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 **Woven fabrics of Synthetic filament Yarn & Stainless Steel Wire** and imports of **Metal - Rolling Mills & Rolls Therefore and Enzyme** 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-5407 &7223for export and 8455 & 3507 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 August'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 Woven fabrics of Synthetic filament Yarn & Stainless Steel Wire and imports of Metal - Rolling Mills & Rolls Therefore and Enzyme**.** 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 :

- **Table 1 : India's top 10 Export destination of Woven fabrics of Synthetic filament Yarn with their shares in percentage.**
- **Table 2 : World's top 10 Exporters of Woven fabrics of Synthetic filament Yarn with their shares in percentage.**
- **Table 3 : World's top 10 Importers of Woven fabrics of Synthetic filament Yarn withtheir shares in percentage.**
- **Annex- I : Top 3 sources of Woven fabrics of Synthetic filament Yarn of World's top 3 Importers.**
- **Table 4 : India's top 10 Export destination of S.S. Wire with their shares in percentage.**
- **Table 5 : World's top 10 Exporters of S.S. Wire with their shares in percentage.**
- **Table 6 : World's top 10 Importers of S.S. Wire with their shares in percentage.**
- **Annex-II : Top 3 sources of S.S. Wire of World's top 3 Importers.**
- **Table 7 : India's top10 Sources of Metal-Rolling Mills with their shares in percentage.**
- **Table 8 : World's top 10 Importers of Metal-Rolling Mills Oils with their shares in percentage.**
- **Table 9 : India's top 10 Sources of Unwrought Enzyme with their shares in percentage.**
- **Table 10 : World's top 10 Importers of Unwrought Enzyme with their shares in percentage.**

EXPORT

Woven fabrics of synthetic filament yarn

Yarn is a long continuous length of interlocked fibres, suitable for use in the production of textiles, sewing, crocheting, knitting, weaving, embroidery, or rope making. It can be made of a number of natural or synthetic materials, and comes in a variety of colours and thicknesses (referred to as "weights"). Thread is a type of yarn intended for sewing by hand or machine. Modern manufactured sewing threads may be finished with wax or other lubricants to withstand the stresses involved in sewing. Embroidery threads are yarns specifically designed for needlework.

Examples of synthetic fibers that are used as yarn are nylon, acrylic fiber, rayon,[7] and polyester. Synthetic fibers are generally extruded in continuous strands of gel-state materials. These strands are drawn (stretched), annealed (hardened), and cured to obtain properties desirable for later processing.

Synthetic fibers come in three basic forms: staple, tow, and filament. Staple is cut fibers, generally sold in lengths up to 120 mm. Tow is a continuous "rope" of fibers consisting of many filaments loosely joined side-to-side. Filament is a continuous strand consisting of anything from 1 filament to many. Synthetic fiber is most often measured in a weight per linear measurement basis, along with cut length. Denier and Dtex are the most common weight to length measures.

In general, natural fibers tend to require more careful handling than synthetics because they can shrink, felt, stain, shed, fade, stretch, wrinkle, or be eaten by moths more readily, unless special treatments such as mercerization or super washing are performed to strengthen, fix colour, or otherwise enhance the fiber's own properties.

Some types of protein yarns (i.e., hair, silk, feathers) may feel irritating to some people, causing sensations of contact dermatitis, hives, wheezing reactions. These reactions are likely a sensitivity to thicker and coarser fiber diameter or fiber ends. In fact, contrary to popular belief, wool allergies are practically unknown. According to a study reviewing the evidence of wool as an allergen conducted by Acta Dermato-Venereologica contemporary superfine or ultrafine Merino wool with their reduced fibre diameters do not provoke itch, are well tolerated and in fact benefit eczema management. Further studies suggest that known allergens applied during textile processing are minimally present in wool garments today given current industry practices and are unlikely to lead to allergic reactions.

When natural hair-type fibers are burned, they tend to singe and have a smell of burnt hair; this is because many, as human hair, are protein-derived. Cotton and viscose (rayon) yarns burn as a wick. Synthetic yarns generally tend to melt though some synthetics are inherently flame-retardant. Noting how an unidentified fiber strand burns and smells can assist in determining if it is natural or synthetic, and what the fiber content is.

Both synthetic and natural yarns can pill. Pilling is a function of fiber content, spinning method, twist, contiguous staple length, and fabric construction. Single ply yarns or using fibers like merino wool are known to pill more due to the fact that in the former, the single ply is not tight enough to securely retain all the fibers under abrasion, and the merino wool's short staple length allows the ends of the fibers to pop out of the twist more easily.

Yarns combining synthetic and natural fibers inherit the properties of each parent, according to the proportional composition. Synthetics are added to lower cost, increase durability, add unusual colour or visual effects, provide machine washability and stain resistance, reduce heat retention or lighten garment weight.

In 2021, Synthetic Filament Yarn Woven Fabric were the world's 173rd most traded product, with a total export trade of US $28.71B. Between 2020 and 2021 the exports of Synthetic Filament Yarn Woven Fabric decreased by 26.53%, from $22.692B to $28.71B. Trade in Synthetic Filament Yarn Woven Fabric represent 0.13% of total world trade.

These are broadly classified under **H.S. Code-5407.**

Table - 1

India's Top 10 destination of Woven fabrics of synthetic filament yarn (H.S Code-5407)

Rank	Countries	2018		2019		2020		2021	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	U A E	103.54	11.58	115.24	10.38	48.02	9.22	125.16	14.28
2.	U S A	76.12	8.51	77.22	6.96	43.19	8.29	108.35	12.36
3.	Bangladesh	77.27	8.64	106.67	9.61	56.01	10.75	87.91	10.03
4.	Afghanistan	38.44	4.30	164.96	14.86	104.89	20.14	35.08	4.00
5.	Togo	27.65	3.09	32.81	2.96	12.59	2.42	33.45	3.82
6.	U K	37.44	4.19	35.71	3.22	13.64	2.62	33.04	3.77
7.	Nepal	20.92	2.34	25.75	2.32	10.00	1.92	30.12	3.44
8.	Nigeria	14.82	1.66	21.46	1.93	13.13	2.52	24.08	2.75
9.	Iran	31.48	3.52	24.63	2.22	4.20	0.81	21.71	2.48
10.	Saudi Arab	27.22	3.04	37.86	3.41	16.22	3.11	18.62	2.12
	Others	439.28	49.13	467.86	42.14	199.02	38.21	359.25	40.97
	Total	894.19	100	1110.18	100	520.91	100	876.78	100

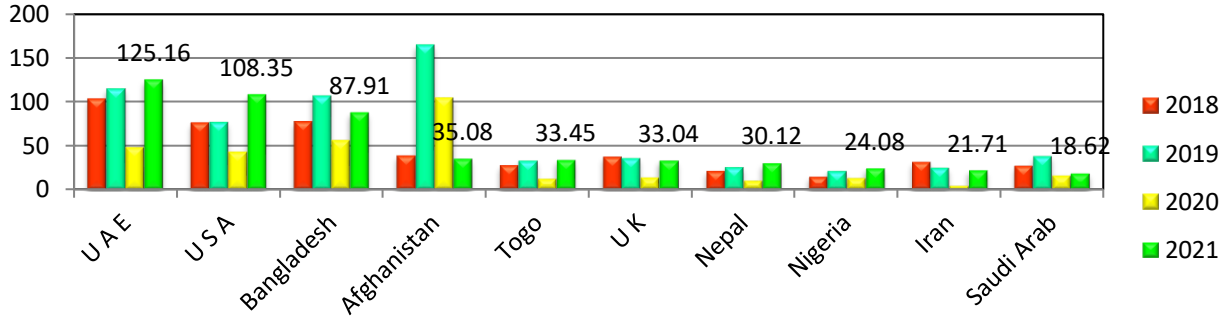
Source: DGCI&S.

Note : India's Export including re-export

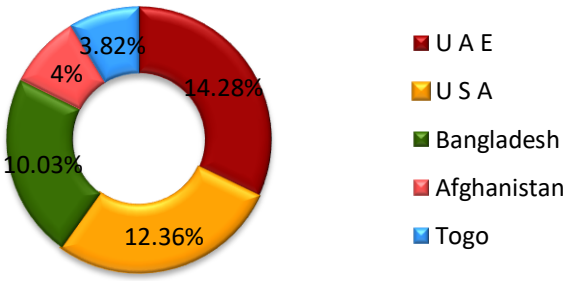
Leading importers of Woven fabrics of synthetic filament yarn from India from 2018-2021

(Values in million USD)

Data label given on the basis of 2021



India's top 5 destinations of Woven fabrics of synthetic filament yarn by percentage India in 2021:



In 2021, India exported US $876.78 million in Synthetic Filament Yarn Woven Fabric, making it the 4th largest exporter of Synthetic Filament Yarn Woven Fabric in the world. In the Same year the main destination of Synthetic Filament Yarn Woven Fabric exports from India are: U A E (US $ 125.16 M), U S A (US $108.38M) and Bangladesh (US $ 87.91 M). Total export of Woven Fabrics of Synthetic Filament Yarn from India has increased by almost 68% in 2021 compared to that in the year 2020.

Table-2

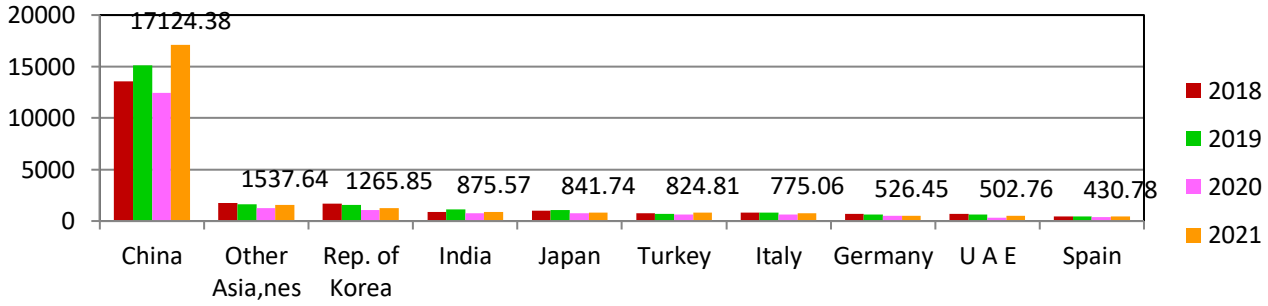
World's Top 10 exporter of Woven fabrics of synthetic filament yarn (H.S Code-5407)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	13554.60	50.27	15121.78	53.15	12462.22	54.91	17124.38	59.64
2.	Other Asia,nes	1739.41	6.45	1654.70	5.82	1253.15	5.52	1537.64	5.36
3.	Rep. of Korea	1674.12	6.21	1594.29	5.60	1060.47	4.67	1265.85	4.41
4.	**India**	**894.69**	**3.32**	**1110.85**	**3.90**	**785.17**	**3.46**	**875.57**	**3.05**
5.	Japan	1009.81	3.75	1042.86	3.67	781.22	3.44	841.74	2.93
6.	Turkey	786.53	2.92	712.56	2.50	647.19	2.85	824.81	2.87
7.	Italy	834.83	3.10	815.97	2.87	651.89	2.87	775.06	2.70
8.	Germany	664.54	2.46	632.95	2.22	511.65	2.25	526.45	1.83
9.	U A E	663.39	2.46	634.98	2.23	344.65	1.52	502.76	1.75
10.	Spain	443.00	1.64	425.92	1.50	353.02	1.56	430.78	1.50
	Others	4696.58	17.42	4705.07	16.54	3844.36	16.94	4008.27	13.96
	Total	26961.50	100	28451.95	100	22694.97	100	28713.32	100

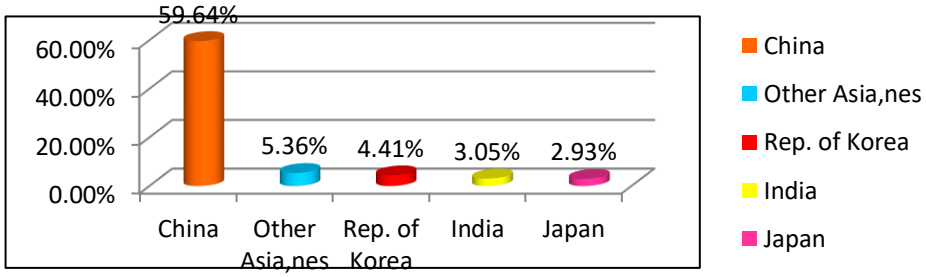
Source: UN Comtrade

Leading exporters of Woven fabrics of synthetic filament Yarn of world during the period from 2018 to 2021 **(Values in million USD)**

Data label given on the basis of 2021



Country wise world's top exporters of Woven fabrics of synthetic filament yarn by percentage in 2021



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In 2021, world export of Synthetic Filament Yarn Woven Fabric was US $ 28.71 billion. In that year the global exports of Synthetic Filament Yarn Woven Fabric increased by 26.51%, from US $ 22.69 billion to US $ 28.71 billion. China dominates Synthetic Filament Yarn Woven Fabric exports structure, which was US $ 17.12 billion or accounted 59.64% of the global total in 2021, followed by Other Asia,nes (5.36%) and Rep. of Korea (4.41%) globally. India stood at 4th position in ranking in the world leading exporting countries with 3.05% share of global export of the commodity group in 2021.

Table-3

World's top 10 Importers of Woven fabrics of synthetic filament yarn (H.S Code-5407)

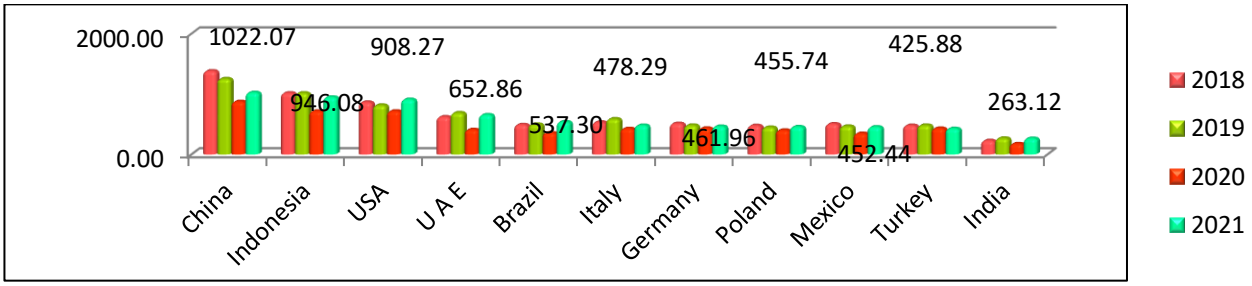
Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	1379.26	7.96	1250.96	7.13	872.33	6.17	1022.07	6.91
2.	Indonesia	1015.24	5.86	1015.32	5.79	715.05	5.06	946.08	6.39
3.	USA	862.00	4.97	812.43	4.63	715.15	5.06	908.27	6.14
4.	U A E	619.10	3.57	686.02	3.91	408.44	2.89	652.86	4.41
5.	Brazil	490.01	2.83	497.17	2.83	355.72	2.51	537.30	3.63
6.	Italy	532.62	3.07	585.62	3.34	425.48	3.01	478.29	3.23
7.	Germany	510.32	2.94	480.05	2.74	432.28	3.06	461.96	3.12
8.	Poland	475.15	2.74	446.56	2.55	398.37	2.82	455.74	3.08
9.	Mexico	502.85	2.90	463.31	2.64	345.36	2.44	452.44	3.06
10.	Turkey	477.41	2.75	480.13	2.74	430.42	3.04	425.88	2.88
19.	**India**	**227.04**	**1.31**	**266.81**	**1.52**	**174.64**	**1.23**	**263.12**	**1.78**
	Others	10243.19	59.09	10552.93	60.17	8872.09	62.72	8191.96	55.37
	Toral	17334.19	100	17537.30	100	14145.34	100	14795.96	100

Source : UN Comtrade

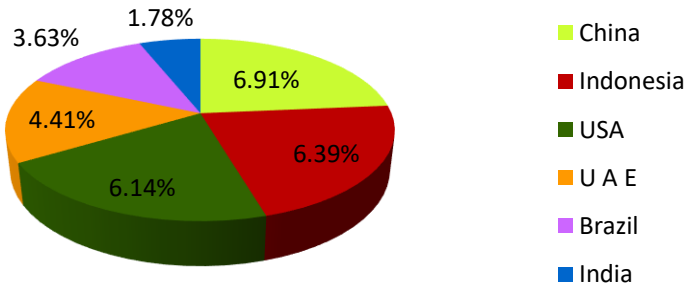
Leading Woven fabrics of synthetic filament Yarn importers of world from 2018 to 2021

(Values in million USD)

Data label given on the basis of 2020



Country wise world's leading importers Woven fabrics of synthetic filament Yarn by % in 2021

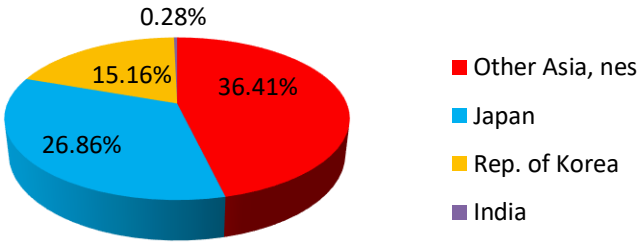


In 2021, China was the leading Synthetic Filament Yarn Woven Fabric importing country in the world, with imports valued at approximately US $ 1.02 billion, accounted for 6.91 % of world import value of it . Indonesia ranked in second that year, with a share of 6.39% of global import and USA ranked was in 3rd position in ranking in the world import in the same year, with 6.14% share globally. India ranked in 19th position in the world with the share of 1.78% of total Global import value of Synthetic Filament Yarn Woven Fabric. Though the China was the leading importer of Woven fabrics of Synthetic Filament Yarn in 2021

Annexure-1

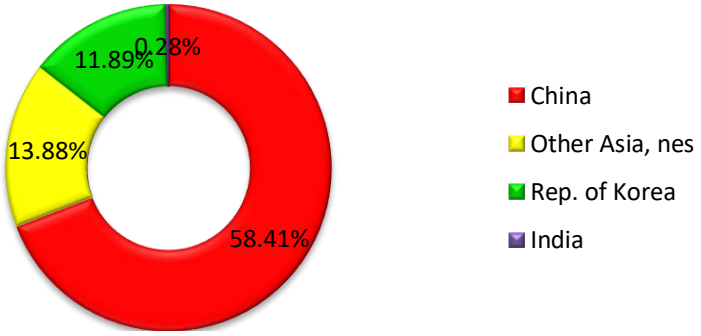
Major sources of world's top three importers of Woven fabrics of synthetic filament yarn (H.S Code-5407)

i) Top 3 Sources of Woven fabrics of synthetic filament yarn to China in 2021 by percentage*:*



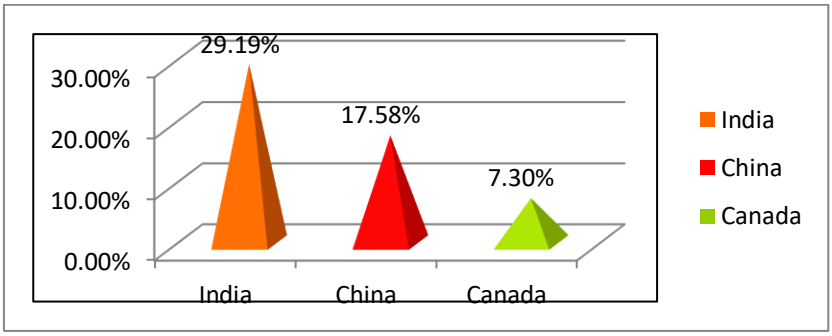
China imported most of its Woven fabrics of synthetic filament yarn from Other Asia, nes., 36.41% share of China's total import value of it came from Other Asia., nes. in 2021 followed by Japan and Rep. of Korea. India exports only 0.28% share in 2021 to China. **(Source : UN Comtrade)**

ii) Top 3 Sources of Woven fabrics of synthetic filament yarn to Indonesia in 2021 by percentage*:*



Indonesia imports most of its requirements of Woven fabrics of synthetic filament yarn from China (58.41 %) ,from Other Asia, nes. (13.88%) ,from Rep. of Korea (11.89%) and from India only 0.28% in 2021**. (Source: UN Comtrade)**

iii) Top 3 Sources of Woven fabrics of synthetic filament yarn to USA in 2021 by percentage*:*



USA's 3 major source countries of Woven fabrics of synthetic filament yarn in 2021 were India (29.19%), China (17.58%) and Canada (7.30%) in 2021.**(Source: UN Comtrade)**

Stainless Steel Wire

Stainless steel is any of a group of ferrous alloys that contain a minimum of approximately 11% chromium, a composition that largely inhibits the iron from rusting and provides heat-resistant properties. Different types of stainless steel include the elements carbon, nitrogen, aluminium, silicon, sulfur, titanium, nickel, copper, selenium, niobium, and molybdenum. Specific types of stainless steel are often designated by their AISI three-digit number, e.g., 304 stainless. The ISO 15510 standard lists the chemical compositions of stainless steels of the specifications in existing ISO, ASTM, EN, JIS, and GB standards in a useful interchange table.

Stainless steel's resistance to rusting results from the presence of chromium in the alloy, which forms a passive film that protects the underlying material from corrosion attack, and can self-heal in the presence of oxygen.

The addition of nitrogen also improves resistance to pitting corrosion and increases mechanical strength. Thus, there are numerous grades of stainless steel with varying chromium and molybdenum contents to suit the environment the alloy must endure.

Resistance to corrosion and staining, low maintenance, and familiar luster make stainless steel an ideal material for many applications where both the strength of steel and corrosion resistance are required. Moreover, stainless steel can be rolled into sheets, plates, bars, wire, and tubing. These can be used in cookware, cutlery, surgical instruments, major appliances, vehicles, construction material in large buildings, industrial equipment (e.g., in paper mills, chemical plants, water treatment), and storage tanks and tankers for chemicals and food products.

The biological cleanability of stainless steel is superior to both aluminium and copper, having a biological cleanability comparable to glass. Its cleanability, strength, and corrosion resistance have prompted the use of stainless steel in pharmaceutical and food processing plants.

Like steel, stainless steels are a relatively poor conductor of electricity, with significantly lower electrical conductivity than copper. In particular, the electrical contact resistance (ECR) of stainless steel arises as to the result of the dense protective oxide layer and limits its functionality in applications as electrical connectors. Copper alloys and nickel coated connectors tend to exhibit lower ECR values, and are preferred materials for such applications. Nevertheless, stainless steel connectors are employed in situations where ECR poses a lower design criteria and corrosion resistance is required, for example in high temperatures and oxidizing environments.

As with all other alloys, the melting point of stainless steel is expressed in the form of a range of temperatures, and not a singular temperature, his temperature range goes from 1,400 to 1,530 °C (2,550 to 2,790 °F) depending on the specific consistency of the alloy in question.

Martensitic and ferritic stainless steels are magnetic. Ferritic steel consists of ferrite crystals, a form of iron with up to 0.025% carbon. Due to its cubic crystalline structure, ferritic steel only absorbs a small amount of carbon, which consists of one iron in each corner and a central iron atom. The central atom is responsible for its magnetic properties. Grades with low coercive field have been developed for electro-valves used in household appliances and for injection systems in internal combustion engines. Some applications require non-magnetic materials, such as magnetic resonance imaging. Annealed austenitic stainless steels are usually non-magnetic, though work hardening can make cold-formed austenitic stainless steels slightly magnetic. Sometimes, if austenitic steel is bent or cut, magnetism occurs along the edge of the stainless steel because the crystal structure rearranges itself.

Stainless steel wire is the raw material for screws, springs, metallic net, cable wire and hardware. It is widely used in filter, building and important for electronic parts, oil and fiber industry, kitchenware and hardware.

These are broadly classified under **H.S. Code-7223**.

Table - 4

India's Top 10 destination of Stainless Steel Wire (HS Code –7223)

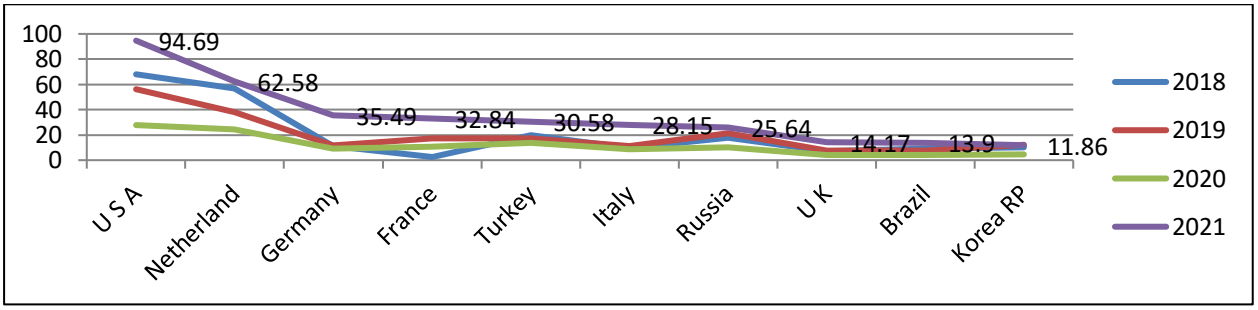
Rank	Countries	2018		2019		2020		2021	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	U S A	68.01	22.37	56.19	19.28	27.78	16.44	94.69	20.11
2.	Netherland	56.97	18.74	38.18	13.10	24.40	14.44	62.58	13.29
3.	Germany	11.14	3.66	11.54	3.96	9.16	5.42	35.49	7.54
4.	France	2.49	0.82	17.28	5.93	10.75	6.36	32.84	6.98
5.	Turkey	19.54	6.43	17.31	5.94	13.54	8.02	30.58	6.50
6.	Italy	9.62	3.17	11.24	3.86	8.81	5.21	28.15	5.98
7.	Russia	17.54	5.77	21.34	7.32	10.26	6.07	25.64	5.45
8.	U K	6.88	2.26	7.57	2.60	4.12	2.44	14.17	3.01
9.	Brazil	9.01	2.96	7.68	2.64	4.10	2.43	13.90	2.95
10.	Korea RP	9.98	3.28	11.93	4.09	4.78	2.83	11.86	2.52
	Others	92.82	30.53	91.17	31.28	51.24	30.33	120.92	25.68
	Total	304.00	100	291.44	100	168.94	100	470.83	100

Source: DGCI&S

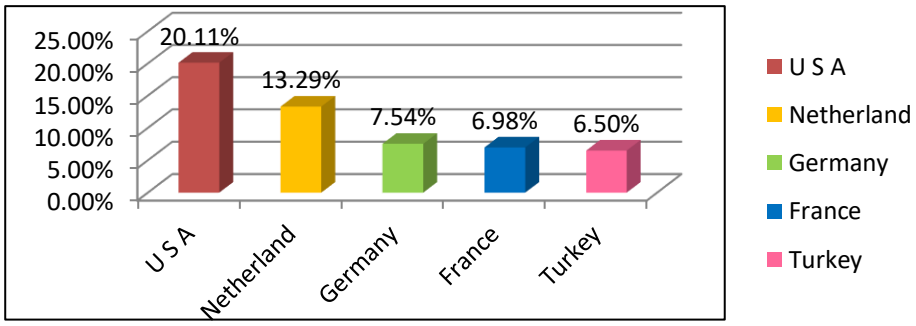
Note : India's Export including re-export

Leading S. S.wire importers from India during the period from 2018-2021**(Values in million USD)**

Data label given on the basis of 2021



India's top 5 major destinations of S. S. Wire by percentage India in 2021:



The above table represents top ten countries where has been exporting Stainless Steel Wire in the year 2021 the export of S.S.Wire from India was US $ 470.83 million and increased to nearly 2.75 times than that in the year 2020. USA was the top most destination of S.S. Wire imports 20.11% share of India's total export value of S.S. Wire from India in 2021, followed by Netherland (13.29%) and Germany (7.54%). The worth value export of S. S. Wire from India have reached on pick in the year 2021, which was US $ 470.83 in that year.

Table - 5

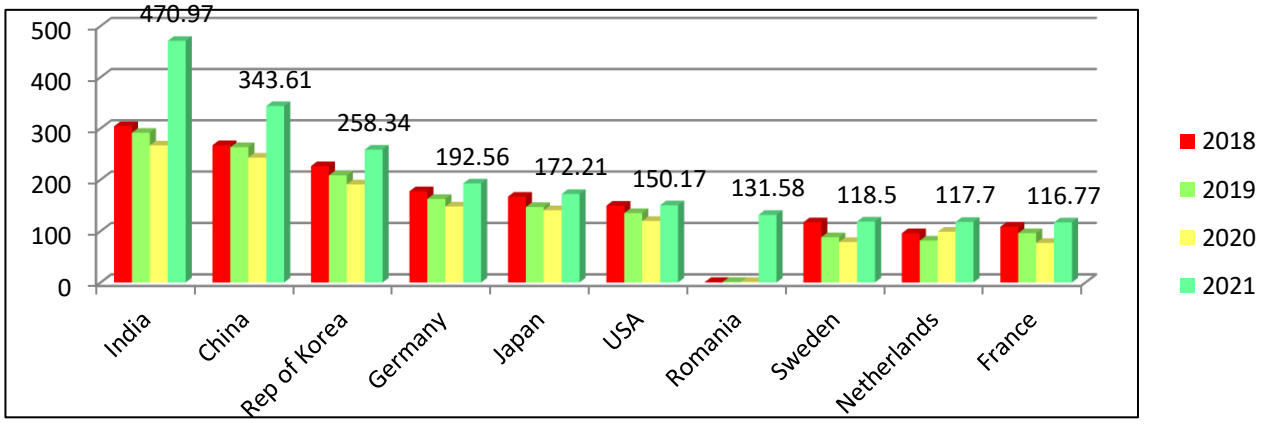
World's Top 10 exporters of Stainless Steel Wire (HS Code –7223)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	**India**	**304.28**	**13.12**	**291.38**	**13.70**	**266.72**	**13.75**	**470.97**	**16.92**
2.	China	267.21	11.52	263.28	12.38	242.92	12.52	343.61	12.35
3.	Rep of Korea	226.34	9.76	208.33	9.79	190.82	9.83	258.34	9.28
4.	Germany	177.52	7.66	162.49	7.64	147.73	7.61	192.56	6.92
5.	Japan	166.91	7.20	146.75	6.90	140.51	7.24	172.21	6.19
6.	USA	149.44	6.45	135.04	6.35	119.71	6.17	150.17	5.40
7.	Romania	1.03	0.04	1.08	0.05	1.06	0.05	131.58	4.73
8.	Sweden	117.10	5.05	88.08	4.14	78.69	4.06	118.50	4.26
9.	Netherlands	95.97	4.14	81.44	3.83	98.62	5.08	117.70	4.23
10.	France	108.37	4.67	95.84	4.51	76.78	3.96	116.77	4.20
	Others	704.47	30.38	653.37	30.72	576.81	29.73	710.45	25.53
	Total	2318.66	100	2127.08	100	1940.35	100	2782.87	100

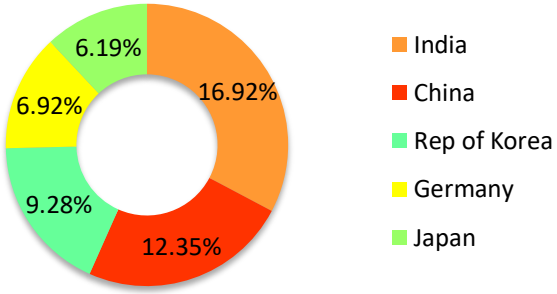
Source: UN Comtrade

Leading S. S. wire exporters of world during the period from 2018 to 2021 **(Values in million USD)**

Data label given on the basis of 2021



Country wise export trends in world's leading S S Wire exporters by percentage in 2021:



As India Being the top most exporter of S.S. Wire in the world over the review from 2018 to 2021 India's Export value of S.S. Wire was estimated at US $ 470.97 million in 2021. Accounted for 16.92% of global export value of S.S. Wire. China followed at 12.35% share of world export value of S.S. Wire and stood at 2nd position in the world, followed by Rep of Korea (9.28%). Germany, Japan and USA were other important exporter of the commodity. The above table shows that in 2021 the world export of S.S Wire has increased by more than 43% than that in the year 2020.

Table - 6

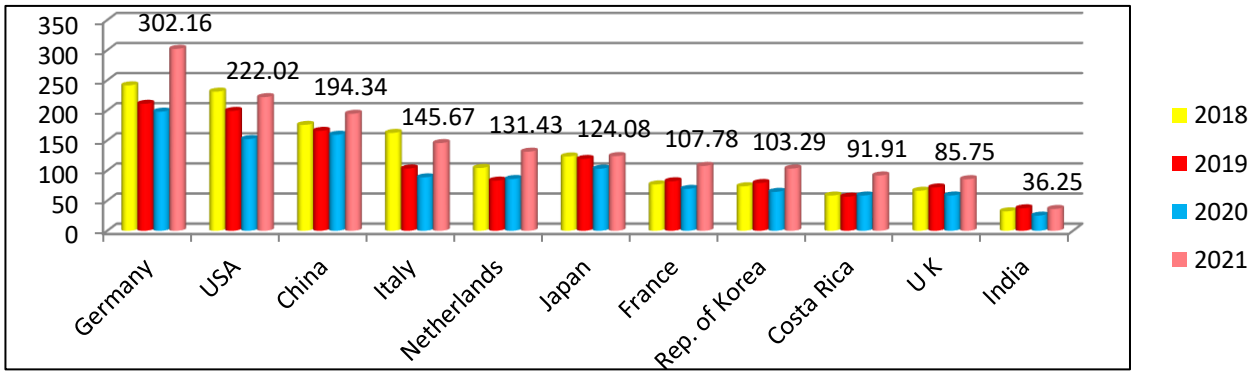
World's Top 10 Importers of Stainless Steel Wire (HS Code –7223)

Rank	Countries	2017		2018		2019		2020	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	Germany	241.59	9.77	210.99	9.50	197.87	10.20	302.16	11.72
2.	USA	231.15	9.34	199.19	8.97	152.39	7.86	222.02	8.61
3.	China	175.92	7.11	166.01	7.47	159.50	8.22	194.34	7.54
4.	Italy	162.58	6.57	103.41	4.66	88.73	4.57	145.67	5.65
5.	Netherlands	104.31	4.22	83.33	3.75	86.01	4.43	131.43	5.10
6.	Japan	123.46	4.99	119.36	5.37	103.17	5.32	124.08	4.81
7.	France	77.03	3.11	82.26	3.70	69.65	3.59	107.78	4.18
8.	Rep. of Korea	73.92	2.99	79.38	3.57	64.72	3.34	103.29	4.01
9.	Costa Rica	58.55	2.37	56.64	2.55	58.61	3.02	91.91	3.57
10.	U K	66.53	2.69	72.02	3.24	58.65	3.02	85.75	3.33
21.	**India**	**32.30**	**1.31**	**37.35**	**1.68**	**25.17**	**1.30**	**36.25**	**1.41**
	Others	1126.26	45.53	1011.15	45.53	875.47	45.13	1032.69	40.07
	Total	2473.58	100	2221.09	100	1939.92	100	2577.36	100

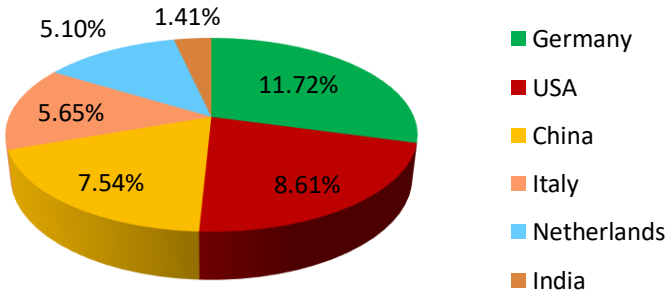
Source :UNComtrade

Leading S S. Wire importers of world during the period from 2018 to 2021 **(Values in million USD)**

Data label given on the basis of 2021



Country wise import trends in world's S. S. Wire importers by percentage in 2021 :

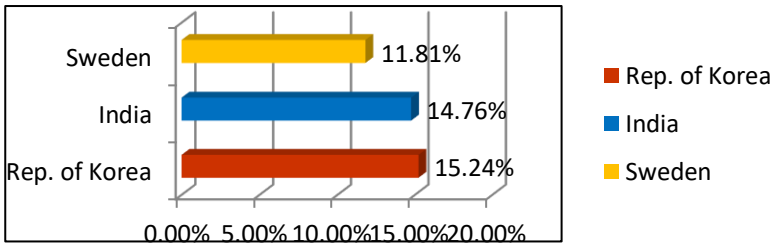


In the year 2021, the main importing countries for S.S. Wire were Germany (US $ 302.16 M), USA (US $ 222.02 M), China (US $ 194.34 M), Italy (US $ 145.67M) and Netherlands (US $ 131.43 M). In 2021 these five countries together imported totalled US $ 995.62 million of S.S.Wire and accounted 38.62% share of total world import value of S.S.Wire. There are very little trade data for India, India imports only 1.41% share of world's total import value of S.S.Wire and holds 21st position in ranking in 2021.

Annexure-II

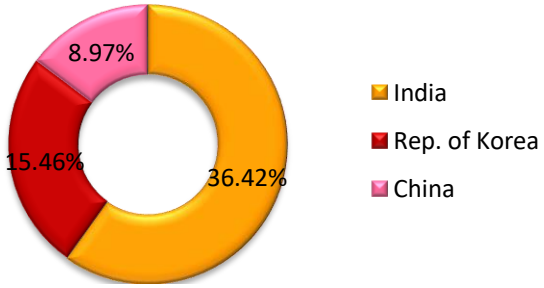
Major sources of world's top three importers of S S Wire (HS Code –7223).

i) Top 3 Sources of S. S. Wire to Germany in 2021 by percentage*:*



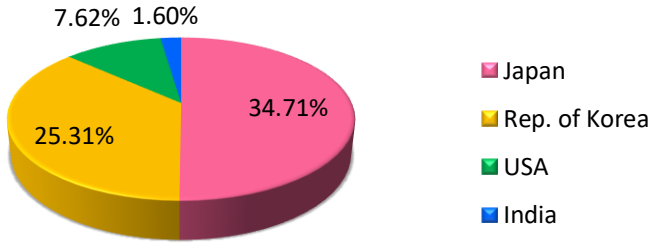
Germany imports most of its requirements of S. S. Wire from Rep of Korea with 15.24 % share of its total import in 2021. **India** has exported 14.76 % share of S.S. Wire to Germany & Sweden (11.81%) were the 2nd and 3rd major source of the commodity to Germany in the same year.**(Source: UN Comtrade)**

ii) Top 3 Sources of S. S. Wire to USA in 2021 by percentage**:**



36.42% of S.S. Wire imports of USA comes from **India** in 2021, followed by Rep. of Korea(15.46%) and China (8.97%). USA imported 60.85 % share of its total import of S. S. Wire from these three countries in 2021. **(Source: UN Comtrade)**

iii) Top 3 Sources of S. S. Wire to China in 2021 by percentage**:**



Japan was the largest source of S. S. Wire to China in 2021, 34.71% of total S. S. Wire import by China from Japan in 2021. Rep. of Korea and USA were other major sources of S. S. Wire to China in that year. In the same year China imported 1.60% share of its total import of S.S. Wire from India. **(Source : UN Comtrade)**

IMPORT

Metal - Rolling Mills & Rolls Therefore

In metalworking, rolling is a metal forming process in which metal stock is passed through one or more pairs of rolls to reduce the thickness, to make the thickness uniform, and/or to impart a desired mechanical property. The concept is similar to the rolling of dough. Rolling is classified according to the temperature of the metal rolled. If the temperature of the metal is above its recrystallization temperature, then the process is known as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling. In terms of usage, hot rolling processes more tonnage than any other manufacturing process, and cold rolling processes the most tonnage out of all cold working processes. Roll stands holding pairs of rolls are grouped together into rolling mills that can quickly process metal, typically steel, into products such as structural steel (I-beams, angle stock, channel stock), bar stock, and rails. Most steel mills have rolling mill divisions that convert the semi-finished casting products into finished products.

The invention of the rolling mill in Europe may be attributed to Leonardo da Vinci in his drawings. The earliest rolling mills in crude form but the same basic principles were found in Middle East and South Asia as early as 600 BCE. Earliest rolling mills were slitting mills, which were introduced from what is now Belgium to England in 1590. These passed flat bars between rolls to form a plate of iron, which was then passed between grooved rolls (slitters) to produce rods of iron. The first experiments at rolling iron for tinplate took place about 1670. In 1697, Major John Hanbury erected a mill at Pontypool to roll 'Pontypool plates' – black plate. Later this began to be rerolled and tinned to make tinplate. The earlier production of plate iron in Europe had been in forges, not rolling mills.

Until well into the eighteenth century, rolling mills derived their power from water wheels. The first recorded use of a steam engine directly driving a mill is attributed to John Wilkinson's Bradley Works where, in 1786, a Boulton and Watt engine was coupled to a slitting and rolling mill. The use of steam engines considerably enhanced the production capabilities of the mills, until this form of power was displaced by electric motors soon after 1900.

Modern rolling practice can be attributed to the pioneering efforts of Henry Cort of Funtley Iron Mills, near Fareham in Hampshire, England. In 1783, a patent number was issued to Henry Cort for his use of grooved rolls for rolling iron bars. With this new design, mills were able to produce 15 times more output per day than with a hammer. Although Cort was not the first to use grooved rolls, he was the first to combine the use of many of the best features of various iron making and shaping processes known at the time. Thus modern writers have called him "father of modern rolling".

The first rail rolling mill was established by John Birkenshaw at Bedlington Ironworks in Northumberland, England, in 1820, where he produced fish-bellied wrought iron rails in lengths of 15 to 18 feet. With the advancement of technology in rolling mills, the size of rolling mills grew rapidly along with the size of the products being rolled. One example of this was at The Great Exhibition in London in 1851, where a plate 20 feet long, 3 ½ feet wide, and 7/16 of an inch thick, and weighing 1,125 pounds, was exhibited by the Consett Iron Company. Further evolution of the rolling mill came with the introduction of three-high mills in 1853 used for rolling heavy sections.

Rolling mills are used to roll hot or cold ferrous or non-ferrous strips, wires and even rods. Depending on the type of mill it could be used for hot or cold breakdown and finishing of bar, sheet or strip. They can also be used for finish rolling of thin gauge stock, embossing or compacting.

In 2020, **Rolls for metal rolling mills** were the world's 1368th most traded product, with a total import trade of US $4.43Billion which was decreased by 15.62% than the year 2019.

These are broadly classified under **H. S. Code 8455**.

Tab le - 7

India's Top 10 Sources of Metal - Rolling Mills & Rolls (HS Code :8455)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	140.39	35.21	212.12	36.53	77.97	30.81	162.18	40.45
2.	Germany	74.10	18.59	63.88	11.00	45.82	18.11	79.15	19.74
3.	Japan	42.04	10.54	118.69	20.44	16.92	6.69	25.13	6.27
4.	Italy	37.71	9.46	33.13	5.71	30.75	12.15	20.25	5.05
5.	Korea RP	18.58	4.66	29.45	5.07	12.95	5.12	20.12	5.02
6.	Ukraine	5.55	1.39	15.37	2.65	14.06	5.56	18.03	4.50
7.	Belgium	11.71	2.94	7.90	1.36	6.16	2.43	14.75	3.68
8.	U S A	26.84	6.73	31.42	5.41	13.62	5.38	14.38	3.59
9.	Slovenia	3.79	0.95	8.57	1.48	4.96	1.96	10.38	2.59
10.	Russia	11.60	2.91	9.35	1.61	4.41	1.74	7.56	1.88
	Others	26.40	6.62	50.77	8.74	25.43	10.05	29.05	7.25
	Total	398.71	100	580.64	100	253.07	100	400.98	100

Source: DGCI&S

Note : India's Import including re-import

The Metal – Rolling Mills & Rolls import in 2021 stood at US $ 400.98 Million and US $ 253.07 Million in 2020, which shows a positive growth of 58% from the 2020 of India's import value of Metal – Rolling Mills & Rolls. Major three source countries of the commodity to India in 2021 were China (US $ 162.18 Million), Germany (US $ 79.15 Million), Japan (US $ 25.13 Million). These 3 countries in total sold US $ 266.46 Million value of Metal – Rolling Mills & Rolls to India which rounds up to 66.46% of the total Metal – Rolling Mills & Rolls import into India.

Table - 8

World's Top 10 Importer ofMetal - Rolling Mills & Rolls (HS Code :8455)

Rank	Countries	2017		2018		2019		2020	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	USA	489.91	11.29	622.71	11.74	592.42	13.27	615.02	15.77
2.	**India**	**402.22**	**9.27**	**580.89**	**10.95**	**384.99**	**8.62**	**400.44**	**10.27**
3.	China	290.66	6.70	342.94	6.47	361.01	8.09	225.00	5.77
4.	Russia	163.85	3.77	171.10	3.23	285.46	6.39	201.35	5.16
5.	Germany	205.25	4.73	191.69	3.61	169.97	3.81	179.42	4.60
6.	Rep. of Korea	122.54	2.82	136.64	2.58	204.43	4.58	129.06	3.31
7.	Indonesia	274.98	6.34	157.40	2.97	118.83	2.66	126.61	3.25
8.	Turkey	110.74	2.55	160.33	3.02	111.18	2.49	124.83	3.20
9.	Mexico	155.91	3.59	513.93	9.69	212.86	4.77	114.16	2.93
10.	Italy	113.60	2.62	153.48	2.89	143.04	3.20	109.99	2.82
	Others	2010.88	46.33	2271.57	42.84	1880.22	42.12	1674.15	42.93
	Total	4340.53	100	5302.67	100	4464.41	100	3900.02	100

Source :UNComtrade

Global Imports of Metal – Rolling Mills & Rolls, the top five importers of Metal – Rolling Mills & Rolls in 2021 were USA (US $ 615.02 M), **India (US $ 400.44 M)**, China (US $ 225 M), Russia (US$ 201.35 M) and Germany (US $ 179.42 M), These 5 countries in total imported US $ 1.62 Billion value of Metal – Rolling Mills & Rolls which rounds up to 41.57% of the total Metal – Rolling Mills & Rolls import of world. The global Metal – Rolling Mills & Rolls import in 2021 stood at US $ 3.9 Billion and US $ 4.46 Billion in 2020, which shows a negative growth of 12.64% from the 2020 of India's import value of Metal – Rolling Mills & Rolls .

Enzyme

Enzyme, a substance that acts as a catalyst in living organisms, regulating the rate at which chemical reactions proceed without itself being altered in the process.

The biological processes that occur within all living organisms are chemical reactions, and most are regulated by enzymes. Without enzymes, many of these reactions would not take place at a perceptible rate. Enzymes catalyze all aspects of cell metabolism. This includes the digestion of food, in which large nutrient molecules (such as proteins, carbohydrates, and fats) are broken down into smaller molecules; the conservation and transformation of chemical energy; and the construction of cellular macromolecules from smaller precursors. Many inherited human diseases, such as albinism and phenylketonuria, result from a deficiency of a particular enzyme.

Enzymes also have valuable industrial and medical applications. The fermenting of wine, leavening of bread, curdling of cheese, and brewing of beer have been practiced from earliest times, but not until the 19th century were these reactions understood to be the result of the catalytic activity of enzymes. Since then, enzymes have assumed an increasing importance in industrial processes that involve organic chemical reactions. The uses of enzymes in medicine include killing disease-causing microorganisms, promoting wound healing, and diagnosing certain diseases.

A large protein enzyme molecule is composed of one or more amino acid chains called polypeptide chains. The amino acid sequence determines the characteristic folding patterns of the protein's structure, which is essential to enzyme specificity. If the enzyme is subjected to changes, such as fluctuations in temperature or pH, the protein structure may lose its integrity (denature) and its enzymatic ability. Denaturation is sometimes, but not always, reversible.

In most chemical reactions, an energy barrier exists that must be overcome for the reaction to occur. This barrier prevents complex molecules such as proteins and nucleic acids from spontaneously degrading, and so is necessary for the preservation of life. When metabolic changes are required in a cell, however, certain of these complex molecules must be broken down, and this energy barrier must be surmounted. Heat could provide the additional needed energy (called activation energy), but the rise in temperature would kill the cell. The alternative is to lower the activation energy level through the use of a catalyst. This is the role that enzymes play. They react with the substrate to form an intermediate complex—a "transition state"—that requires less energy for the reaction to proceed. Enzyme activity can be inhibited in various ways. Competitive inhibition occurs when molecules very similar to the substrate molecules bind to the active site and prevent binding of the actual substrate. Penicillin, for example, is a competitive inhibitor that blocks the active site of an enzyme that many bacteria use to construct their cell walls.

Enzymes are used in the food, agricultural, cosmetic, and pharmaceutical industries to control and speed up reactions in order to quickly and accurately obtain a valuable final product. Enzymes are crucial to making cheese, brewing beer, baking bread, extracting fruit juice, tanning leather, and much more. The industrial uses of enzymes are also increasing since they are being used in the production of bio fuels and biopolymers. The enzymes can be harvested from microbial sources or can be made synthetically. Yeast and E. coli are commonly engineered to over express an enzyme of interest. This type of enzyme engineering is a powerful way to obtain large amounts of enzyme for bio catalysis in order to replace traditional chemical processes.

The global enzymes market size was valued at USD 10.69 billion in 2020. Growing consumer awareness regarding health has resulted in surging demand for functional food and beverage products, which is further anticipated to trigger the product demand in the coming years. Enzymes are derived from the organs of animals such as plant materials, microorganisms, and calf stomach. With the advent of different technologies including genetic engineering, enzyme manufacturers have an option to produce the necessary quantity of enzymes in selected production hosts such as transgenic plants and microorganisms.

These are broadly classified under **H. S. Code 3507**.

Table - 9

India's Top 10 Source Countries of Enzyme (HS Code : 3507)

Rank	Countries	2018		2019		2020		2021	
		Value (million $)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	China	37.07	28.06	42.59	36.57	27.04	34.60	50.92	30.36
2.	Germany	10.18	7.70	9.32	8.01	8.01	10.24	31.58	18.82
3.	Denmark	20.74	15.70	20.65	17.73	13.77	17.62	21.16	12.61
4.	U S A	18.03	13.65	11.32	9.72	8.07	10.32	15.30	9.12
5.	Lithuania	0.35	0.27	0.30	0.26	0.46	0.59	10.53	6.28
6.	Austria	4.37	3.31	3.22	2.76	2.45	3.13	8.26	4.93
7.	Netherland	5.54	4.19	7.30	6.27	5.15	6.59	7.58	4.52
8.	Singapore	4.86	3.68	5.99	5.14	2.80	3.58	5.45	3.25
9.	Japan	2.59	1.96	2.78	2.38	1.23	1.57	3.53	2.11
10.	U K	0.69	0.52	0.68	0.58	0.22	0.29	2.69	1.60
	Others	27.70	20.97	12.31	10.57	8.95	11.45	10.74	6.40
	Total	132.12	100	116.46	100	78.16	100	167.74	100

Source: DGCI&S

Note : India's Import including Re-import

The value of imports of Enzymes to India totalled US $ 167.74million in 2021. Sales of Enzymes to India increased by more than double in value terms compared to 2020.Major five source countries of Enzymes to India in 2021 are China(US $ 50.92 Million), Germany (US $ 31.58 Million), Denmark (US $ 21.16 Million), USA (US $ 15.30 Million) and Lithuania (US $ 10.53 Million). These 5 countries in total exported US $ 799.64 Million value of Acyclic Hydrocarbon to India which rounds up to 77.19% of the total Enzymes import into India.

Table - 10

World Top 10 Importer of Enzyme (HS Code :3507)

Rank	Countries	2017		2018		2019		2020	
		Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)	Value (million$)	Share (%)
1.	USA	869.63	16.07	784.63	14.83	959.97	16.53	1191.96	17.20
2.	Netherlands	346.06	6.39	376.92	7.12	441.26	7.60	527.87	7.62
3.	Germany	365.12	6.75	376.74	7.12	395.87	6.82	470.12	6.78
4.	China	249.59	4.61	238.63	4.51	299.48	5.16	441.43	6.37
5.	France	249.44	4.61	215.19	4.07	215.79	3.72	244.17	3.52
6.	Denmark	220.85	4.08	193.29	3.65	175.79	3.03	236.97	3.42
7.	Brazil	167.05	3.09	162.39	3.07	182.30	3.14	232.96	3.36
8.	Russia	116.08	2.15	120.59	2.28	129.14	2.22	200.92	2.90
9.	Singapore	125.38	2.32	122.33	2.31	156.48	2.69	189.53	2.73
10.	Canada	124.11	2.29	132.00	2.49	141.30	2.43	173.89	2.51
13.	**India**	**131.57**	**2.43**	**116.40**	**2.20**	**122.80**	**2.11**	**167.71**	**2.42**
	Others	2446.47	45.21	2451.48	46.34	2587.46	44.55	2853.34	41.17
	Total	5411.34	100	5290.59	100	5807.64	100	6930.86	100

Source :UNComtrade

The imports of the Five major importers of Enzymes, namely USA, Netherlands, Germany, China and France represented more than US $ 2.87 Billon of total imports in 2021. In value terms, USA (US $ 1.19 B), Netherlands (US $ 527.87 M), Germany (US $ 470.12 M), China (US $ 441.43 M) and France (244.17M) constituted the countries with the highest levels of imports in 2021, together accounting for 41.49 % share of global imports of Enzymes. **India** experienced the highest growth rate of the value of imports, among the main importing countries and ranked in 13th position in the world with 2.42% share of Global import of Enzymes in 2021.