas in 6 States:

1	Aurangabad, Kaimur & Rohtas Districts	Bihar
2	Bokaro, Hazaribagh & Ramgarh Districts	Jharkhand
3	Rewa District	Madhya Pradesh
4	Guna District	
5	Jagtial, Peddapalle, Karimnagar & Rajanna Sircilla Districts	Telangana
6	Coimbatore District	Tamil Nadu
7	Salem District	
8	Srikakulam, Visakhapatnam & Vizianagarm Districts	Andhra Pradesh

  - IOAGPL won 11 GAs

- **2019**
  - IndianOil was awarded 9 GAs, in 4 States:

1	Araria, Purnia, Katihar and Kishanganj Districts	Bihar
2	Arwal, Jehanabad, Bhojpur and Buxar Districts	
3	Khagaria, Saharsa and Madhepura Districts	
4	Lakhisarai, Munger and Bhagalpur Districts	
5	Muzaffarpur, Vaishali, Saran and Samastipur Districts	
6	Nawada and Koderma Districts	Bihar & Jharkhand
7	Sheikhpura, Jamui and Deoghar Districts	
8	Ashoknagar	Madhya Pradesh
9	Morena	

  - IOAGPL was awarded 1 GA

- **2021-22**
  - IndianOil won 9 GAs in 7 States:

1	Kurnool, Guntur, and Prakasam districts	Andhra Pradesh
2	Jammu, Udhampur, Reasi, Samba and Kathua districts	UT of Jammu & Kashmir
3	Beed, Jalgaon and Jalna districts	Maharashtra
4	Pathankot	Punjab
5	Jhunjhunu, Sikar and Nagaur districts	Rajasthan
6	Dharmapuri and Krishnagiri districts	Tamil Nadu
7	Madurai, Theni and Virudhnagar districts	
8	Kanyakumari, Thoothukudi and Tiruneveli Kattabo districts	
9	East Mednipore, West Mednipore and Jhargram districts	West Bengal

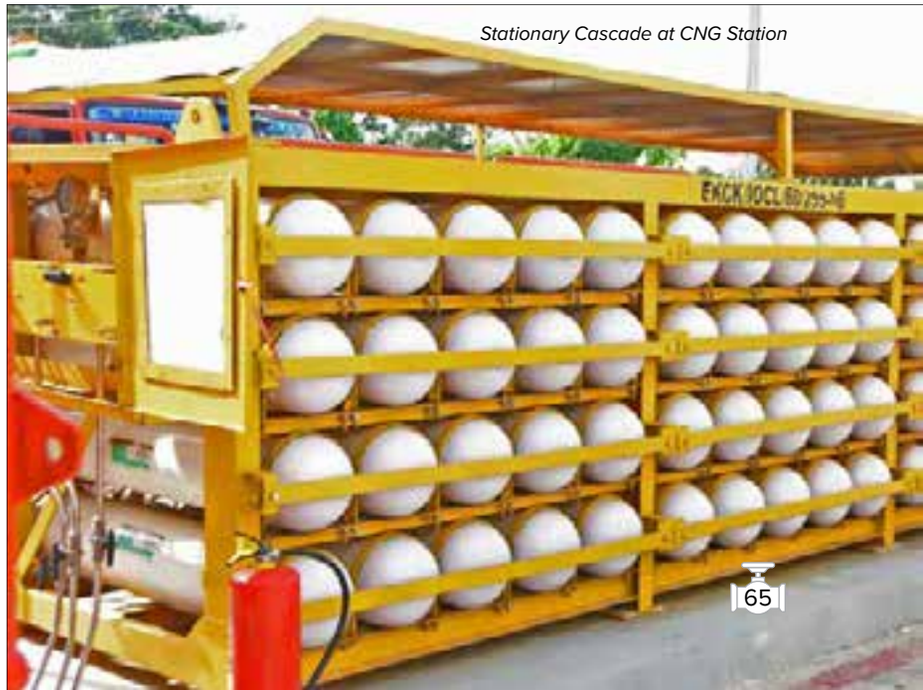
  - JVs did not participate in bidding
  - Cumulative GAs authrorized to IndianOil cover 12.3% area of country, 20.6% of population and demand share of 19.8%

PNG customer of Dehri Sub division- District Rohtas

CNG Unloading at Daughter Booster Station, Arwal

CNG-Future Plans

- In all the 26 GAs authorized to IndianOil, IndianOil shall be investing approx. 14000 Crore for development of CGD infrastructure, including setting up of City Gate Stations, laying of Steel & MDPE pipeline networks, setting up CNG Stations and providing PNG connections, over a period of 8 years.
- By 2030, IndianOil targets to set-up approx. 2800 CNG Stations, provide 2.5 Core PND-Domestic connections and lay approx. 30,000 Inch-Km of steel pipelines.



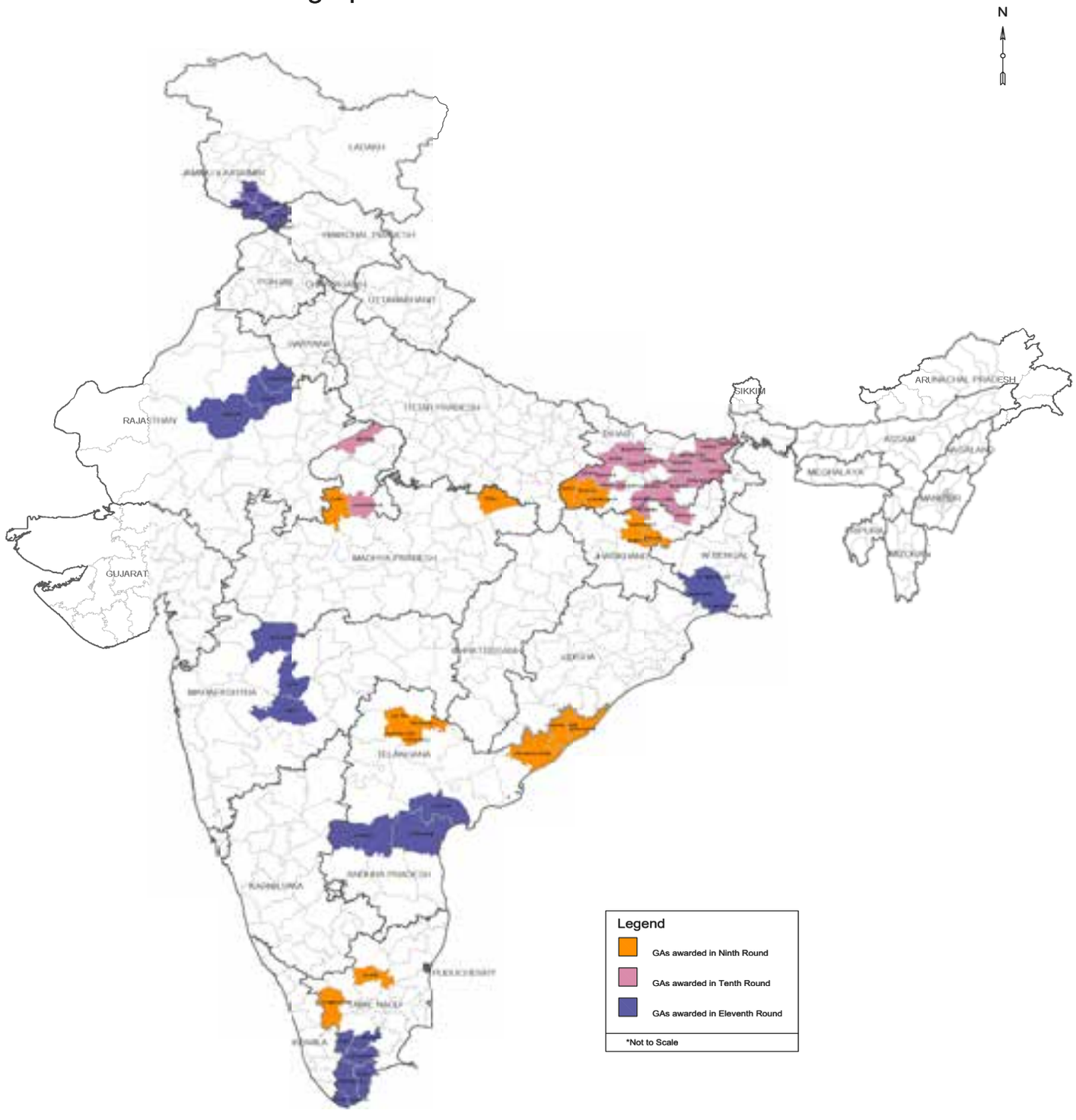
Stationary Cascade at CNG Station

CGS, Coimbatore

CGD Sales & Infrastructure

- Cumulative number of CNG stations reached to 111 and more than 11000 Inch-Km steel pipeline laid
- 41 CNG Stations commissioned
- CNG Sale has shown continuous growth and has reached to 16,141 MT (till 31.12.2022)

Geographical Areas Under IOCL



EPMC

Consultancy

IndianOil Pipelines has been a pioneer in best engineering and design practices across the entire spectrum of hydrocarbon pipelines and our expertise is widely recognized in the industry and we have been providing EPMC consultancy to other divisions of IndianOil and to other companies like CPCL, GIGL (GSPL India Gasnet Limited). At present, M/S IHB which is building the world's longest LPG Pipeline from Kandla to Gorakhpur is also being provided consultancy by IndianOil Pipelines.

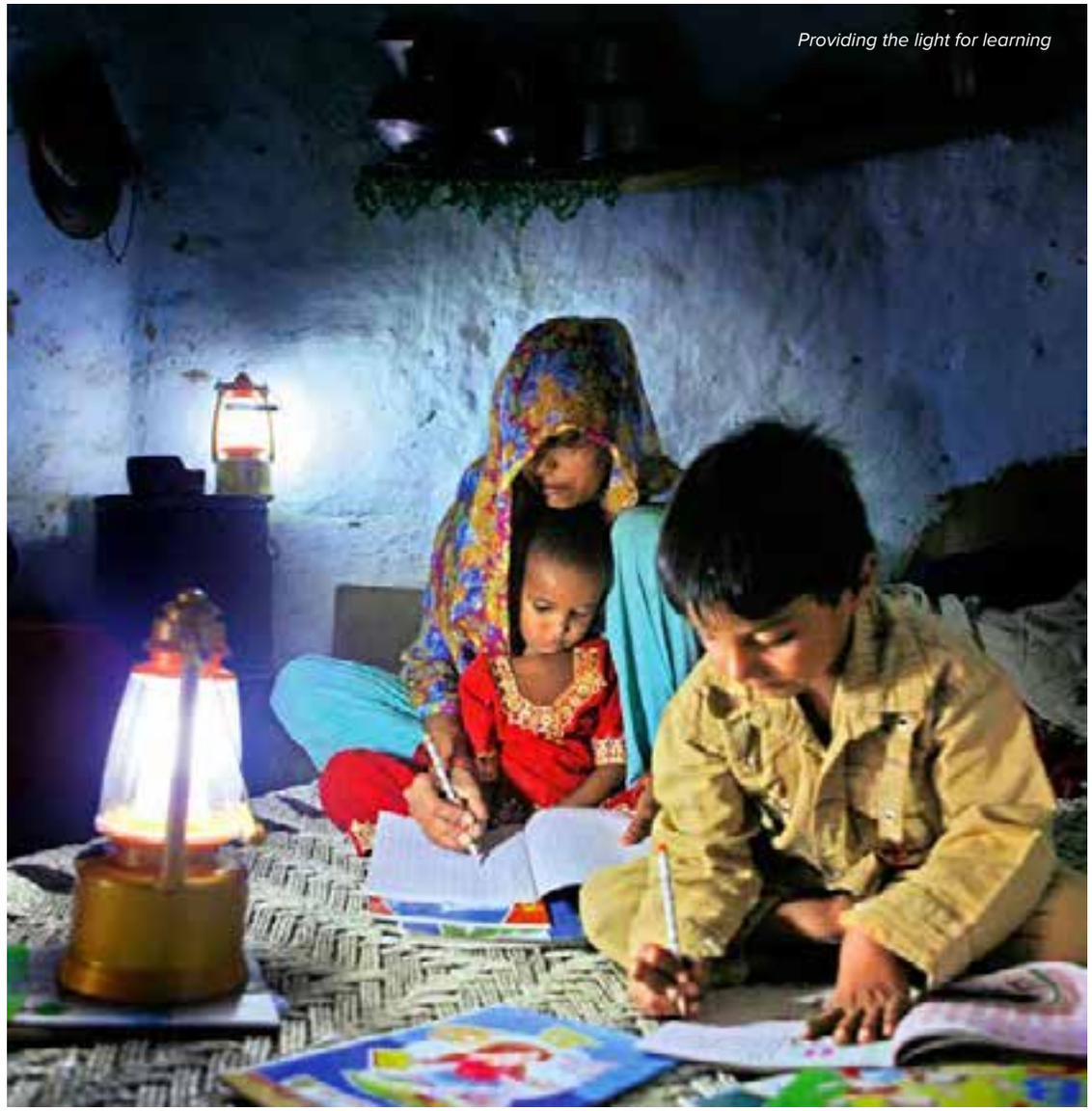
We are a one stop solution manager, from conceptualisation till commissioning of a project with a rich experience of building more than 55 cross country pipelines worth over ₹ 10,000 crore. We have experience of designing and laying Pipelines across all kinds of terrains be it rivers, rocks, sand marsh or mountains.

Enormous talent pool with tremendous knowledge base and off the chart execution capabilities. At any given time, more than 500 executives are involved in EPMC activities to ensure a rich talent pool of healthy and dynamic blend of engineers with experience in Project/Operations/ Maintenance roles.

Director (Pipelines), Mr. DS Nanaware releasing the EPMC Brochure with his Senior Team

Corporate

Social Responsibility



Providing the light for learning

IndianOil Pipelines – CSR Journey

IndianOil Pipelines have been serving the nation by transporting and distributing the energy needs to the nook and corner of the country since 1964. By statute the oil pipelines traverses along routes avoiding human habitations, environmentally sensitive locations, and other public utility areas. This takes cross-country pipelines always pass through very remote parts of interior India. As a socially responsible corporate, IndianOil, Pipelines Division has been involved in Community Development activities in those villages during construction / operations of the pipelines.

The farmers / villagers along the Pipeline Right of Way are considered our stake holders, and IndianOil relentlessly involved in social upliftment activities along pipeline Right of Way since inception. Providing drinking water facilities, school infrastructure and sanitation facilities had been carried out across India since then, though not in a structured form. At few locations Schools have been constructed owing to the large distance to the nearest towns. Though IndianOil students got benefitted, indirectly many outside students got benefitted through these schemes.

These social schemes have been run as welfare schemes partly and later as a Community Development projects. But these activities were carried out on case-to-case basis as a Corporate Philanthropy.

Mandatory CSR

Later in 2010, a major shift happened in streamlining Corporate Social Responsibility activities under DPE (Department of Public Enterprises) guidelines, mandating PSUs to take up CSR activities through NGOs (Trusts / Societies and other agencies).

IndianOil too has started taking up CSR activities in project mode through need assessment, which has changed the way CSR projects are implemented. As per the DPE guidelines, the end beneficiary of our CSR programs is selected in a such a way that they are from under privileged sections of society. Since then, the CSR activities have been monitored and reported to various Govt. authorities.

Later through the promulgation of Companies Act 2013, the Corporate Social Responsibility has been brought under the Section 135 of Companies Act. The Companies Act 2013 is a legislation which officially embarked on one of the worlds largest experiments of introducing the concept of CSR as a mandatory provision. The inclusion of CSR is an attempt by the Government to engage businesses with the national development agenda.

School at Vadinar supported by IndianOil

Drinking Water project by Eastern Region Pipelines

The activities related to poverty alleviation, health, sanitation, education, skill development, women empowerment, social inclusion, drinking water, art & culture, animal welfare etc. are detailed in Schedule VII of the Act.

After 2015, Sustainable Development Goals (SDGs) are a call for action by all countries through UN framework. This required a concerted efforts from all countries to act on 17 targets with less than 10 years to reach the target i. e. 2030. Hence all global, local & people's social action shall align with the SDGs and CSR is no exception. IndianOil's CSR has been aligned with the SDGS, National Development Agenda and development of Aspirational Districts as allotted by NITI Ayog.

Pipeline Right of Way

IndianOil pipeline infrastructure has been growing every year and presently it has stretched for more than 15000 Km. The pipelines cross more than 170 districts in entire India. And there is huge requirement of holistic, impact-oriented projects along these remote villages. IndianOil Pipelines Division has been striving to bring change in the grassroots level.

The challenge is to reach out to as many villages as possible with the right kind of activity for the right population with right quantum which is sustainable and scalable. IndianOil Pipelines has taken up noteworthy CSR projects which has impacted lives of the beneficiaries across Indian.

CSR flagship project Vidushi

Girl Child Education: (IndianOil Vidushi)

IndianOil Pipelines Division has taken up

a. With an objective to empower girls of economically weaker section by providing them specialized coaching and mentoring to succeed in JEE (Mains), JEE (Advanced) and other Central & State Engineering Examinations in India on merit cum means basis “IndianOil Vidushi Super 30 Girls” project was started in 2018-19.

b. Started with concept of fully residential coaching program for 30 girls, for a period of 5 years from 4 centers Bhubaneswar, Noida, Patna & Jaipur through classroom mode, but post pandemic the Vidushi project was to be converted to online mode from two centres Bhubaneswar & Jaipur keeping in view the safety & security of the students. The students are selected from 12 states.

“I am thankful to IOCL from the bottom of my heart for supporting and empowering us. Wherever we go, we ‘Vidushis’ always feel connected to brand IndianOil. Our lives have truly changed; IOCL not only provided us coaching for engineering examinations and the confidence to excel in life, but is also providing us scholarship during our graduation. Thank you IOCL!”

- Testimonial from a Vidushi

Integrated Pottery Development in Tiruvallur under IndianOil CSR

IndianOil partnered with IIT Madras and established a Common Facility Centre (CFC) for Integrated Pottery Development in Perumudivakkam village of Tiruvallur. The project was developed with technology from Rural Technology Action Group (RuTAG) of IIT Madras and was formulated in association with District Administration of Tiruvallur to provide better livelihoods to the potters of this region by integrating their traditional skills with modern technologies. Under the project, 82 participants from nearby villages have been extensively trained on adaption of innovative technology in red clay pottery. The CFC has been equipped with modern infrastructure like ball mill, pug mill, blunger, electric furnace, automatic potter's wheel etc. 16 villagers who got trained in the facility have set up their own enterprise or joined local pottery clusters to further their business. The technique of microwaveable pottery was also imparted to the trainees at the CFC.

Superior pottery work through technology & training

A small help group of potters at a production facility provided by IndianOil

Miyawaki Afforestation

a. Miyawaki Forest - a Japanese concept of urban afforestation by turning backyards into mini-forests, is a method of developing dense forests in small areas by planting a number of different types of native species of trees close together in a small pit with vital nutrients. The close plantation enriches the green cover and reinforces the richness of the land. This method would lead to develop a dense a green cover in urban areas and improve biodiversity. This forest can be developed in the areas as low as 500 Sqft.

b. IndianOil Pipelines Division has taken urban forests in the cities of Chennai, Madurai & Ghaziabad. In Delhi NCR first time ever Miyawaki afforestation has been taken by planting 2000 trees.

Miyawaki Forest at Madurai

Agriculture Project – Implementing Water Saving Technologies in Paddy Crop

Implementing Water Saving Technologies in 375 Hectares of Paddy crop through CSR has brought smiles on more than 400 farmers families in Villupuram District of Tamilnadu, wherein IndianOil Pipeline Division (SRPL) in association with Tamilnadu Agricultural University (TNAU) demonstrated and hand-held farmers to adopt new technologies (SRI Method, AWDI Method & DSR Method). This resulted in reduction of water consumption by 30%, increase in paddy yield by 20% and increase in income per crop by 20%. Total CSR spending was Rs. 54 Lakh for this project in 3 years period.

Best practices for best crop yield

CSR Intervention

	Before	After
Biochemical oxygen demand	16 mg/l	2 mg/l
Chemical oxygen demand	32 mg/l	12 mg/l
Water Turbidity	18 NTU	1 NTU

Cleaning of Bindu Sagar Lake with technology from ICT - Mumbai

Bindu Sagar Lake Cleaning

Focusing on water resource conservation, IndianOil Pipeline Division (SERPL) has undertaken the project Cleaning of Bindu Sagar Lake, which is one of the natural heritage and holy lakes in Old Bhubaneswar, through Institute of Chemical Technology, Mumbai-IndianOil Campus, Bhubaneswar (ICTM-IOCB) under its CSR ambit. The project, which dovetails GOI's Swachh Bharat Mission, is executed by IndianOil Pipelines Division. This CSR intervention is aimed at improving lake ecology, thereby adding to the aesthetic and tourism value.

ICT patented 'Hydrodynamic Cavitation Technology' is used to reduce Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) & microbial population in the water body.

Milestones of

IndianOil Pipelines

The 60's

During 1962-64, IndianOil built the country's first product pipeline from Guwahati Refinery to Siliguri Terminal. Commissioned in November 1964, it was the first petroleum product pipeline to be constructed east of the Suez Canal. The spurt of new refineries in the 60's speeded up pipeline development and three more product pipelines were completed. Koyali-Ahmedabad product Pipeline from Koyali Refinery to Sabarmati Terminal was commissioned in 1966; Barauni-Kanpur product Pipeline was also commissioned in 1966 and Haldia-Barauni product Pipeline was commissioned in 1967.

The 70's

- Haldia-Mourigram-Rajbandh product Pipeline was commissioned in 1972.
- India'a first cross-country crude oil pipeline, from Salaya to Mathura began in 1978.
- The first single-point mooring set up off in Vadinar, on the west coast for receipt of crude oil through ocean tankers was commissioned in 1978.

The 80's

- Salaya-Mathura Crude Pipeline commissioned on 25th March 1981.
- Mathura-Jalandhar product pipeline system commissioned in phases.
- Mathura-Delhi section, Delhi-Panipat section, Panipat-Ambala-Jalandhar Pipeline commissioned in 1982.

The 90's

- Kandla-Bhatinda product pipeline inaugurated in 1996.
- Koyali-Sanganer product Pipeline commissioned in 1996.
- Haldia- Barauni crude Pipeline commissioned in 1999.
- SPM-II commissioned at Vadinar in 1997.
- By 1990-2000, the Cross-country Pipeline network of IndianOil had expanded to over 6400 km.

The 21st Century

- Mathura-Tundla Pipeline commissioned in 2003.
- 12 Crude Oil tanks commissioned at Mundra during 2004-06.
- Panipat-Rewari Pipeline commissioned in 2004.
- Chennai-Trichy-Madurai Pipeline commissioned in 2005.
- IndianOil enters CGD business through JV mode. Green Gas Limited formed for Lucknow and Agra GAs.
- Koyali-Dahej Pipeline commissioned in 2006.
- Kandla Bhatinda product Pipeline repurposed as a crude pipeline and renamed as Mundra-Panipat Pipeline in 2006.
- Panipat-Jalandhar Pipeline, IndianOil's first LPG Pipeline commissioned in 2008.
- Chennai-Meenambakkam Pipeline, IndianOil's first ATF pipeline commissioned in 2008.
- SPM-I commissioned at Paradip in 2008 at Paradip (East Coast).
- Paradip-Haldia crude oil pipeline commissioned.

- Chennai-Bangalore Pipeline commissioned in 2010.
- Panipat-Bijwasan ATF Pipeline commissioned in 2010.
- IndianOil's Cross country Pipeline network of IndianOil crossed the magical figure of 10,000 km in 2009.

2010-2020

- SPM-II and SPM-III commissioned at Paradip in 2012 and 2013.
- IndianOil-Adani Gas Pvt. Ltd., another JV formed for CGD Business for Allahabad and Chandigarh GAs.
- Paradip-Raipur-Ranchi Pipeline commissioned in 2016.
- Paradip-Haldia-Durgapur LPG Pipeline commissioned in 2017.
- On 24-2-2019 Prime Minister of India laid the foundation stone of 2800 km Kandla- Gorakhpur LPG pipeline, which will directly feed 22 bottling plants enroute. It is being built by a JV of IndianOil, HPCL and BPCL and will be the longest LPG pipeline in the world.
- Indo-Nepal Motihari-Amlekhganj products pipeline, South Asia's first transnational pipeline was commissioned in July 2019, eight months ahead of schedule. It was inaugurated on 10-9-2019 in presence of the Prime Ministers of India & Nepal.
- First Benchmarking Study of Pipelines Division by M/s Solomon Associates, USA in 2018-19.
- IndianOil entered into CGD Business on its own, securing 7 GAs in 9th round of PNGRB's CGD bidding.
- IndianOil secures 10 GAs in 10th round of PNGRB's CGD bidding.

2020-2022

- The Pipelines Division crossed the milestone of 15,000 km in pipeline network length.
- Second Benchmarking Study of Pipelines Division by M/s Solomon Associates, USA in 2020-21,
- Prime Minister of India dedicates to the nation the Durgapur-Banka (193km) section of Paradip-Haldia-Durgapur Augmentation LPG project on 13-9-2020 and the 144 km Ramanthapuram-Tuticorin section of the ETBPNMTPL R-LNG Pipeline on 17.2.2021.
- Dahej-Koyali Natural Gas Pipeline (106 km) commissioned in Feb 2022.
- The Pipelines Division emerges as a big player in the City Gas Distribution Business by securing 9 out of 15 high potential GAs covering 33% of the total demand potential of the 11th Round of PNGRB bidding. Now, IndianOil along with its 2 JVs is present in 49 GAs and 105 districts spread across 21 States & UTs.
- Lucknow ATF Pipeline commissioned.
- IndianOil's 100th CNG station commissioned.
- Tundla- Gawaria Pipeline commissioned.

Towards a

Greener Future

Windfarm under Western Region Pipelines

21 MW Windmill installed in Gujarat in Western Region of Pipelines Division

In the year 2008, IndianOil had installed 14 windmills (M/s Suzlon make WTGs (Model S82)) each of 1.5MW capacity in three phases: Phase-1 (4.5 MW: S102, S106 & S107) commissioned in Dec'2008, Phase-2 (3.0 MW: S108 & S112) commissioned in Dec'2008 and Phase-3 (13.5 MW: S104, S113, S124, S127, S128, S129, S130, S132 & S137) commissioned in Jan'2009 at village Amaliara and Jangi Gujarat, the generated power of these Wind Mills are wheeled to different Pipeline installations located in Gujarat.

Windfarm under Southern Region Pipelines

Towards augmentation of its wind portfolio IndianOil has set up 48.3 MW wind project in Andhra Pradesh.

Total 23nos. Wind Energy Generators (S-88 make) were installed and commissioned with total Capacity of 48.3 MW in the years 2012-2014 comprising 10 nos. in Gandikota, Kadapa District and 13nos. in Vajrakarur, Anathapuram Dist. The project was executed through Pipeline Division and Operation & Maintenance is also being managed by Pipeline Division.

In FY 21-22, power generated in wind farm at AP, was 76.6 MU.

Out of 48.3 MW; 46.2 MW capacity has been registered for the sale of energy to the grid at predefined tariff (FIT mode) and remaining 2.1 MW capacity installed in Gandikota has been registered for captive power consumption at Chittoor Terminal of IndinaOil (CAPTIVE mode).

Harnessing Solar Energy

WRPL Rawara Plant: 5MW SPV Plant, Rawra, Rajasthan Commissioned in Jan-2012

30 KW SPV Plant at WRPL Gauridad

Solar Panels in SRPL Locations

Chairman, IndianOil reviewing progress of BS-VI

Successful Transition from BS-IV to BS-VI scenario

As per Government of India's guidelines, fuel grade in India was to be upgraded from BS-IV to BS-VI by 1st April 2020. Pipelines Division had geared-up for such a transition by revising SOPs, conducting trainings for field personals and following stringent norms in handling interface of multi-product pipelines with zero margin of error due to sulphur limits of maximum 10 ppm in MS and HSD. Due to Covid-19 lockdown from March 2020, the transition from BS-IV to BS-VI was a challenging task as there was availability of manpower was constrained and there were shutdowns in pipelines due to drop in market demand for petroleum products. Pipelines operating locations had successfully ensured smooth transition from BS-IV to BS-VI in such challenging times. In preparedness to the transition series of awareness programs were conducted for operations team. Close and meticulous monitoring and co-ordination were ensured during transition by conducting virtual operations audits in various pipelines. Such efforts had led to a smooth transition from BS-IV to BS-VI, ensuring on-spec delivery of products at all terminals throughout the country each time.

Coral Translocation

The ever increasing Energy Demand, pipelines enquired upgraded higher capacity pipelines with upgraded technologies to cater to these needs. Sometimes the path of oil pipelines can transverse sensitive ecological spaces in the Gulf of Kutchh at the very edge of the Gujrat central belt of Vadinar.

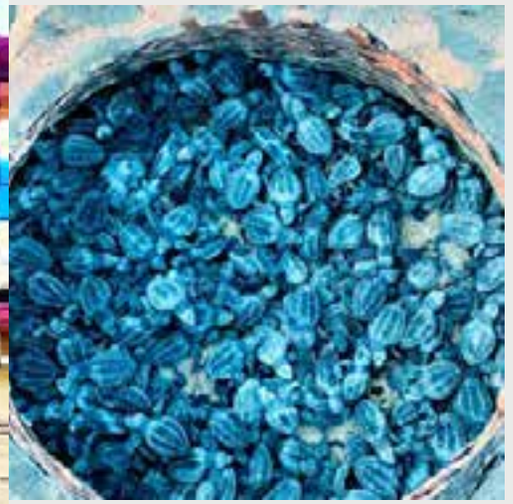
IndianOil Pipelines owns and operates two Single Point Mooring systems that operates from 1978. As the undersea pipelines were over 40 Years old, it was thought prudent to replace or build a new set of pipelines so that the offshore pipelines stay healthy and do not inadvertently harm the ecological health of the aura and flora in the marine national park.

The present coral translocation and rehab aition project remains one of the largest over undertaken in the country to protect rehab aition and monitor these highly sensitive speeds until they are fully established the translocated corals will be monitored for a period of four more years to ensure their continued growth and survival.

Forest authorities of helped us to get in touch with the scientists of Zoological Survey of India, who have extensive and in-depth knowledge of coral life in India. After the ZSI survey, the experts gave a report where they proposed to re-locate the precious coral life to another similar habitat without causing any damage to them.

Coral Translocation in progress at Vadinar, Gulf of Kutch, Gujarat

Southern Region Pipelines (SRPL), in first of its kind initiative has taken the plunge for the conservation of endangered Olive Ridley Turtles in association with Wildlife Department, Chennai by sponsoring.



Inspiring Words from Former Director (Pipelines)

A K Arora
Director (Refineries & Pipelines)
24.01.1995 - 06.01.1998
Director (Refineries)
07.01.1998 - 31.03.2003

It gives me immense pleasure to learn that Pipelines Division of IOCL is releasing a Coffee Table Book on 7th of this month, coinciding with completion of its successful performance of 25 years. While congratulating you all on this occasion, it fills me with pride to reflect on the stunning contributions which Pipelines Division has made over the years.

Today it operates more than 17,000 km long network of pipelines to transport crude oil, POL, LPG, R-LNG etc. It is also setting up CGD networks in 26 geographical areas across the country. Without dedication, and hard work put in by all the Pipeliners, past and present, such distinguished accomplishments would not have resulted.

This is thus an opportune time to compile and consolidate the significant contributions of our illustrious and distinguished IndianOil Pipeliners who continuously pushed the bar of performance higher, catapulting the Division to Himalayan Heights all along.

As Director(R&P) since 24th January 1995 on the Board of IOCL, I was fortunate to have been associated with the operations, development, and growth of Pipelines Division till 6th Jan 1998; in addition to my other role of leading the Refineries Division

On this occasion, I wish all IndianOil Pipeliners the very best in times to come.

S N Jha
Director (Pipelines)
07.01.1998 - 31.08.2001

I vividly remember the day when Pipelines Division was carved out of IndianOil's erstwhile R&P Division due to growing scale and complexities of pipeline operations.

I consider myself lucky that I got the opportunity to lead a fantastic group of Pipeliners and gave wings to their aspirations. I have no inhibitions in saying that challenge of leading a new division seemed much easier with the people raring to go with a 'Never say Die' attitude.

Today, I look with great satisfaction that pipeline networks, which was less than 6,000 km at the time of formation of Pipelines Division is today more than 17,000 km in length. I am also happy to note that IndianOil is operating India's longest LPG pipeline from Paradip to Patna. News of a 34 MMSCMD Ennore-Tuticorin R-LNG pipeline and a transnational pipeline to Nepal further excites me. It is extremely satisfying to me that the Division has justified its existence by providing IndianOil the strategic edge to remain ahead of the competition.

I wish good luck to Pipelines Division and all the Pipeliners on completing 25 years of successful existence.

A M Uplenchwar
Director (Pipelines)
01.09.2001 - 31.07.2007

Cross country Pipelines are known to be Lifelines of a country. IndianOil is pioneer in establishing these lifelines for India in Sixties of the last century and grown into a network of over 17,000 Kms till now. Rated as the Top pipeline operator in the world, IndianOil is the only Company doing everything from concept to commissioning and subsequently operating and maintaining the Pipelines efficiently. I am proud to be a member of this great Team. I wish the Pipelines Division all the best for continuous growth and success in this yeoman service to India.

P K Chakraborty
Director (Pipelines)
01.08.2007 - 31.08.2009

During my journey with the organisation over nearly 34 years of the prime time of my life, I have had the good luck & opportunity to witness the phenomenal transformation of the country's pioneer Petroleum Pipeline Company from owning & operating a 2000 km long network of product pipelines to becoming a behemoth owning more than 17,000 km long diversified & modernised county wide network of pipelines. In the course of doing so, I have also witnessed with pride the Company systematically accomplishing inter alia:

Commissioning of the Company's first LPG cross country pipeline & implementation of the first gas (R-LNG) pipeline.

With the kind of camaraderie, enthusiasm & talent prevalent in the organisation, I have no doubt that in the coming days the Company (which is so close to my heart) will flourish in terms of all business parameters and will earn many more laurels.

K K Jha
Director (Pipelines)
01.09.2009 - 31.01.2012

Oil and Gas Pipelines not only facilitate Fuel transportation, but also ensures that Nation's Energy needs are met economically and efficiently. Being a member of Pipelines Division Family was a lifetime experience, and memory of that relationship I will always cherish.

Me and my family's time spent with fellow Pipeliners of IndianOil shall always remain golden period of our life. The bond provided by IndianOil, as the energy provider of the Nation, is for Forever.

Oil & Gas Industry is witnessing major business transformation & I am sure Pipelines division is keeping ahead with the changing times. Our venture into new businesses have definitely brought us glory and I yearn to see the day when the division starts laying pipelines for transportation of Hydrogen as fuel.

My best wishes to the Pipelines family to flourish both personally and Professionally.

V S Okhde
Director (Pipelines)
01.02.2012 - 31.01.2015

Pipelines have been known to be lifelines of the country. I would go a step further by saying that Pipelines have been our lifelines too, all through our lives. We ensured uninterrupted flow of energy in Pipelines. In turn, Pipelines ensured the same in our bodies, in our lives. Outwardly, Pipelines connect crude unloading terminals with refineries and refineries with marketing terminals. Inwardly, the Pipelines connected us, the Pipelines people, creating such a strong bond amongst us, that the entire Pipelines Division became one close knit family. We ensured growth of Pipelines' network. Pipelines Division ensured our all-round growth. Being underground and working silently, the Pipelines taught us the virtues of humility, restraint, selfless work and contentment.

I am aware that, over the years, Pipelines Division has scaled new heights in its core business, and has also successfully ventured into new businesses. It has been possible due to the unwavering commitment and dedication of its leaders and the entire workforce.

I am happy to note that a Coffee Table Book is being released, which is bound to take us all down the memory lane. It would also be an effective way to let the younger generation know the steps that led the Division to where it is now.

I wish the Pipelines Division Team all the very best for growth and success in all its ventures.

Anish Aggarwal

Director (Pipelines)

01.02.2015 - 31.03.2018

My tenure from Feb 2015 to Mar 2018 was one of the golden periods of the Pipelines Division. During this period, 2370 Km of pipeline sections were added to the pipeline network adding 14.3 MMTPA capacity. 14 pipeline projects with capital outlay of Rs. 14935 cr were approved and specific energy consumption was reduced by 37.5% along with an increase of 6.37% in haulage.

My best wishes to the Pipelines family to flourish nd attain new horizons. Pipeliners will always be in my heart.

Akshay Kumar Singh

Director (Pipelines)

14.08.2018 - 31.01.2021

My journey of more than 3 decades in Oil & Gas Industry, took a fresh start on the momentous date of 14th August 2018, when I joined this great organization as Director (Pipelines).

When I took over, Pipelines Division was already poised for growth, with largest network of liquid pipelines and number of projects under execution. I knew that IOCL pipelines is numero-uno in its domain; hence I focused on building its strength, synchronize inter-related activities and making every IOCian to believe in their capabilities.

I feel honoured to mention that Team Pipelines completed some major projects during my tenure.

I firmly believe that best of IOCL is yet to come. My best wishes to IOCL and all IOCians for achieving many more milestones in the years to come.

IndianOil Pipelines'

Strategic Vision

1. Integrity of Assets for Safe Operations

2. Ontime Project Completion With No Cost Overruns

3. Scaling Up Our Gas Business

4. Leveraging our EPMC Expertise

5. Thrive in Times of Energy Transition

Pipelines Head Office, Noida

TRIVIA

Infrastructure:

1. Total IndianOil pipeline length (17047 km) as of 1.1.2023, is equivalent to 1.33 times Earth's Diameter.
2. IndianOil's pipeline network is more than that of total length of land border of India (15,200 km).
3. IndianOil's cross country pipelines traverses through 19 out of 28 states of India.
4. India's longest LPG Pipeline is IndianOil's Paradip-Haldia-Durgapur-Patna pipeline which is 1468 km long.
5. IndianOil Pipelines Division total crude oil inventory including pipeline linefill corresponds to 8 days of India's daily crude oil requirement.
6. Footprint of each crude oil storage tank at Vadinar can accommodate 1.54 Taj Mahals.
7. Salaya-Mathura Pipeline was the 1st IndianOil pipeline to get SCADA (Supervisory Control and Data Acquisition) system in 1983. It was through transfer of technology at government level from UK to India.
8. Optical Fibre Cable based communication was first introduced in IOCL pipelines in 1996 in Kandla Bhatinda Pipeline.
9. Panipat Jalandhar LPG Pipeline was also the first to get OFC based Pipeline intrusion detection and warning system in 2016.
10. 435 Km long Guwahati Siliguri Pipeline commissioned in 1964 is the oldest cross-country pipeline of Indian Oil Corporation ltd.
11. Longest IndianOil pipeline is Salaya Mathura Pipeline of length – 2660 km, which is also largest in terms of capacity of 25.0 MMTpa.
12. Longest product pipeline of IndianOil is from Koyali to Panipat via Jaipur, which is 1644 km in length.
13. Vadinar crude oil tank farm is the largest in IndianOil which has a storage capacity of 1440 TKL.
14. First LPG pipeline of IndianOil from Panipat to Jalandhar was commissioned in November 2008.
15. First R-LNG pipeline of IndianOil from Dadri (UP) to Panipat was commissioned in July 2010.
16. Chennai and Bengaluru airports were the first airports to be connected through IndianOil pipeline network for supply of ATF by in 2008.
17. Koyali Ahmedabad Pipeline was operated by Indian Oil Corporation Limited on lease basis from ONGC till 31.03.1970
18. IndianOil constructed first ever Transmix Separator Plant at WRPL Jaipur in 2021 for processing of MS-HSD Interface generated in Koyali-Sanganer pipeline.
19. By the 2nd decade of twentieth century, USA had largest length of hydrocarbon pipelines in the world. In fact, it was more than double of the total pipeline length taken together in remaining parts of the world. India stands at number 9.
20. India's first transnational oil pipeline was laid by IndianOil in 2019 from Motihari in Bihar to Amlekhgunj in Nepal.
21. Line Pipes used for cross country pipelines are designed as per API standard, first published in 1928. Numerals in the end of the pipeline specification are indicative of its strength in 1000 psis.

Operation & Maintenance:

22. 61% of POL products sold by IndianOil are transported through pipeline.
23. Batches of multiple products like MS, HSD, ATF, SKO and Naphtha may be simultaneously travelling as different blocks inside the pipeline during operation.
24. Product in the pipeline moves at 3-5 km/hour, the same speed you would be going while casually walking down the street.
25. AC interference with pipelines can cause severe external corrosion upto 1-2 mm per year. Pipelines having a wall thickness of 7 mm pipe may fail in only 3 years.
26. Underground Pipelines are protected from external corrosion by coatings applied on it.
27. Pipelines are protected against external corrosion by electric current under cathodic protection system wherein, a feeble current is passed through the pipeline to a sacrificial zinc anode.
28. Pipelines are regularly cleaned from inside during its operation through instruments called as PIGs. Some of them have instruments mounted on them to record flaws and imperfections in the pipe.
29. A tanker pumps crude oil to shore tanks at around 10,000 Kl/hr which is equivalent to filling a 20 kl road tanker in 7 seconds.
30. Line fill of Crude Oil Pipelines is more than 1600 TKL which is equivalent to volume of around 5 VLCCs.
31. ERPL Haldia is the only pipeline location which handles Crude Oil, Petroleum Products and LPG having crude oil tank farm as well as LPG mounded bullets.
32. MT Neta Ji Subhash Chandra Bose was the first tanker to berth at Vadinar SPM on 27th August 1978.
33. MT Jawahar Lal Nehru was the first tanker to berth at Paradip SPM on 31st December 2008.
34. Ethanol Blended Motor Spirit was first introduced in a pipeline in April 2019 in Mathura-Tundla Pipeline.
35. Liquified Petroleum Gas (LPG) at normal environmental condition is a gas 1.5-2 times heavier than air which liquifies at 8 kg/cm2 with density approximately half that of water. 1 litre of LPG upon expansion will form approximately 250 litres of vapour.
36. The energy content of 1 MT HSD is roughly 8 Lakh times the energy required for its transportation for 1 km through pipelines. Transportation through the pipelines is the most energy efficient mode for transportation of hydrocarbon.
37. IndianOil Pipeline Division throughput of liquid petroleum for the calendar year 2022 was 92.5 MMT which means at each second, 3.5 KL of liquid petroleum is being delivered.
38. Ms Ruma Barua became the first female station in charge while Ms M Manila became the first female CGD GA in charge in 2022.


नियंत्रण कक्ष

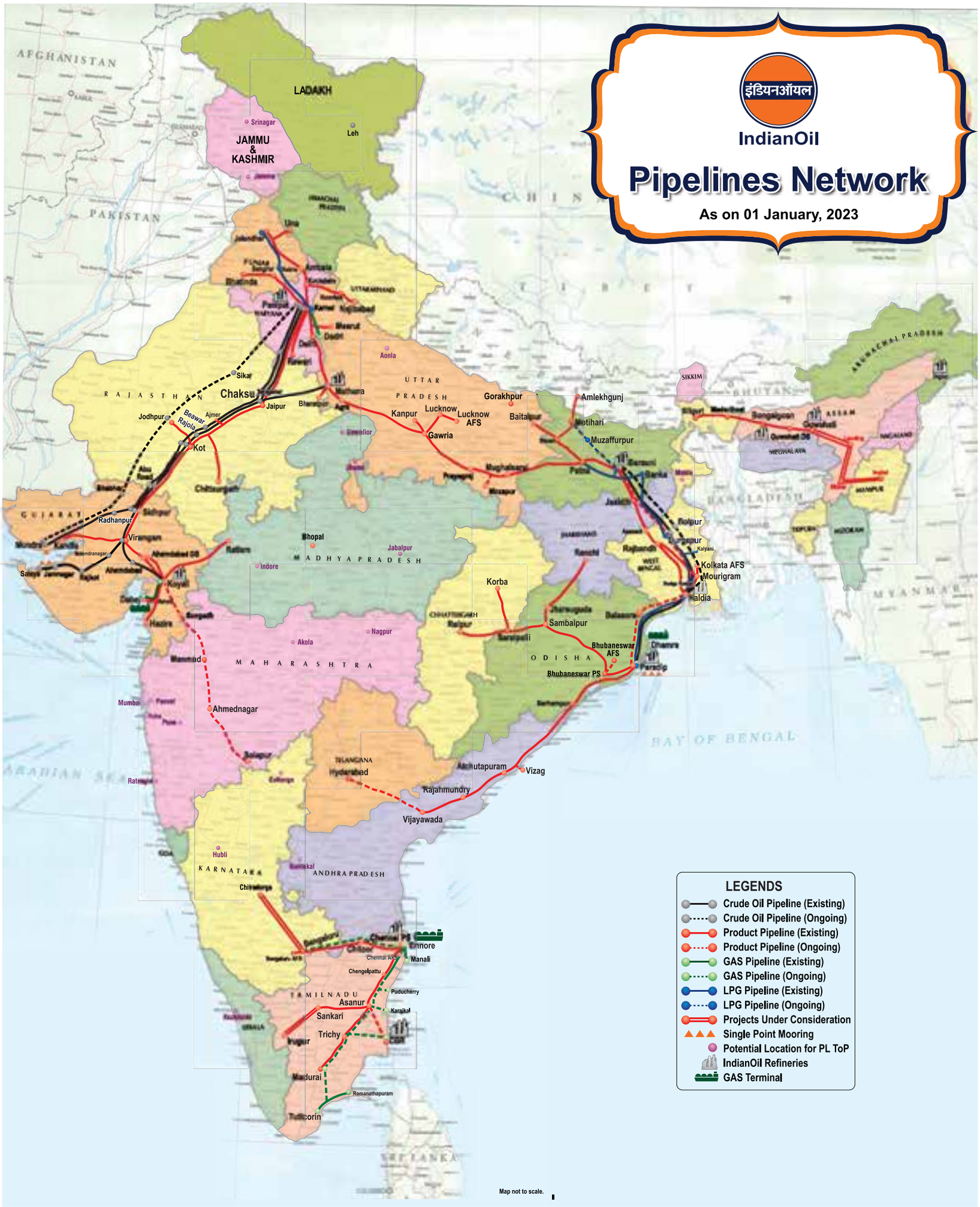

कार्यालय एवं अनुरक्षण भवन










IndianOil
Pipelines Network
As on 01 January, 2023
LADAKH
Srinagar
Leh
JAMMU & KASHMIR
Jammu
AFGHANISTAN
PAKISTAN
CHINA
TIBET
BHUTAN
NEPAL
BANGLADESH
MYANMAR
SRI LANKA
Una
Jalandhar
Amritsar
Bhatinda
Panipat
Kurukshetra
Karnal
Kaithal
Meerut
Delhi
Kanwari
Sikar
Chaksu
Jaipur
Bharatpur
Mathura
Agra
Aonla
UTTAR PRADESH
RAJASTHAN
Jodhpur
Beawar
Rajola
Ajmer
Kot
Gwalior
Kanpur
Lucknow
Lucknow AFS
Gawria
Gorakhpur
Baitalpur
Amlekhgunj
Motihari
Muzaffurpur
Barauni
Barka
Patna
Jaynagar
Mughalsarai
Pragagraj
Mirzapur
Chittaurgarh
Sidhpur
Radhanpur
Viramgam
Mundra
Kandla
Ahmedabad DD
Ahmedabad
Kalol
Koyali
Hazira
Bongaigaon
Guwahati
Guwahati DD
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
SIKKIM
ARUNACHAL PRADESH
Bhopal
Jabalpur
Indore
Ratlam
MADHYA PRADESH
Jharsuguda
Sambalpur
Balasore
Raigarh
Korba
CHHATTISGARH
Bhubaneswar AFS
Bhubaneswar PS
Dhamra
Paradip
ODISHA
Haldia
Kolkata AFS
Mourigram
Kalyani
Rajbandh
Ranchi
JHARKHAND
WEST BENGAL
Nagpur
Akola
Manmad
MAHARASHTRA
Mumbai
Panvel
Pune
Ahmednagar
Solapur
Ratnagiri
Kolhapur
TELANGANA
Hyderabad
Vijayawada
Rajahmundry
Vishakhapatnam
Vizag
ANDHRA PRADESH
Hubli
KARNATAKA
Gulbarga
Chitradurga
Bangalore
Bangalore AFS
Chennai PS
Chennai AFS
Ennore
Manali
Chengelpattu
Puducherry
Karaikal
TAMILNADU
Asanur
Sankari
Trichy
Erode
Madurai
Ramanathapuram
Tuticorin
KERALA
Kochi
Kozhikode
Map not to scale.
LEGENDS
Crude Oil Pipeline (Existing)
Crude Oil Pipeline (Ongoing)
Product Pipeline (Existing)
Product Pipeline (Ongoing)
GAS Pipeline (Existing)
GAS Pipeline (Ongoing)
LPG Pipeline (Existing)
LPG Pipeline (Ongoing)
Projects Under Consideration
Single Point Mooring
Potential Location for PL ToP
IndianOil Refineries
GAS Terminal

Indian Oil Corporation Limited
(Pipelines Division)

A-1, Udyog Marg, Sector-1, Noida-201 301