India's International Trade of Four Specific Commodities in the Recent Past

Some Insights

Preface

The study uses trade indicators to analyse merchandise export and import data in a way that should be useful for the purpose of policy. The indicators provide a glimpse of the trade patterns of the world and the performance of India in comparison to various other countries. They have been used in the case of India's exports of **Sugar including Lactose etc.... in solid form and Synthetic Staple Fibres – Of Polyester Stable fabrics** and imports of **Centrifuges & Artificial Graphite, Colloidal Graphite etc.** to indicate the possible directions policy may take.

The data used in this study has been sourced from the Export Import Data Bank of the DGCI&S, Department of Commerce, and Government of India and from the United Nations Comtrade Database. Introduction notes of each commodities has been sourced from the various sights –viz Wikipedia, Britannica, The Economic Times etc.

Computations are based on data at ITC-HS four-digit level (ITC-HS Code-1702 & 5515 for export and 8421 & 3801 for import) and the latest finalized data available on the UN Comtrade Database up to year 2021 and on the DGCI&S Database up to November'2022. So, trends from 2018 to 2021 have been shown when we extract the data from UN Comtrade and from 2018 to 2021 have been shown when we extract the data from DGCIS Data base.

In this report, we will see various analysis and aspects of India's Precious as well as International export trade of Sugar including Lactose etc.... in solid form and Synthetic Staple Fibres – Of Polyester Stable fabrics and imports of Centrifuges & Artificial Graphite, Colloidal Graphite etc.. We will use both the 4 digit Commodity codes, for our analysis, as appropriate.

Trends in India's as well as International Trade i.e. Exports and Imports of above four Commodities are given below in different tables :

- Table1 : India's top 10 Export destination of Sugar including Lactose etc.... in solid form with their shares in percentage.
- Table 2 : World's top 10 Exporters of Sugar including Lactose etc.... in solid form with their shares in percentage.
- Table 3 : World's top 10 Importers of Sugar including Lactose etc.... in solid form with their shares in percentage.
- Annex- I : Top 3 sources Sugar including Lactose etc.... in solid form of World's top 3 Importers.
- Table 4 : India's top 10 Export destination of Synthetic Staple Fibres – Of Polyester Stable fabrics with their shares in percentage.
- Table 5 : World's top 10 Exporters of Synthetic Staple Fibres – Of Polyester Stable fabrics with their shares in percentage.
- Table 6 : World's top 10 Importers of Synthetic Staple Fibres – Of Polyester Stable fabrics with their shares in percentage.
- Annex-II : Top 3 sources of Synthetic Staple Fibres – Of Polyester Stable fabrics of World's top 3 Importers.
- Table 7 : India's top10 Sources of Centrifuges with their shares in percentage.
- Table 8: World's top10 Importers of Centrifuges with their shares in percentage.
- Table 9 : India's top 10 Sources of Artificial Graphite, Colloidal Graphite etc.. with their shares in percentage.
- Table 10 : World's top 10 Importers of Artificial Graphite, Colloidal Graphite etc.. with their shares in percentage.

EXPORT

Sugar including Lactose, Maltose, Glucose and Fructose in solid forms

Sugar is the generic name for sweet-tasting, soluble carbohydrates, many of which are used in food. Simple sugars, also called monosaccharides, include glucose, fructose, and galactose. Compound sugars, also called disaccharides or double sugars, are molecules made of two bonded monosaccharides; common examples are sucrose (glucose + fructose), lactose (glucose + galactose), and maltose (two molecules of glucose). White sugar is a refined form of sucrose. In the body, compound sugars are hydrolysed into simple sugars.

Longer chains of monosaccharides (>2) are not regarded as sugars, and are called oligosaccharides or polysaccharides. Starch is a glucose polymer found in plants, the most abundant source of energy in human food. Some other chemical substances, such as glycerol and sugar alcohols, may have a sweet taste, but are not classified as sugar.

Lactose is a disaccharide sugar synthesized by galactose and glucose subunits and has the molecular formula $C_{12}H_{22}O_{11}$. Lactose makes up around 2–8% of milk (by mass). The name comes from *lac* (gen. *lactis*), the Latin word for milk, plus the suffix -ose used to name sugars. The compound is a white, water-soluble, non-hygroscopic solid with a mildly sweet taste. It is used in the food industry.

Lactose composes about 2–8% of milk by weight. Several million tons are produced annually as a by-product of the dairy industry.

Whey or milk plasma is the liquid remaining after milk is curdled and strained, for example in the production of cheese. Whey is made up of 6.5% solids, of which 4.8% is lactose, which is purified by crystallisation.[10] Industrially, lactose is produced from whey permeate – that is whey filtrated for all major proteins. The protein fraction is used in infant nutrition and sports nutrition while the permeate can be evaporated to 60–65% solids and crystallized while cooling.[11] Lactose can also be isolated by dilution of whey with ethanol.

Its mild flavour and easy handling properties have led to its use as a carrier and stabiliser of aromas and pharmaceutical products.[5] Lactose is not added directly to many foods, because its solubility is less than that of other sugars commonly used in food. Infant formula is a notable exception, where the addition of lactose is necessary to match the composition of human milk.

Maltose is one of the most common disaccharide carbohydrates; other examples are sucrose and lactose. Carbohydrates are a major class of biomolecules that can be classified based on the saccharide constituents. A disaccharide is a carbohydrate made up of two monosaccharides that are linked together by a glycosidic bond (glycosidic linkage). Maltose is a white crystalline solid. Its molar mass is 342.30 $g \cdot mol^{-1}$. Its melting point is (i.e. 102 °C). It is soluble in water. Similar to sucrose and lactose, maltose has a general formula of $C_{12}H_{22}O_{11}$. Maltose, though, is a disaccharide made up of two glucose units.

Glucose is most common monosaccharide. It is known as Dextrose because it occurs in nature principally as optically dextrorotatory isomer. Glucose is found in most sweet fruits, especially grapes (20-30%), and honey. It is an essential constituent of human blood. The blood normally contains 65 to 110 mg (0.06 to 0.1%) of glucose per 100 ml. In diabetic persons the level may be much higher. In combined form glucose occurs in abundance in cane sugar and polysaccharides such as starch and cellulose.

Fructose, or fruit sugar, is a ketonic simple sugar found in many plants, where it is often bonded to glucose to form the disaccharide sucrose. It is one of the three dietary monosaccharides, along with glucose and galactose, that are absorbed by the gut directly into the blood of the portal vein during digestion. The liver then converts both fructose and galactose into glucose, so that dissolved glucose, known as blood sugar, is the only monosaccharide present in circulating blood.

Natural sources of fructose include fruits, vegetables (including sugar cane), and honey.[31] Fructose is often further concentrated from these sources. The highest dietary sources of fructose, besides pure crystalline fructose, are foods containing white sugar (sucrose), high-fructose corn syrup, agave nectar, honey, molasses, maple syrup, fruit and fruit juices, as these have the highest percentages of fructose (including fructose in sucrose) per serving compared to other common foods and ingredients. Fructose exists in foods either as a free monosaccharide or bound to glucose as sucrose, a disaccharide. Fructose, glucose, and sucrose may all be present in a food; however, different foods will have varying levels of each of these three sugars.

These are broadly classified under **H.S. Code-1702**.

Table - 1

India's Top 10 destination of Sugar including Lactose etc...in solid forms (**H.S Code-1702)**

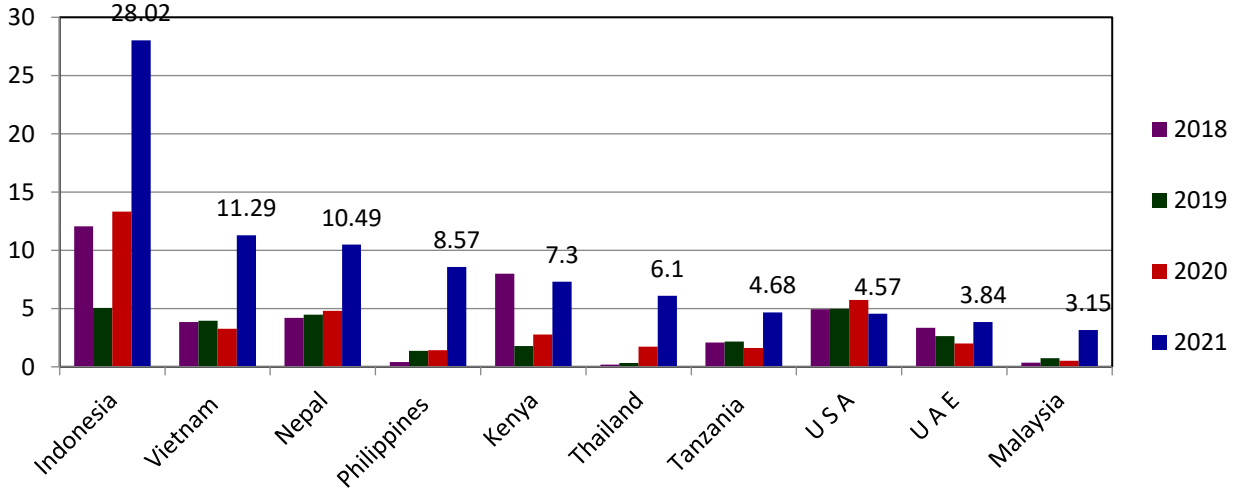
Rank	Countries	2018		2019		2020		2021	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	Indonesia	12.06	15.34	5.05	9.86	13.31	21.93	28.02	22.89
2.	Vietnam	3.85	4.91	3.96	7.73	3.28	5.41	11.29	9.22
3.	Nepal	4.20	5.35	4.47	8.73	4.80	7.90	10.49	8.57
4.	Philippines	0.42	0.54	1.36	2.65	1.43	2.36	8.57	7.00
5.	Kenya	7.99	10.16	1.78	3.48	2.78	4.58	7.30	5.96
6.	Thailand	0.19	0.25	0.32	0.62	1.72	2.84	6.10	4.98
7.	Tanzania	2.08	2.65	2.17	4.23	1.63	2.68	4.68	3.83
8.	U S A	4.94	6.28	4.98	9.73	5.74	9.46	4.57	3.73
9.	U A E	3.36	4.28	2.64	5.16	2.01	3.32	3.84	3.14
10.	Malaysia	0.36	0.46	0.75	1.47	0.53	0.87	3.15	2.57
	Others	39.13	49.79	23.74	46.33	23.46	38.66	34.40	28.10
	Total	78.59	100	51.23	100	60.68	100	122.41	100

Source: DGCI&S.

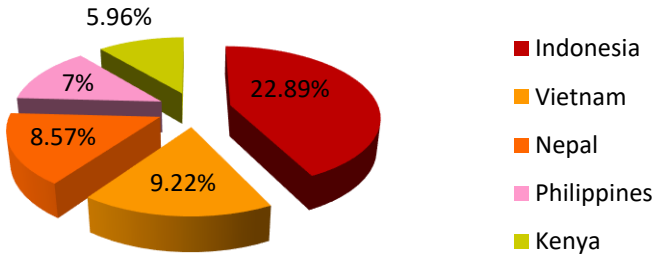
Note : India's Export including re-export

Country wise Sugar including Lactose etc...in solid *forms* export from India for 2018-2021**(in million US $)**

Data label given on the basis of 2021



India's top 5 destinations of Sugar including *Lactose etc...in solid forms* by percentage India in 2021:



India's total export of Sugar including Lactose, Maltose, Glucose and Fructose in solid forms was worth US $ 122.41 Million in 2021, which when compared to the previous year's export stats has increased by more than two times from the year 2020. In that year Sugar including Lactose, Maltose, Glucose and Fructose in solid forms is exported from India majorly to Indonesia (US $ 28.02 Million), Vietnam (US $ 11.29 Million), Nepal (US $ 10.49 Million), Philippines (US $ 8.57 Million) and Kenya (US $ 7.30 Million), for which the combined export value from India to these countries stands at US $ 65.67 Million, which is 53.64% of India's total exports for this commodity.

Table-2

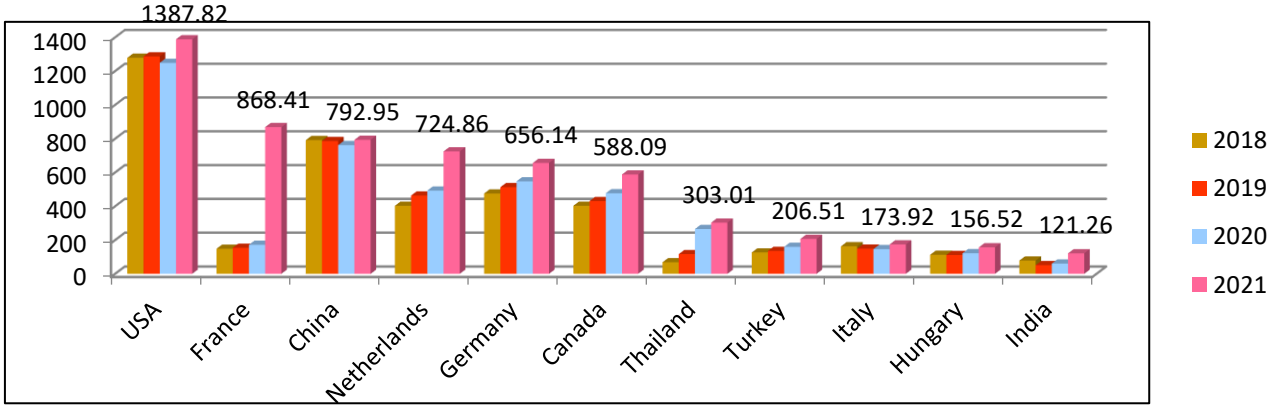
World's Top 10 exporter of Sugar including Lactose etc...in solid forms (H.S Code-1702)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	USA	1278.75	23.00	1286.93	22.42	1248.70	19.94	1387.82	17.77
2.	France	148.42	2.67	154.17	2.69	171.67	2.74	868.41	11.12
3.	China	791.38	14.24	785.96	13.69	761.88	12.17	792.95	10.15
4.	Netherlands	402.45	7.24	463.14	8.07	492.43	7.86	724.86	9.28
5.	Germany	475.51	8.55	512.95	8.94	547.44	8.74	656.14	8.40
6.	Canada	402.90	7.25	430.38	7.50	476.57	7.61	588.09	7.53
7.	Thailand	68.25	1.23	116.58	2.03	265.07	4.23	303.01	3.88
8.	Turkey	126.55	2.28	135.65	2.36	159.97	2.55	206.51	2.64
9.	Italy	162.91	2.93	148.78	2.59	146.36	2.34	173.92	2.23
10.	Hungary	112.69	2.03	110.96	1.93	121.63	1.94	156.52	2.00
12.	**India**	**78.30**	**1.41**	**51.09**	**0.89**	**60.69**	**0.97**	**121.26**	**1.55**
	Others	1511.00	27.18	1543.57	26.89	1808.96	28.89	1831.82	23.45
	Total	5559.12	100	5740.16	100	6261.38	100	7811.30	100

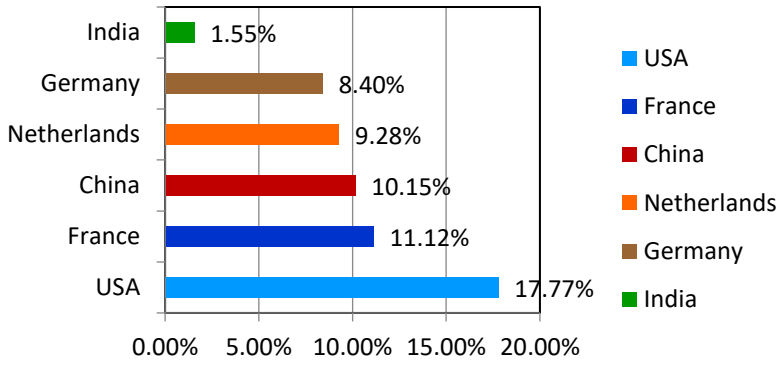
Source: UN Comtrade

World's top Exporters of Lactose etc...in solid forms from 2018-2021**(in million USD)**

Data label given on the basis of 2021



Country wise world's top 5 exporter of *Lactose etc...in solid forms* by percentage in 2021 :



In 2021, world export of Sugar including Lactose, Maltose, Glucose and Fructose in solid forms was US $ 7.81 billion. In that year the global exports of Sugar including Lactose, Maltose, Glucose and Fructose in solid forms increased by 24.76%, from 2020. USA was the largest exporter of Sugar including Lactose, Maltose, Glucose and Fructose in solid forms exports structure, which was US $ 1.38 billion or accounted 17.77% of the global total in 2021, followed by France (11.12%) and China (10.15%) globally. India stood at 12th position in ranking in the world leading exporting countries with 1.55% share of global export of the commodity group in 2021.

Table-3

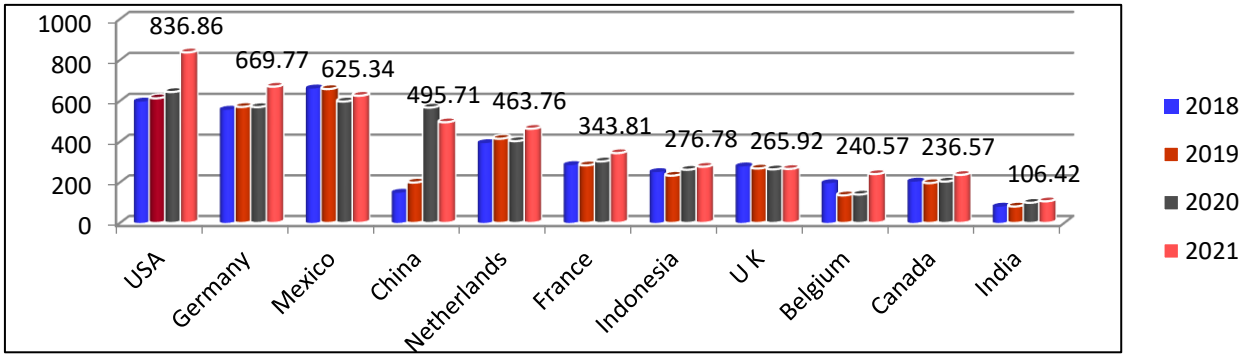
World's top 10 Importers of *Sugar including Lactose etc...in solid forms* (H.S Code-1702)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	USA	596.29	8.78	612.90	8.88	643.57	8.63	836.86	9.98
2.	Germany	556.62	8.19	570.60	8.27	569.75	7.64	669.77	7.99
3.	Mexico	660.29	9.72	657.93	9.54	597.18	8.01	625.34	7.46
4.	China	148.34	2.18	198.84	2.88	567.52	7.61	495.71	5.91
5.	Netherlands	392.64	5.78	414.50	6.01	402.77	5.40	463.76	5.53
6.	France	284.55	4.19	283.48	4.11	302.96	4.06	343.81	4.10
7.	Indonesia	250.16	3.68	232.79	3.37	261.90	3.51	276.78	3.30
8.	U K	278.15	4.09	268.06	3.89	263.82	3.54	265.92	3.17
9.	Belgium	195.74	2.88	135.78	1.97	139.92	1.88	240.57	2.87
10.	Canada	203.23	2.99	196.32	2.85	203.79	2.73	236.57	2.82
22.	**India**	**79.77**	**1.17**	**81.04**	**1.17**	**99.22**	**1.33**	**106.42**	**1.27**
	Others	3149.43	46.35	3247.33	47.07	3403.91	45.65	3824.20	45.60
	Total	6795.23	100	6899.57	100	7456.32	100	8385.71	100

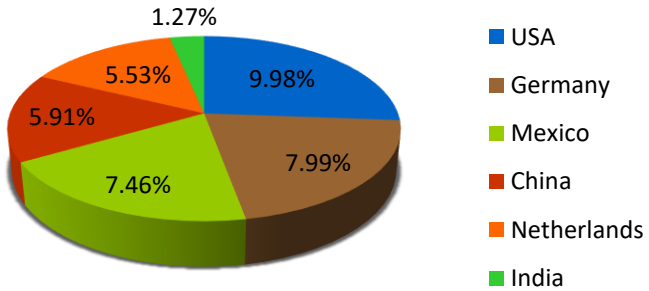
Source : UN Comtrade

Leading Sugar including Lactose etc...in solid forms importers of world from 2018-2021**(in million $)**

Data label given on the basis of 2021



Country wise world's top 3 importers of Sugar including Lactose etc...in solid by percentage in 2021

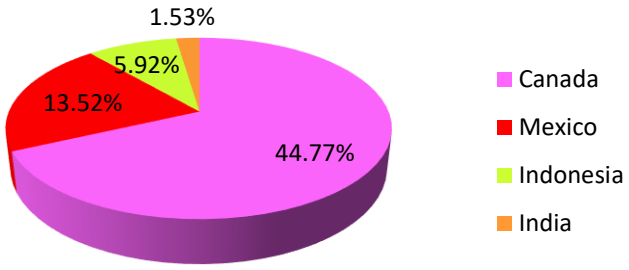


In 2021, the world imports of Sugar including Lactose, Maltose, Glucose and Fructose was US $ 8.38 million. It was increased by US $ 929.39 million from the previous year. In 2021 with Sugar including Lactose, Maltose, Glucose and Fructose imported by USA with imports valued at more than US $ 836.36 million, accounted for more than 9.98% of world import value of it, which makes USA as largest importer of the commodity group 1702 in the world . Germany ranked in second that year, with a share of 7.99% of global import, which was followed by Mexico, who ranked in 3rd in the world in the same year, with 7.46% share globally. In that year India has imported US $ 106.42 million share of world's import of Sugar including Lactose, Maltose, Glucose and Fructose.

Annexure-1

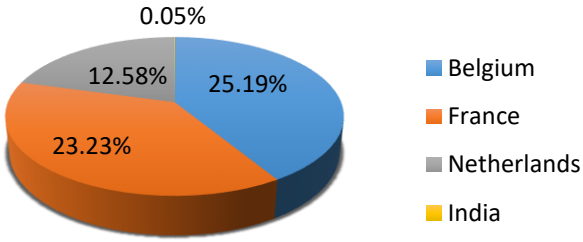
Sources of world's top 3 importers of Sugar including Lactose etc...in solid forms **(H.S Code-1702)**

i)Top 3 Sources of Sugar including Lactose etc...in solid form to USA in 2021 by percentage:



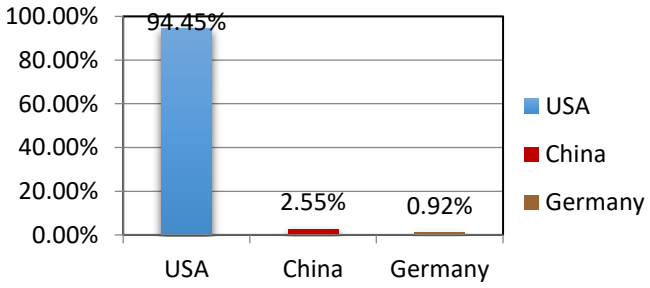
Canada was the prime source country of Sugar including Lactose etc...in solid form of USA. USA has imported nearly 44.77% share of its total import of the commodity group from Canada in 2021. In that year USA purchased 13.52% share from Mexico and 5.92% share from Indonesia. In the same year India has exported 1.53% share of USA's total imports of Sugar including Lactose etc...in solid form. **(Source : UN Comtrade)**

ii) Top 3 Sources of Sugar including Lactose etc...in solid form to Germany in 2021 by percentage*:*



Being the 2nd largest importer of Sugar including Lactose etc...in solid form in world, in 2021 Germany imported 25.19% share of Sugar including Lactose etc...in solid form Belgium which was followed by France 23.23% and Netherlands 12.58%. India also exports a very little amount of Sugar including Lactose etc...in solid form to USA in that year, only 0.05% of USA's total import. **Source : UN Comtrade)**

iii) Top 3 Sources of Sugar including Lactose etc...in solid form to Mexico in 2021 by percentage*:*



In 2021 USA has exported 94.45% share of Mexico's total share of Sugar including Lactose etc...in solid form and became the largest source of it to Mexico. China and Germany was 2nd and 3rd largest Source countries of Sugar including Lactose etc...in solid form to Mexico in that year. Mexico imported the same 2.55% and 0.92% share from China and Germany. In that year India has no account with the Mixico. **(Source: UN Comtrade)**

Woven Fabrics of woven fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics

Polyester is a category of polymers that contain the ester functional group in every repeat unit of their main chain. As a specific material, it most commonly refers to a type called polyethylene terephthalate (PET). Polyesters include naturally occurring chemicals, such as in plants and insects, as well as synthetics such as polybutyrate. Natural polyesters and a few synthetic ones are biodegradable, but most synthetic polyesters are not. Synthetic polyesters are used extensively in clothing.

Polyester fibers are sometimes spun together with natural fibers to produce a cloth with blended properties. Cotton-polyester blends can be strong, wrinkle- and tear-resistant, and reduce shrinking. Synthetic fibers using polyester have high water, wind and environmental resistance compared to plant-derived fibers. They are less fire-resistant and can melt when ignited.

Liquid crystalline polyesters are among the first industrially used liquid crystal polymers. They are used for their mechanical properties and heat-resistance. These traits are also important in their application as an abradable seal in jet engines.

Polyesters are one of the most economically important classes of polymers, driven especially by PET, which is counted among the commodity plastics; in 2000 around 30 million tons were produced worldwide. There is great variety of structures and properties in the polyester family, based on the varying nature of the R group (see first figure with blue ester group).

Polyester is a synthetic fabric that's usually derived from petroleum. This fabric is one of the world's most popular textiles, and it is used in thousands of different consumer and industrial applications.

Chemically, polyester is a polymer primarily composed of compounds within the ester functional group. Most synthetic and some plant-based polyester fibers are made from ethylene, which is a constituent of petroleum that can also be derived from other sources. While some forms of polyester are biodegradable, most of them are not, and polyester production and use contribute to pollution around the world.

Polyesters occurring in nature include the cutin component of plant cuticles, which consists of omega hydroxyl acids and their derivatives, interlinked via ester bonds, forming polyester polymers of indeterminate size. Polyesters are also produced by bees in the genus Colletes, which secrete a cellophane-like polyester lining for their underground brood cells earning them the nickname "polyester bees".

Depending on the chemical structure, polyester can be a thermoplastic or thermoset. There are also polyester resins cured by hardeners; however, the most common polyesters are thermoplastics. The OH group is reacted with an Isocyanate functional compound in a 2 component system producing coatings which may optionally be pigmented. Polyesters as thermoplastics may change shape after the application of heat. While combustible at high temperatures, polyesters tend to shrink away from flames and self-extinguish upon ignition. Polyester fibres have high tenacity and E-modulus as well as low water absorption and minimal shrinkage in comparison with other industrial fibres.

Increasing the aromatic parts of polyesters increases their glass transition temperature, melting temperature, thermos ability, chemical stability, and solvent resistance.

Fabrics woven or knitted from polyester thread or yarn are used extensively in apparel and home furnishings, from shirts and pants to jackets and hats, bed sheets, blankets, upholstered furniture and computer mouse mats. Industrial polyester fibres, yarns and ropes are used in car tire reinforcements, fabrics for conveyor belts, safety belts, coated fabrics and plastic reinforcements with high-energy absorption. Polyester fibre is used as cushioning and insulating material in pillows, comforters and upholstery padding. Polyester fabrics are highly stain-resistant since polyester is a hydrophobic material, making it hard to absorb liquids. The only class of dyes which can be used to alter the colour of polyester fabric are what are known as disperse dyes.

Polyesters are also used to make bottles, films, tarpaulin, sails (Dacron), canoes, liquid crystal displays, holograms, filters, dielectric film for capacitors, film insulation for wire and insulating tapes. Polyesters are widely used as a finish on high-quality wood products such as guitars, pianos, and vehicle/yacht interiors. Thixotropic properties of spray-applicable polyesters make them ideal for use on open-grain timbers, as they can quickly fill wood grain, with a high-build film thickness per coat. It can be used for fashionable dresses, but it is most admired for its ability to resist wrinkling and shrinking while washing the product. Its toughness makes it a frequent choice for children's wear. Polyester is often blended with other fibres like cotton to get the desirable properties of both materials. Cured polyesters can be sanded and polished to a high-gloss, durable finish.

These are broadly classified under **H.S. Code-5515**

Table - 4

India's Top 10 destination of woven fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics ((HS Code –5515)

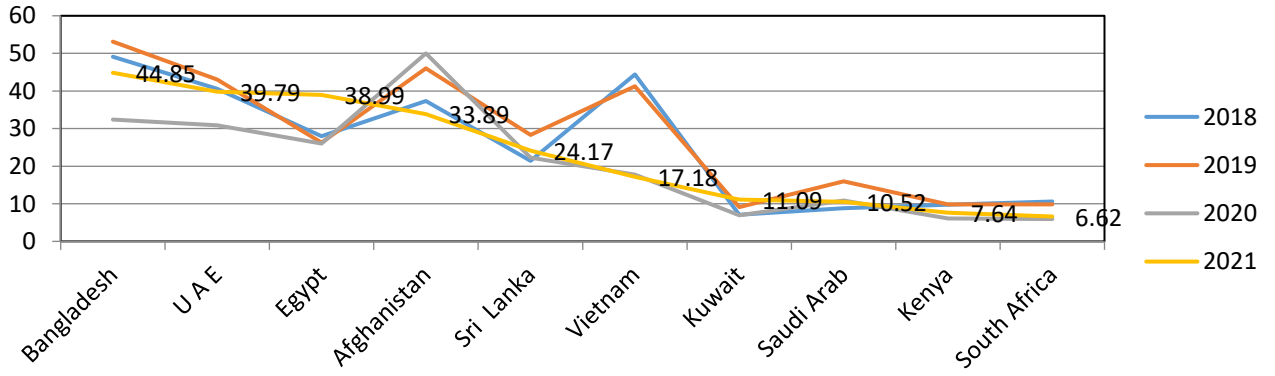
Rank	Countries	2018		2019		2020		2021	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	Bangladesh	49.11	11.01	53.12	12.12	32.40	10.88	44.85	13.03
2.	U A E	40.57	9.10	43.07	9.82	30.86	10.37	39.79	11.56
3.	Egypt	28.01	6.28	26.30	6.00	26.00	8.73	38.99	11.32
4.	Afghanistan	37.35	8.38	46.06	10.50	50.00	16.80	33.89	9.84
5.	Sri Lanka	21.44	4.81	28.28	6.45	22.25	7.48	24.17	7.02
6.	Vietnam	44.44	9.97	41.29	9.42	17.72	5.95	17.18	4.99
7.	Kuwait	7.08	1.59	9.12	2.08	6.98	2.34	11.09	3.22
8.	Saudi Arab	8.82	1.98	15.98	3.64	10.87	3.65	10.52	3.06
9.	Kenya	9.74	2.18	9.80	2.23	6.06	2.04	7.64	2.22
10.	S.Africa	10.63	2.38	9.85	2.25	5.94	2.00	6.62	1.92
	Others	188.70	42.32	155.58	35.48	88.61	29.77	109.58	31.82
	Total	445.90	100	438.45	100	297.68	100	344.31	100

Source: DGCI&S

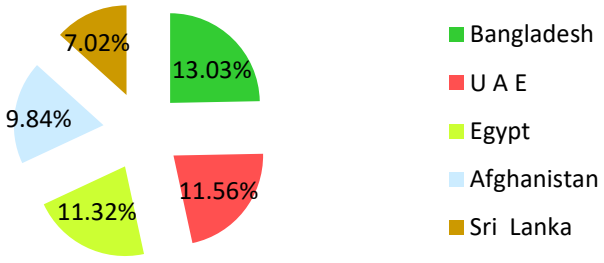
Note : India's Export including re-export

India's major destination Synthetic Staple Fibres – of Polyester Staple Fabrics from 2018-2021**(in million $)**

Data label given on the basis of 2021



India's top 5 destinations of Synthetic Staple Fibres – of Polyester Staple Fabrics by percentage in 2021:



The total worth of Synthetic Staple Fibres – of Polyester Staple Fabrics export around the world in year 2021 was US $ 344.31 million. The figures show the great potential for Indian exporters of Synthetic Staple Fibres – of Polyester Staple Fabrics to increase their participation in global trading. Bangladesh was the largest market for Synthetic Staple Fibres – of Polyester Staple Fabrics export from India. 2021, imported 44.85 USD million worth Synthetic Staple Fibres – of Polyester Staple Fabrics from India or 13.03% share of India's total export, which was followed by UAE and Egypt with share of 11.56% and 11.32% share. The top 3 countries in total shared the share of 35.91% of the Synthetic Staple Fibres – of Polyester Staple Fabrics value from India in 2021.

Table - 5

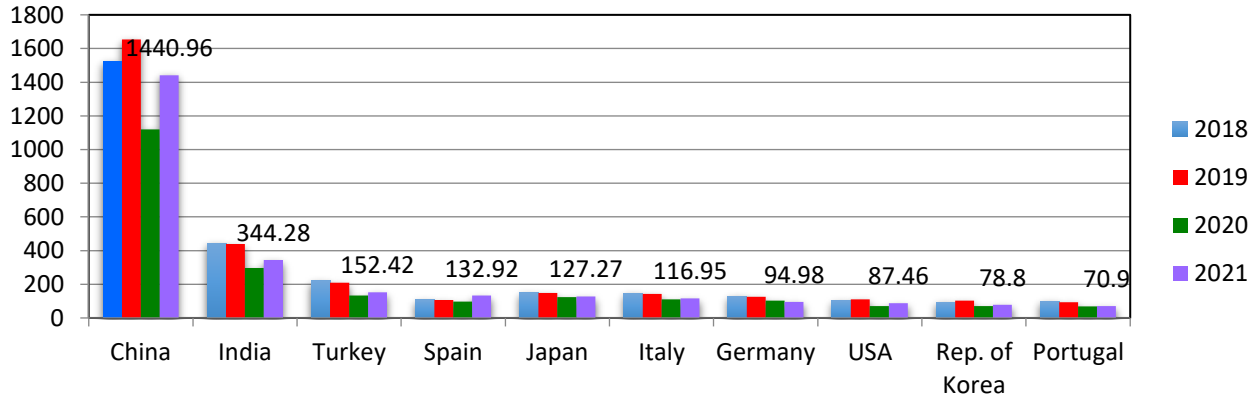
World's Top 10 exporters of woven fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics ((HS Code –5515)

Rank	Countries	2018		2019		2020		2021	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	1523.75	40.52	1654.20	42.58	1120.39	39.38	1440.96	43.59
2.	**India**	**445.04**	**11.83**	**438.66**	**11.29**	**296.67**	**10.43**	**344.28**	**10.41**
3.	Turkey	219.64	5.84	209.86	5.40	133.10	4.68	152.42	4.61
4.	Spain	108.67	2.89	107.47	2.77	96.51	3.39	132.92	4.02
5.	Japan	148.97	3.96	148.69	3.83	124.28	4.37	127.27	3.85
6.	Italy	147.06	3.91	142.95	3.68	110.26	3.88	116.95	3.54
7.	Germany	130.24	3.46	125.64	3.23	102.02	3.59	94.98	2.87
8.	USA	104.67	2.78	110.04	2.83	71.04	2.50	87.46	2.65
9.	Rep. of Korea	94.61	2.52	102.21	2.63	70.67	2.48	78.80	2.38
10.	Portugal	99.47	2.65	94.17	2.42	69.60	2.45	70.90	2.14
	Others	738.46	19.64	750.72	19.33	650.66	22.87	658.76	19.93
	Total	3760.59	100	3884.61	100	2845.20	100	3305.71	100

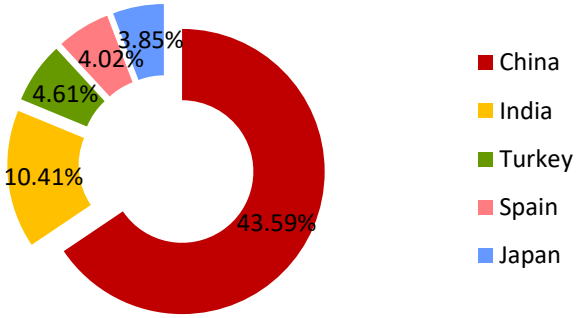
Source: UN Comtrade

Top world exporters of Woven Synthetic Staple Fibres – of Polyester Staple Fabrics from 2018 to 2021 **(in million USD)**

Data label given on the basis of 2021



Export trends in world's leading Synthetic Staple Fibres – of Polyester Staple Fabrics by percentage in 2021:



The global export of woven fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics was US $ 3.30 billion in 2021, which has risen by almost 16.19% over the previous year. Over the period under review, global exports hit record highs at US $ 3.88 Billion in 2019; however, 2020 and 2021, imports stood at a somewhat lower figure. Among the top exporting countries, China exported highest worth of Woven Fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics in 2021 valued at US $ 1.44 Billion. In that year **India** lagged somewhat behind in ranking from China for export of Synthetic Staple Fibres – of Polyester Staple Fabrics. It constituted the 2nd position in ranking in the world with US $ 344.28 million or 10.41% share of world export of Synthetic Staple Fibres – of Polyester Staple Fabrics. Which was followed by Turkey with the share 4.61% share of world export.

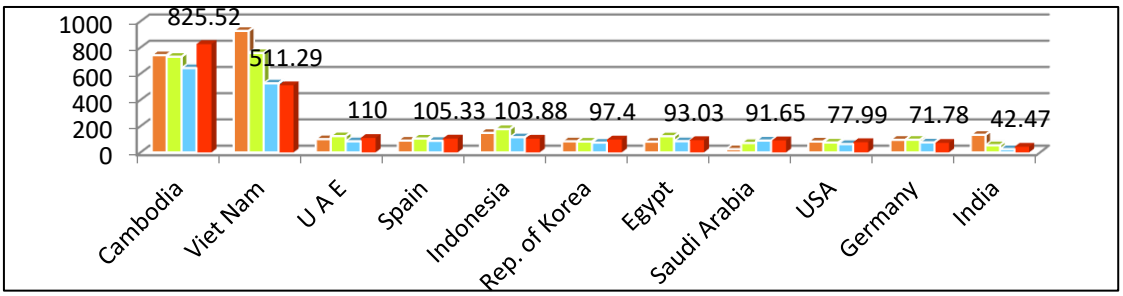
Table - 6

World's Top 10 Importers of woven fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics ((HS Code –5515)

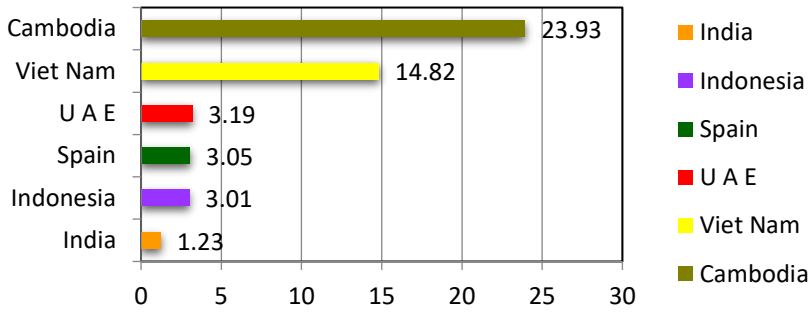
Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	Cambodia	741.46	16.93	729.34	17.24	642.63	20.52	825.52	23.93
2.	Viet Nam	926.16	21.15	757.76	17.91	526.64	16.82	511.29	14.82
3.	U A E	101.35	2.31	124.10	2.93	84.90	2.71	110.00	3.19
4.	Spain	90.29	2.06	105.41	2.49	88.48	2.83	105.33	3.05
5.	Indonesia	148.93	3.40	177.51	4.20	115.43	3.69	103.88	3.01
6.	Rep. of Korea	84.18	1.92	82.71	1.95	74.48	2.38	97.40	2.82
7.	Egypt	81.91	1.87	122.82	2.90	85.67	2.74	93.03	2.70
8.	Saudi Arabia	24.76	0.57	71.28	1.68	90.40	2.89	91.65	2.66
9.	USA	83.09	1.90	75.51	1.78	63.81	2.04	77.99	2.26
10.	Germany	95.91	2.19	96.64	2.28	76.43	2.44	71.78	2.08
21.	**India**	**133.67**	**3.05**	**54.62**	**1.29**	**25.21**	**0.81**	**42.47**	**1.23**
	Others	1867.41	42.64	1833.35	43.33	1257.00	40.15	1318.86	38.24
	Total	4379.13	100	4231.05	100	3131.07	100	3449.20	100

Source :UNComtrade

Top world importers of Synthetic Staple Fibres – of Polyester Staple Fabrics from 2018 to 2021 **(million $)**
Data label given on the basis of 2021



Country wise leading global Importer of Synthetic Staple Fibres – of Polyester Staple Fabrics by percentage in 2021

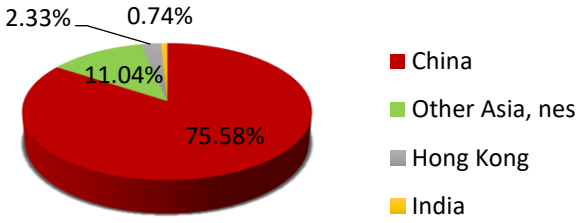


In 2021, the global import value of woven fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics was approximately US $ 3.49 billion, up from about US $ 3.13 billion recorded a year earlier. In 2021, Cambodia imported approximately US $ 825.52 Million worth of Synthetic Staple Fibres – of Polyester Staple Fabrics from the rest of the world. Viet Nam was the second largest importer of the same, with imports of around US $ 511.29 Million that year, which was followed by UAE with imports of US $ 110 million. In the same India has imported around US $ 42.47 million worth of Synthetic Staple Fibres – of Polyester Staple Fabrics from the world and occupied 21st position in the world. In comparison, the export value of the same from India was amounted to US $ 344.28 million in 2021.

Annexure-II

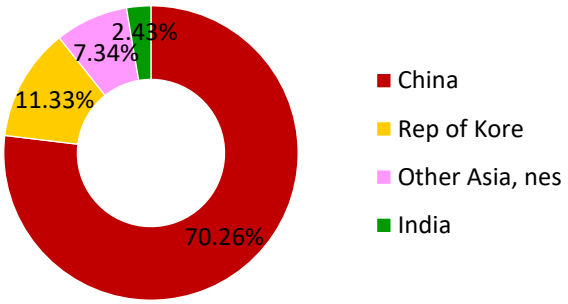
Sources of world's top three importers of Synthetic Staple Fibres – of Polyester Staple Fabrics (HS Code –5515)

i) Top 3 Sources of Synthetic Staple Fibres – of Polyester Staple Fabrics to Cambodia in 2021 by percentage*:*



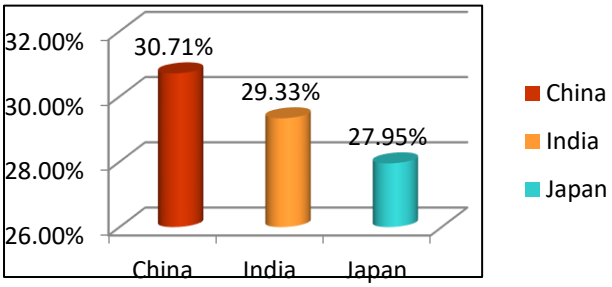
China was the top most supplier of Synthetic Staple Fibres – of Polyester Staple Fabrics to Cambodia in 2021. Cambodia imports 75.58 % of Synthetic Staple Fibres – of Polyester Staple Fabrics of its requirements from China. Other Asia, nes and Hong Kong were the 2nd and 3rd largest source of the commodity in Cambodia with shares of 11.04% and 2.33% in 2021. India exports it to Cambodia 0.74% in 2021.
(Source: UN Comtrade)

ii) Top 3 Sources of Woven Fabrics of Synthetic Staple Fibres – of Polyester Staple Fabrics to Viet Nam in 2021 by percentage**:**



70.26% share of Synthetic Staple Fibres – of Polyester Staple Fabrics imports to Viet Nam came from China in 2021, it was followed by Rep of Korea (11.33%) and Other Asia, nes (7.34%). In the same year Viet Nam imported 2.43% share of its total import of Synthetic Staple Fibres – of Polyester Staple Fabrics from **India**. **(Source: UN Comtrade)**

iii) Top 3 Sources of Synthetic Staple Fibres – of Polyester Staple Fabrics to UAE in 2021 by percentage**:**



UAE imports 88% share of Synthetic Staple Fibres – of Polyester Staple Fabrics of its requirement from China (30.71%), from India(29.33%) and from Japan (27.95%).
. **(Source : UN Comtrade)**

IMPORT

Centrifuges, including Centrifugal dryers, Purifying Machinery

A **centrifuge** is a device that uses centrifugal force to subject a specimen to a specified constant force, for example to separate various components of a fluid. This is achieved by spinning the fluid at high speed within a container, thereby separating fluids of different densities (e.g. cream from milk) or liquids from solids. It works by causing denser substances and particles to move outward in the radial direction. At the same time, objects that are less dense are displaced and moved to the centre. In a laboratory centrifuge that uses sample tubes, the radial acceleration causes denser particles to settle to the bottom of the tube, while low-density substances rise to the top. A centrifuge can be a very effective filter that separates contaminants from the main body of fluid.

The Centrifugal Dryers are basically a spin dryer. They are typically used when parts are being processed in bulk. The parts may be placed into an appropriate size basket that then is inserted into the dryer. The dryer is then closed, turned on and spins the basket at a very high speed to force any liquid, oil, etc. to leave the part. Along with the spinning action drying the parts, an optional heater can be installed to offer adequate time in drying the samples.

Industrial scale centrifuges are commonly used in manufacturing and waste processing to sediment suspended solids, or to separate immiscible liquids. An example is the cream separator found in dairies. Very high speed centrifuges and ultracentrifuges able to provide very high accelerations can separate fine particles down to the nano-scale, and molecules of different masses. Large centrifuges are used to simulate high gravity or acceleration environments (for example, high-G training for test pilots). Medium-sized centrifuges are used in washing machines and at some swimming pools to draw water out of fabrics. Gas centrifuges are used for isotope separation, such as to enrich nuclear fuel for fissile isotopes.

A wide variety of laboratory-scale centrifuges are used in chemistry, biology, biochemistry and clinical medicine for isolating and separating suspensions and immiscible liquids. They vary widely in speed, capacity, temperature control, and other characteristics. Laboratory centrifuges often can accept a range of different fixed-angle and swinging bucket rotors able to carry different numbers of centrifuge tubes and rated for specific maximum speeds. Controls vary from simple electrical timers to programmable models able to control acceleration and deceleration rates, running speeds, and temperature regimes. Ultracentrifuges spin the rotors under vacuum, eliminating air resistance and enabling exact temperature control. Zonal rotors and continuous flow systems are capable of handing bulk and larger sample volumes, respectively, in a laboratory-scale instrument. Another application in laboratories is blood separation. Blood separates into cells and proteins (RBC, WBC, platelets, etc.) and serum. DNA preparation is another common application for pharmacogenetics and clinical diagnosis. DNA samples are purified and the DNA is prepped for separation by adding buffers and then centrifuging it for a certain amount of time. The blood waste is then removed and another buffer is added and spun inside the centrifuge again. Once the blood waste is removed and another buffer is added the pellet can be suspended and cooled. Proteins can then be removed and the entire thing can be centrifuged again and the DNA can be isolated completely. Specialized cytocentrifuges are used in medical and biological laboratories to concentrate cells for microscopic examination.

Industrial centrifugal separator is a coolant filtration system for separating particles from liquid like, grinding machining coolant. It is usually used for non-ferrous particles separation such as, silicon, glass, ceramic, and graphite etc. The filtering process does not require any consumption parts like filter bags, which saves the earth from harm.

Standalone centrifuges for drying (hand-washed) clothes – usually with a water outlet. Washing machines are designed to act as centrifuges to get rid of excess water in laundry loads. Centrifuges are used in the attraction Mission: SPACE, located at Epcot in Walt Disney World, which propels riders using a combination of a centrifuge and a motion simulator to simulate the feeling of going into space. In soil mechanics, centrifuges utilize centrifugal acceleration to match soil stresses in a scale model to those found in reality. Large industrial centrifuges are commonly used in water and wastewater treatment to dry sludges. The resulting dry product is often termed cake, and the water leaving a centrifuge after most of the solids have been removed is called cent rate. Large industrial centrifuges are also used in the oil industry to remove solids from the drilling fluid. Disc-stack centrifuges used by some companies in the oil sands industry to separate small amounts of water and solids from bitumen. Centrifuges are used to separate cream (remove fat) from milk; see Separator (milk).

These are broadly classified under **H. S. Code 8421**.

Table - 7

India's Top 10 Sources of Centrifuges (HS Code :8421)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	163.52	15.42	211.87	18.94	225.61	19.97	264.88	18.16
2.	Germany	187.63	17.69	170.26	15.22	152.32	13.49	259.56	17.79
3.	U S A	183.57	17.31	148.09	13.24	150.69	13.34	198.41	13.60
4.	Japan	57.85	5.45	73.02	6.53	82.96	7.34	106.62	7.31
5.	Korea RP	75.78	7.15	92.63	8.28	95.64	8.47	93.07	6.38
6.	U K	32.66	3.08	45.97	4.11	62.68	5.55	84.66	5.80
7.	Singapore	56.99	5.37	82.53	7.38	81.35	7.20	81.06	5.56
8.	South Africa	18.26	1.72	16.39	1.47	16.76	1.48	42.12	2.89
9.	France	36.48	3.44	35.08	3.14	29.85	2.64	34.90	2.39
10.	Malaysia	9.33	0.88	10.44	0.93	19.99	1.77	34.44	2.36
	Others	238.50	22.49	232.18	20.76	211.67	18.74	258.91	17.75
	Total	1060.56	100	1118.46	100	1129.52	100	1458.61	100

Source: DGCI&S

Note : India's Import including re-import Collectively India imported US $ 1.45 Billion of Centrifuges, including Centrifugal dryers, Purifying Machinery from different countries in 2021 and US $ 1.13 Billion in 2020. which is up by 28.31% than the Centrifuges, including Centrifugal dryers, Purifying Machinery imported into India the previous year. India Imports from China of Centrifuges, including Centrifugal dryers, Purifying Machinery was US $ 264.88 Million during 2021 or 18.16% share of India's total import. The second position in the ranking was occupied by Germany (US $ 259.66 M), with an 17.79% share of India's imports. It was followed by the USA, with a 13.60% share of India's total import of Centrifuges, including Centrifugal dryers, Purifying Machinery in 2021.

Table - 8

World's Top 10 Importer of Centrifuges (HS Code :8421)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	USA	9214.97	13.42	9592.06	13.35	10458.45	14.17	12888.68	14.80
2.	Germany	6423.51	9.36	7078.59	9.85	7310.03	9.90	9014.11	10.35
3.	China	4744.31	6.91	5737.54	7.99	5448.59	7.38	6078.35	6.98
4.	France	2622.68	3.82	2692.84	3.75	2772.17	3.75	3309.99	3.80
5.	Canada	2562.73	3.73	2610.44	3.63	2599.56	3.52	3052.47	3.50
6.	Mexico	2694.44	3.93	2846.77	3.96	2362.44	3.20	2782.80	3.19
7.	U K	2240.50	3.26	2265.26	3.15	2152.67	2.92	2655.74	3.05
8.	Japan	1718.91	2.50	1735.10	2.42	1840.33	2.49	2125.44	2.44
9.	Spain	1751.14	2.55	1743.56	2.43	1855.06	2.51	2067.40	2.37
10.	Russia	1667.06	2.43	1853.11	2.58	1697.03	2.30	1993.23	2.29
20.	**India**	**1062.28**	**1.55**	**1120.69**	**1.56**	**1131.88**	**1.53**	**1460.34**	**1.68**
	Others	31938.16	46.53	32561.20	45.33	34202.13	46.33	39684.59	45.56
	Total	68640.69	100	71837.17	100	73830.33	100	87113.14	100

Source :UNComtrade

The world imports of Centrifuges, including Centrifugal dryers, Purifying Machinery was totalled US $ 87.11 Billion in 2021. The total imports volume increased at an 26.90% over the year 2018 and 17.98% from the year 2020. Over the period under review, global Centrifuges, including Centrifugal dryers, Purifying Machinery imports attained its maximum level of US $ 87.11 Billion in 2021. USA has been the top importer of Centrifuges, including Centrifugal dryers, Purifying Machinery with its import share of 14.80 % in the year 2021 followed by Germany and China that imported Centrifuges, including Centrifugal dryers, Purifying Machinery of 10.35 % and 6.98 % respectively. In the same year India imports US $ 1.46 Billion, accounted 1.65% share of world import and ranked at 20th in the world import.

Artificial Graphite, Colloidal Graphite

Graphite is a crystalline form of the element carbon. It consists of stacked layers of graphene. Graphite occurs naturally and is the most stable form of carbon under standard conditions. Synthetic and natural graphite are consumed on large scale (300 kton/year, in 1989) for uses in pencils, lubricants, and electrodes. Under high pressures and temperatures it converts to diamond. It is a weak conductor of heat and electricity.

Synthetic graphite is a man made substance manufactured by the high temperature processing of amorphous carbon materials. The types of amorphous carbon used as precursors to graphite are many, and can be derived from petroleum, coal, or natural and synthetic organic materials. In some cases graphite can even be manufactured by the direct precipitation of graphitic carbon from pyrolysis of a carbonaceous gas such as acetylene (pyrolytic graphite). One important commonality between all graphite precursors is that they must contain carbon. Graphite is carbon, a specific form of carbon, so it can only be derived from other carbon containing substances.

Manufactured or synthetic graphite was discovered by accident during the late 1800's by Edward Goodrich Acheson. While attempting to manufacture silicon carbide (Carborundum) in an electric furnace from a combination of silica and amorphous carbon, Mr. Acheson found that an unintentional reaction product, graphite crystals, was also formed. By refining the process and eliminating silica (SiO2) from the equation high purity, highly crystalline synthetic graphite could now be manufactured from certain (but not all) solid amorphous carbons. One of the furnace types still used to manufacture graphite, as well as the process method still bears Mr. Acheson's name: the Acheson furnace and the Acheson process.

Natural graphite that forms in the earth's crust forms at temperatures in the neighborhood of 750°C. At 750 °C on the earth's surface virtually nothing will happen to carbon other than oxidation (burning). However, if in addition to heating to 750 °C you apply about 75,000 psi for 10 million years, graphite will form. Although 750 °C is an easily achieved temperature, the pressure and time requirements have obvious drawbacks when it comes to the practical manufacture of graphite..

Although synthetic graphite can be manufactured from any number of precursor materials the primary material used to manufacture it in the United States is petroleum coke. As noted above only certain types of carbonaceous feeds are suitable for graphite production. Therefore the petroleum coke used for the synthetic graphite industry must be carefully specified to assure it is of the type that will ultimately result in high quality graphitic carbon.

In 1893, Charles Street of Le Carbone discovered a process for making artificial graphite. In the mid-1890s, Edward Goodrich Acheson (1856–1931) accidentally invented another way to produce synthetic graphite after synthesizing carborundum (silicon carbide or SiC). He discovered that overheating carborundum, as opposed to pure carbon, produced almost pure graphite. While studying the effects of high temperature on carborundum, he had found that silicon vaporizes at about 4,150 °C (7,500 °F), leaving the carbon behind in graphitic carbon. This graphite became valuable as a lubricant.

Acheson's technique for producing silicon carbide and graphite is named the Acheson process. In 1896, Acheson received a patent for his method of synthesizing graphite,[62] and in 1897 started commercial production. Graphite electrodes carry the electricity that melts scrap iron and steel, and sometimes direct-reduced iron (DRI), in electric arc furnaces, which are the vast majority of steel furnaces. They are made from petroleum coke after it is mixed with coal tar pitch. They are then extruded and shaped, then baked to carbonize the binder (pitch), and finally graphitized by heating it to temperatures approaching 3000 °C, at which the carbon atoms arrange into graphite. They can vary in size up to 3.5 m (11 ft) long and 75 cm (30 in) in diameter. An increasing proportion of global steel is made using electric arc furnaces, and the electric arc furnace itself is becoming more efficient, making more steel per tonne of electrode. An estimate based on USGS data indicates that graphite electrode consumption was 197,000 tonnes in 2005.

Electrolytic aluminium smelting also uses graphitic carbon electrodes. On a much smaller scale, synthetic graphite electrodes are used in electrical discharge machining (EDM), commonly to make injection molds for plastics.

Graphite (carbon) fiber and carbon nanotubes are also used in carbon fiber reinforced plastics, and in heat-resistant composites such as reinforced carbon-carbon (RCC). Commercial structures made from carbon fiber graphite composites include fishing rods, golf club shafts, bicycle frames, sports car body panels, the fuselage of the Boeing 787 Dreamliner and pool cue sticks and have been successfully employed in reinforced concrete. The mechanical properties of carbon fiber graphite-reinforced plastic composites and grey cast iron are strongly influenced by the role of graphite in these materials.

. These are broadly classified under **H. S. Code 3801.**

Table - 9

India's Top 10 Source Countries of Artificial Graphite, Colloidal Graphite (HS Code 3801)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	38.73	41.71	38.67	49.83	23.46	35.43	39.41	39.35
2.	Germany	14.05	15.13	14.37	18.52	19.76	29.85	13.32	13.30
3.	U K	0.53	0.58	0.74	0.95	2.34	3.53	11.44	11.42
4.	Poland	6.18	6.66	1.31	1.69	3.42	5.16	4.75	4.74
5.	Norway	2.87	3.09	4.12	5.32	3.39	5.11	4.34	4.33
6.	U S A	2.68	2.89	2.37	3.05	2.52	3.81	4.29	4.29
7.	France	4.64	5.00	5.24	6.75	3.77	5.69	3.75	3.75
8.	Japan	11.54	12.43	3.51	4.52	2.29	3.47	3.27	3.27
9.	Netherland	0.75	0.80	0.33	0.42	0.38	0.58	3.17	3.17
10.	U A E	2.73	2.94	2.21	2.85	0.67	1.01	1.78	1.77
	Others	8.14	8.76	4.73	6.09	4.20	6.34	10.63	10.61
	Total	92.85	100	77.60	100	66.20	100	100.16	100

Source: DGCI&S

Note : India's Import including Re-import

The value of imports of commodity group 3801 Artificial Graphite, Colloidal Graphite to India totalled exceeds US $ 100 million in 2021. Sales of Artificial Graphite, Colloidal Graphite to India increased by 51.30% compared to 2020. In 2021, most of the Artificial Graphite, Colloidal Graphite imported to India originated from China with an import value of US $ 39.41 million, accounted 39.35 % of the commodity group 3801 Artificial Graphite, Colloidal Graphite comes from China. On the other hand, other countries such as Germany (13.30%) and UK (11.42%) were becoming more important sources for India's Artificial Graphite, Colloidal Graphite imports in 2021.

Table - 10

World Top 10 Importer of Artificial Graphite, Colloidal Graphite (HS Code 3801)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	Poland	65.00	2.19	128.72	4.45	266.45	10.45	413.81	12.21
2.	Malaysia	318.94	10.72	240.81	8.32	254.61	9.99	413.43	12.20
3.	China	335.94	11.29	308.04	10.64	330.54	12.96	401.99	11.86
4.	USA	445.02	14.96	544.87	18.82	310.47	12.18	376.17	11.10
5.	Rep. of Korea	241.09	8.10	243.01	8.39	202.22	7.93	227.24	6.70
6.	Hungary	30.46	1.02	52.04	1.80	96.62	3.79	170.93	5.04
7.	Germany	169.50	5.70	147.41	5.09	153.56	6.02	160.07	4.72
8.	Japan	214.26	7.20	226.63	7.83	108.60	4.26	139.89	4.13
9.	Brazil	190.72	6.41	124.05	4.29	78.16	3.07	115.70	3.41
10.	Indonesia	48.95	1.65	57.55	1.99	66.90	2.62	105.77	3.12
11.	**India**	**93.65**	**3.15**	**77.63**	**2.68**	**66.35**	**2.60**	**100.23**	**2.96**
	Others	821.19	27.61	744.10	25.70	615.42	24.14	764.75	22.56
	Total	2974.73	100	2894.86	100	2549.90	100	3389.98	100

Source :UN Comtrade

In 2021, the world imports of Artificial Graphite, Colloidal Graphite exceeded US $3.38 billion. It was $2.55 billion in the previous year. Poland was the largest importer of the Commodity group (3801) in 2021, imports almost US $ 413.81 million, accounted more than 12.21% of world import of Artificial Graphite, Colloidal Graphite. In the same year the second and third position in the world ranking were occupied by Malaysia and China with the share of 12.20% and 11.86% respectively of global imports. In the same year India imports more than US $ 100 million, accounted 2.96% share of world import and ranked at 11th in the world import.