**Major Companies-**

Southern Petrochemical Industries Corporation Limited, Punjab Carbonic private Limited, SICGIL India Limited, Indian Farmers Fertilizer Cooperative, Bathinda industrial Gases Pvt. Ltd. (BIGPL), National Fertilizers Limited.

**Total Capacity-**

Currently the carbon dioxide capacity in India stands at 3810 thousand tonnes in FY2021 and is anticipated to reach 4152 thousand tonnes in FY2040.

**India Status of Carbon Capture and Storage**

India is one of 24 developing countries which are working towards Carbon Capture & Storage (CCS).

There is very little focus on carbon capture domestic demonstration in India because of the high investment cost.

Indian Oil Corporation Ltd, National Aluminium Company (NALCO), Oil & Natural Gas Corporation (ONGC), Bharat Heavy Electrical Ltd. (BHEL) are some of the companies which are in the early stages of setting up facilities associated with CCS.

**List of CO2 Capture Plants in India**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Plant Name** | **Technology Provider** | **End User Company** | **Capture Technology** | **Industry** | **CO2 Capture Capacity** |
| Aonla (U.P.) urea plant | Mitsubishi Heavy Industries Limited | Indian Farmers Fertilizer Cooperative | Amine Based (Post Combustion Capture) | Chemical Production | 450 TPD |
| Jagdishpur (Orissa) urea plant | - | Indo Gulf Corporation | Amine Based (Post Combustion Capture) | Chemical Production | 150 TPD |

**Total Production-**

The total production currently stands at 2958 thousand tonnes, out of which 1556 thousand tonnes is for merchant sales.

In India, carbon dioxide generation is not preferred due to lack of availability of raw materials. However, carbon dioxide is recovered by installation of carbon dioxide recovery plants with distilleries and fertilizers production units.

**Total Demand-**

The total demand stands at 1550 thousand tonnes in FY2021 and is anticipated to reach 4270 in FY2040F growing with a healthy CAGR of 5.43% for the forecasted period. Only Merchant sale demand is considered for the same.

**Total Demand By Value-**

India carbon dioxide market size by value is anticipated to surpass USD407 million by 2040 owing to increasing demand from food & beverages industry, healthcare industry and automotive industry and is expected to grow with a healthy CAGR of 6.15% for the forecasted period.

**India Carbon Dioxide Market Share, By Source of Supply**

Table

Description automatically generated

The source of carbon dioxide is derived majorly by the combustion of fossil fuels which includes hydrocarbons and natural gas.

**India Carbon Dioxide Market Share, By Grade**

Table

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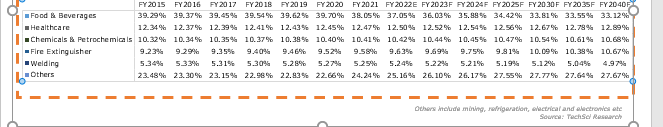
Liquid CO2 is sold in large volumes due to its high demand in different industries such as welding and beverages. On the other hand, dry ice is sold in form of pellets and bricks, which requires additional treatment of carbon dioxide. Due to this, average price of dry ice is almost three times that of liquid CO2.

Food & beverage industry is the largest consumer of liquid carbon dioxide in India. Liquid carbon dioxide is majorly used for carbonation in soft drinks, beer and wine. Additionally, liquid carbon dioxide is required to prevent fungal and bacterial growth and to de-caffeinate coffee.

Growing need for dry ice for the transportation of perishable food products, particularly meat and dairy products, has augmented demand for carbon dioxide in the country. Perishable food items start to decay if not stored at below 40°F (4.4°C).

Carbon dioxide is used in automotive fabrication, particularly for welding purposes where high purity carbon dioxide is used for strengthening the weld to shield it from oxidation.

**India Carbon Dioxide Market Share, By Application**



Food & beverage industry is the largest end use industry for carbon dioxide, as liquid carbon dioxide is used in carbonation of aerated beverages and large quantity of dry ice is used for maintaining quality of perishable food products during storage or transport at distant locations.

Carbon dioxide is required for production various chemicals substances. Carbon dioxide is consumed in large quantities for production of urea, methanol, precipitated calcium carbonate and soda ash.

**Demand By Region-**

**North- 34.92%, South- 29.96%, West-** **24.28%, East- 10.84%**

North region dominated India carbon dioxide market and accounted for a volume share of 34.92% in 2021. Owing to presence of leading food & beverage industries lead to growth in consumption of liquid carbon dioxide as well as dry ice. Additionally, popular beer manufacturing companies such as Carlsberg India Pvt. Ltd (popular brands Carlsberg, Tuborg) and Mohan Meakin Group are headquartered in Gurgaon and Ghaziabad, respectively.

**India Carbon Dioxide Market Share, By Top 5 Company**

**Carbon Dioxide Sourcing Details**

India is net exporter of Carbon dioxide in Southeast Asia Region. India is having surplus capacity to produce carbon dioxide and use majority of carbon dioxide produce for captive consumption. For Instance, carbon dioxide produce during the manufacturing of fertilizers is used for capacitive consumption to produce end products.

**Mode of Transportation**

Carbon dioxide can be transported as gas or a liquid. Pipelines and ships are used for transportation of gas and as a liquid form, the transportation takes place through pipelines, ships and road tankers.

**Cost of Transportation**

Transportation cost for carbon dioxide is high as it is majorly supplied in tankers and cylinders. High transportation cost compels carbon dioxide suppliers to address demands of customers located in proximity to carbon dioxide recovery plants.

The average cost of transportation which company undergoes is around ₹ 1 to ₹ 2 per km per Kg.

**Routes To Reduce Carbon Emission**

Refineries around the world are channelizing number of routes to reduce CO2 emission. This is generally done through Carbon Capture and Storage and in general, three routes are recognized for the capture of CO2.

* **Oxyfiring:** In the process, Pure oxygen rather than air is used for combustion. This produces a stream containing only CO2 and water.
* **Pre-Combustion Capture:** Fuel is preheated in the process, typically forming CO2 and hydrogen. Then, CO2 is removed easily from hydrogen being at higher temperature.
* **Post Combustion capture :** Its an end of process solution, where CO2 IS removed from flue gas, before the flue gas is emitted to atmosphere via stack.

**Global Capture of Carbon Dioxide**

At Global level, most refineries prefer post combustion capture method as most of the refinery emission is made up of large numberr of flue gas sources at a refinery. Emissions sources in this category are large stacks from furnaces and gas turbines.

**India Initiatives**

In India, major oil giants are taking initiatives to channelize carbon emission to boost crude oil production from ageing oilfields in the country. For instance, In 2019, Indian oil Corporation Limited (IOCL) has signed a preliminary agreement to capture carbon di oxide emitted from its refineries and pipe it to Oil and Natural Gas Corporation (ONGC) and Oil India Limited (OIL) for injecting in depleting oil-fields to boost output. This is an initiative taken not only to curb environment pollution but also to address India’s falling oil production.

**India Enhanced Oil Recovery Market Outlook**

* Crude oil production in the country has been declining consistently since 2012. With the declining production due to lack of exploration activities, public companies such as ONGC and OIL are cutting down their production rates.
* The crude oil production in the country is estimated to be decreased at CAGR of 0.88%during 2012-2021. The lower production would present a positive scenario for the crude oil production based on enhanced oil recovery in the country.
* Indian State-owned company, ONGC, has been carrying out major enhanced oil recovery processes in the Mumbai Offshore regions. Currently, Cairn India, the field operator of the Rajasthan Block, is carrying out the enhanced oil recovery process in the Mangala fields in the Barmer area through polymer flooding method.
* Thus, declining year on year crude oil production in the country, coupled with the good economic health would drive the market for EOR market through 2040.
* Higher employment rate of crude EOR processes during 2021-2040 would be majorly due to the higher crude oil prices across the globe and high cost related to EOR activities.

**Upcoming / Under construction Global Carbon Capture & Storage Facilities**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Abu Dhabi CCS Phase 2: Natural gas processing plant** | **Commercial CCS facilities** | **Advanced Development** | **United Arab Emirates** | **2025** | **Natural Gas Processing** | **2.3** | **Industrial Separation** | **Enhanced Oil Recovery** |
| **Brevik Norcem - Langskip** | **Commercial CCS facilities** | **Advanced Development** | **Norway** | **2023-2024** | **Cement Production** | **0.4** | **Industrial Separation** | **Dedicated Geological Storage** |