TURKISH PVC

INDUSTRY FOLLOW-UP REPORT

2017/9 Months

PAGEV

PREFACE

The plastics industry is one of the most important actors of the Turkish economy. Today, the contribution of the plastics industry to the country's economy is gradually increasing with the total production exceeding 9 million tons, and 35 billion dollars' worth of turnover, the approaching direct exports of 5 billion dollars and the annual growth of 12% for the last 10 years.
Our industry, with its production capacity, has reached the second place in Europe and the sixth place in the world. As PAGEV, we continue to lead the industry successfully in the framework of the "Unifying Power" mission of the Turkish Plastics Industry.

We also know that having the right and reliable data and information is the most important part of the solution when we sign the indispensability of Plastics in our lives and sign our work to tackle our industrial problems with concrete steps based on scientific evidence. In this direction we constantly investigate, collect new data, compile and report them. We present our reports that we believe are important for the development of our industry and our booklets containing important information to the plastics industry representatives, stakeholders and public institutions.

As PAGEV, we prepared a report set that will contribute to the industry in a serious way in the face of our long and dedicated researches. With our reports, we made booklets with the comments of our expert reporters about the point where the Turkish Plastics Industry is in the right and reliable light, common problems and what should be the search for concrete solutions. We believe that our reports and information set will benefit all of our stakeholders, especially our members, and will guide the plastics world. At the same time, we are pleased that our public institutions have reached the most up-to-date and accurate information about the plastics industry.

On the other hand, with our sector reports in English, we think that our colleagues will be able to share the potential of our country's plastics industry with the most up-to-date business partners in the global marketplace.

Hereby, presenting our current reports and information files relating with our industry, we would like to thank all of our colleagues who have contributed to this day's achievement of our industry, who has taken a position as a locomotive mission in the development of our country.

Best regards,

Yavuz EROĞLU
PAGEV President

CONTENTS

1. PLASTIC RAW MATERIALS COVERED BY REPORT

The plastic raw material covered by the analysis is Polymers of Vinyl Chloride or Other Halogenated Olefins of HS Code 3904. In the analysis, foreign trade data is taken as 3904 GTIP sum.

HS Code	Definition
39.04	**Polymers of vinyl chloride or other halogenated olefins**
	(in the first form):
	- Poly (vinyl chloride) (not mixed with any other substance) (PVC)
3904.10.00.00.11	- - Emulsion poly (vinyl chloride) (E-PVC)
3904.10.00.00.19	- - Others
	- Other poly (vinyl chloride):
3904.21.00.00.00	**- - Non-plastic PVC**
3904.22.00.00.00	**- - Plasticized PVC**
3904.30.00.00.00	**- Vinyl chloride-vinyl acetate copolymers**
3904.40.00.00.00	**- Other vinyl chloride copolymers**
3904.50	**- Vinylidene chloride polymers:**
3904.50.10.00.00	- - Copolymer of acrylonitrile with vinylidene chloride (diameter 4 micrometers or more in the form of expandable spheres, but not exceeding 20 micrometers)
3904.50.90.00.00	- - Others
	- Fluorine polymers:
3904.61.00.00.00	**- - Polytetrafluoroethylene (PTFE)**
3904.69	**- - Others:**
3904.69.10.00.00	- - - Polyvinyl fluoride (any of the forms specified in note 6 (b) of this chapter
3904.69.20.00.00	- - - Fluor elastomer FKM
3904.69.80.00.00	- - - Others
3904.90.00.00.00	**Polymers of vinyl chloride or other halogenated olefins**

Table 1: Polymers of Vinyl Chloride or Other Halogenated Olefins of HS Code 3904
Source: Turk Stat and ITC Trade Statistics

2. INSTALLED CAPACITY

The only plant producing PVC in Turkey is PETKİM and its current production capacity is capable of producing 150,000 tons of PVC per year.

Initial Capacity	105.000 ton/year
Date of Operation	1986
Extension History	1995, 2001
Capacity after extension	150.000 ton /year

Table 2: PETKİM’s PVC Production Capacity and Products
Source: PETKİM Annual Reports

Primary End Uses of PVC produced by PETKİM are Agriculture and Construction industries (irrigation pipes, drain pipes, fittings manufacturing) packaging film, cable coverings, transparent cosmetic and oil bottles, manufacture of various tubes and other bottles, foot beds, floor bedsteads, various construction materials (door, window profiles, shutter manufacture) floor covering and manufacture of artificial leather.

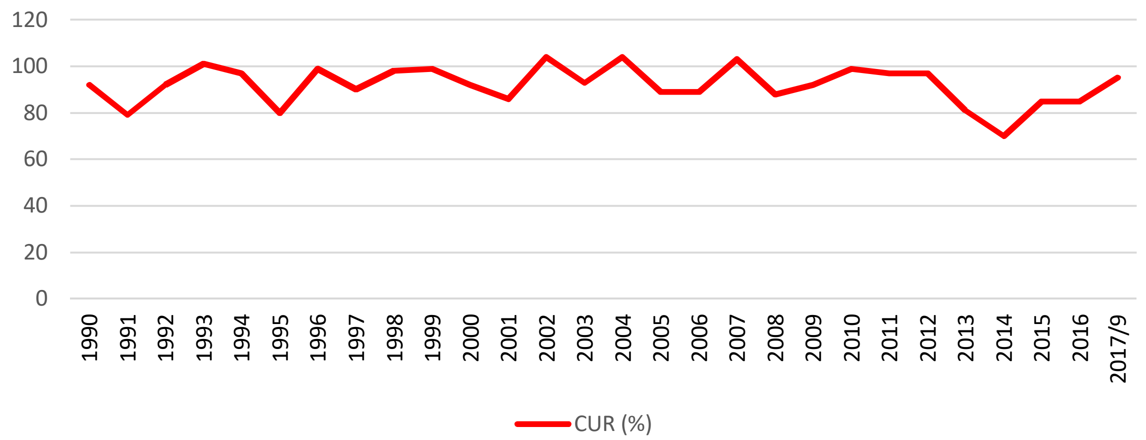
3. PRODUCTION AND CAPACITY UTILIZATION

PVC production and capacity utilization of PETKİM between 2012 and 2017/9 months are given in the table and graphic below and PVC production of the company has reached its maximum level with 157 thousand tons in 2002 and 2004. PVC production which was 128 thousand tons in 2016 realized as 107 thousand tons in the 9 months of 2017 and expected to be 142 thousand tons by the end of 2017.

	(1000 Ton)	C.U.R. (%)
2012	**146**	**97**
2013	**121**	**81**
2014	**105**	70
2015	128	85
2016	128	85
2017/9	107	95
2017/E	142	95

Table 3: PETKİM PVC Production
Source: PETKİM Annual Reports

PETKİM's capacity utilization in PVC production exceeded 100% in 1993, 2002, 2004 and 2007, but only 70% of the capacity was available in 2014. Capacity utilization rose to 85% in 2015 and 2016 and estimated to be 95% by the end of 2017.



Graphic 1: PETKİM's PVC Capacity Utilization (%)
Source: PETKİM Annual Reports

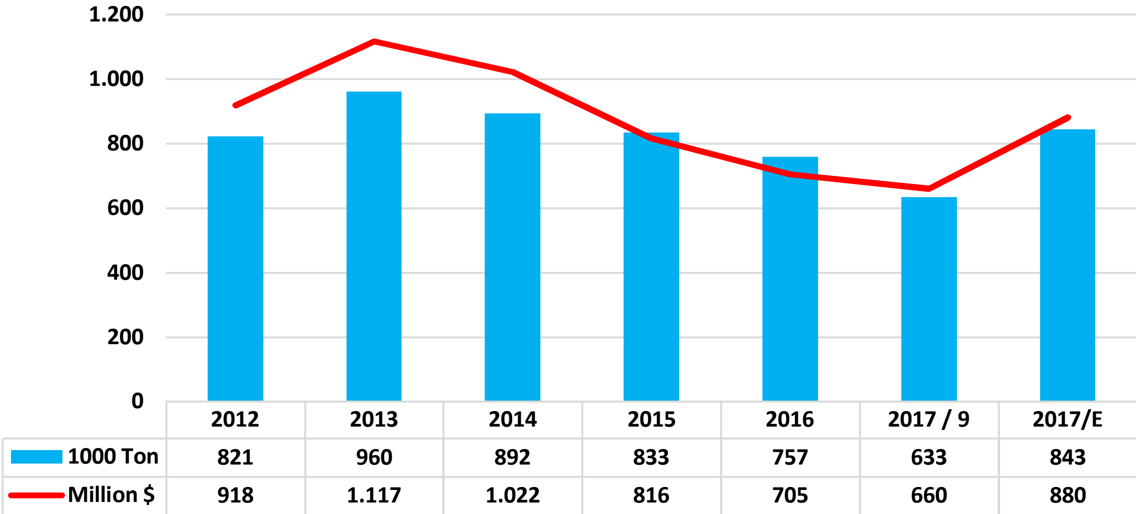
4. FOREIGN TRADE

4.1. IMPORTS

The total imports of PVC in Turkey during the period of 2012-2016 decreased by an average of 2% per year on amount and by 6.4% in terms of value and it decreased from 821 thousand tons to 757 thousand tons and from 918 million dollars to 705 million dollars. It is estimated that imports of 633 thousand tons and 660 million dollars in the 9 months of 2017 will be 843 thousand tons and 880 million dollars at the end of 2017 increasing by 11,3% on amount and by 24,8% compared to 2016.

	2012	2016	2017 / 9	2017 / T	CAGR % 2016/2012	% Increase 2017/2016 (E)
1000 Ton	821	757	633	843	-2,0	11,3
Million $	918	705	660	880	-6,4	24,8

Table 4: PVC Imports of Turkey
Source: Turk Stat and ITC Trade Statistics



Graphic 2: PVC Imports of Turkey
Source: Turk Stat and ITC Trade Statistics

In the 9 months of 2017, 94% of Turkey's total PVC imports on amount and 89% of on value accounted for PVC which was not mixed with any other substances

HS Code	Definition	Amount Base	Value Base
390410	Polyvinyl chloride (not mixed with any other substance).	93,6	88,9
390421	Un plasticized PVC	0,5	0,8
390422	Plasticized PVC	2,2	3,5
390430	Vinyl chloride-vinyl acetate copolymers.	0,2	0,4
390440	Other vinyl chloride copolymers	3,2	3,0
390450	Vinylidene chloride polymers	0,0	0,1
390461	Polytetrafluoroethylene (PTFE)	0,2	1,7
390469	Polyvinyl fluoride (any of the forms specified in Note 6 (b) of this chapter	0,1	1,5
390490	Others.	0,0	0,0
	Total.	100,0	100,0

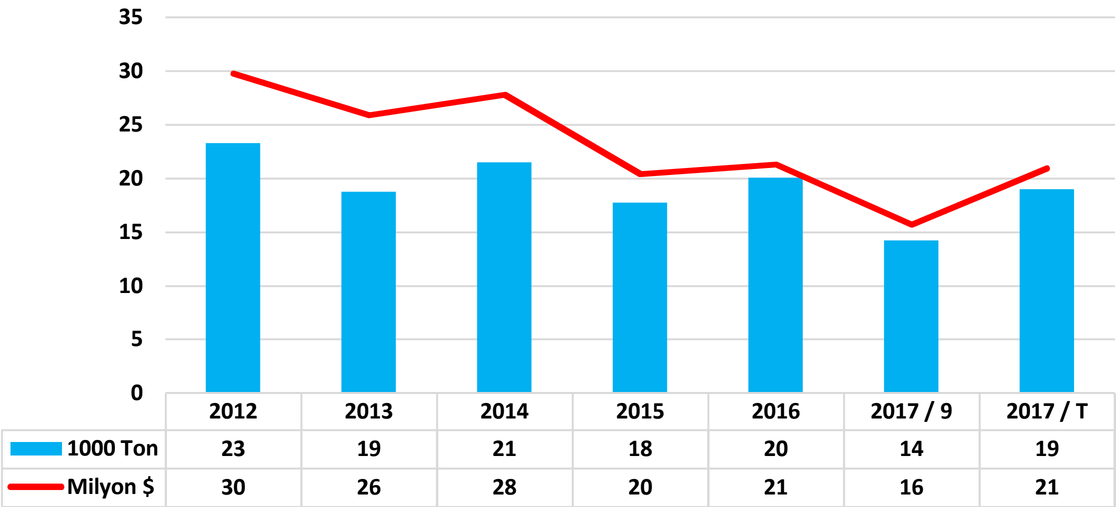
Table 5: PVC Imports by HS Codes (%) 2017/9
Source: Turk Stat and ITC Trade Statistics

4.2. EXPORT

The total exports of PVC in Turkey during the period of 2012-2016 have decreased by an average of 3.7% per annum on amount and decreased by 8% per annum on value basis and have fallen from 23 thousand tons to 20 thousand tons and from 30 million dollars to 21 million dollars. It is estimated that exports, which were 14 thousand tons and 16 million dollars in the 9 months of 2017, will be 19 thousand tons and 21 million dollars at the end of 2017 decreasing by 5, 4% on amount and by 1, 7% value basis compared to 2016.

	2012	2016	2017 / 9	2017 / T	CAGR % 2016/2012	% Increase 2017/2016 (E)
1000 Ton	23	20	14	19	-3,7	-5,4
Million $	30	21	16	21	-8,0	-1,7

Table 6: PVC Exports of Turkey
Source: Turk Stat and ITC Trade Statistics



Graphic 3: PVC Exports of Turkey
Source: Turk Stat and ITC Trade Statistics

In the 9 months of 2017, 43% of Turkey's total PVC exports on amount and 42% of on value basis amounted to PVC not mixed with any other substance. In the mentioned period, plastifed PVC received a 40% share of total PVC exports on amount basis and 42% in value basis.

HS Code	Definition	Amount Base	Value Base
390410	Polyvinyl chloride (not mixed with any other substance).	42,6	41,7
390421	Unplasticized PVC	3,5	3,4
390422	Plasticized PVC	41,7	39,5
390430	Vinyl chloride-vinyl acetate copolymers.	0,0	0,0
390440	Other vinyl chloride copolymers	0,1	0,2
390450	Vinylidene chloride polymers	0,1	0,1
390461	Polytetrafluoroethylene (PTFE)	0,2	2,0
390469	Polyvinyl fluoride (any of the forms specified in Note 6 (b) of this chapter	0,3	2,9
390490	Others.	11,6	10,2
	Total.	100,0	100,0

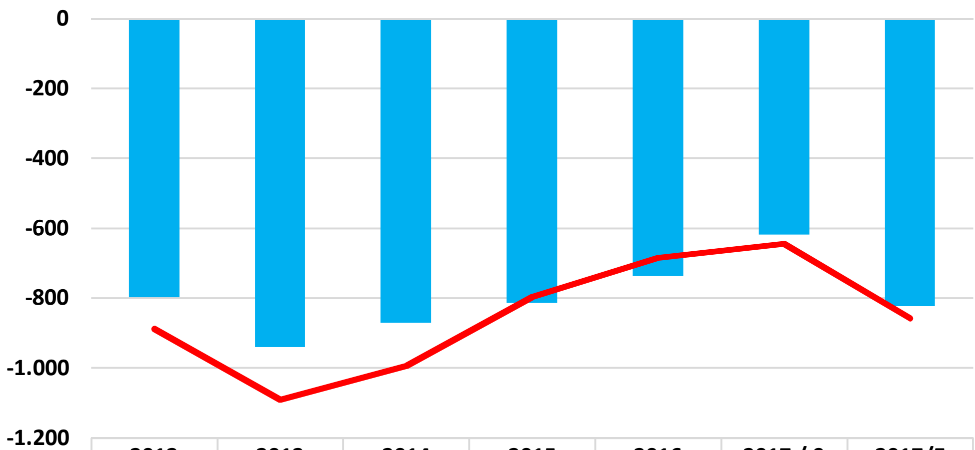
Table 7: PVC Exports by HS Codes (%) (2017/9)
Source: Turk Stat and ITC Trade Statistics

4.3. FOREIGN TRADE DEFICIT

Turkey gives deficit in PVC foreign trade on both amount and value basis. PVC foreign trade deficit which was 797 thousand tons and 888 million dollars in 2012, decreased to 737 thousand tons and 684 million dollars in 2016. It is estimated that the foreign trade deficit of 618 thousand tons and 644 million dollars in the 9 months of 2017 will be 824 thousand tons and 859 million dollars at the end of 2017 increasing by 11, 8% on amount and 25, 6% on value basis.

	2012	2016	2017/9	2017/E	CAGR % 2016/2012	% Increase 2017/2016 (E)
1000 Ton	-797	-737	-618	-824	-1,9	11,8
Million $	-888	-684	-644	-859	-6,3	25,6

Table 8: PVC Foreign Trade Deficit
Source: Turk Stat and ITC Trade Statistics



	2012	2013	2014	2015	2016	2017 / 9	2017/E
1000 Ton	-797	-941	-871	-815	-737	-618	-824
Million $	-888	-1.091	-994	-796	-684	-644	-859

Graphic 4: PVC Foreign Trade Deficit
Source: Turk Stat and ITC Trade Statistics

In the 9 months of 2017, PVC imports of Turkey accounted for 12% of total plastic raw material imports on amount and 9% on value basis. In the same period, the share of PVC exports in total plastic raw material exports was 2% on amount and on value basis.

4.4. IMPORTS BY COUNTRIES

In the 9 months of 2017, Turkey has realized 73% of PVC imports on amount and on value basis from 10 countries. France, USA, Germany, Mexico and Spain are Turkey's main import partners.

Countries	1000 Ton	Million $	% Ton	$ - %
France	106	108	17	16
USA	83	82	13	12
Germany	55	63	9	10
Mexico	57	56	9	8
Spain	41	40	6	6
Sweden	35	36	5	5
S.Korea	31	30	5	5
Norway	23	24	4	4
Egypt	22	21	4	3
Italy	11	21	2	3
10 Total	**464**	**481**	**73**	**73**
Others	**168**	**179**	**27**	**27**
Total	**633**	**660**	**100**	**100**

Table 9: PVC Imports of Turkey by Countries (2017/9)
Source: Turk Stat and ITC Trade Statistics

4.5. EXPORTS BY COUNTRIES

In the 9 months of 2017, Turkey has realized 72% of its PVC exports on amount and 66% on value basis to 10 countries. Bulgaria, Azerbaijan, Georgia, Bursa Free Trade Zone and Turkish Republic of Northern Cyprus (TRNC) constitute the main export partners.

Countries	1000 Ton	Million $	% Ton	$ - %
Bulgaria	3.2	3.3	23	21
Azerbaijan	1.6	1.4	11	9
Georgia	1.3	1.0	9	6
Bursa Free Trade Zone	0.8	0.9	5	6
Turkish Republic of Northern Cyprus	0.7	0.8	5	5
Algeria	0.9	0.7	7	5
Israel	0.5	0.7	4	5
Ukraine	0.4	0.6	3	4
Kazakhstan	0.5	0.5	3	3
Russian Fed.	0.3	0.5	2	3
10 Total	**10.3**	**10.4**	**72**	**66**
Others	**3.9**	**5.3**	**28**	**34**
Total	**14.2**	**15.7**	**100**	**100**

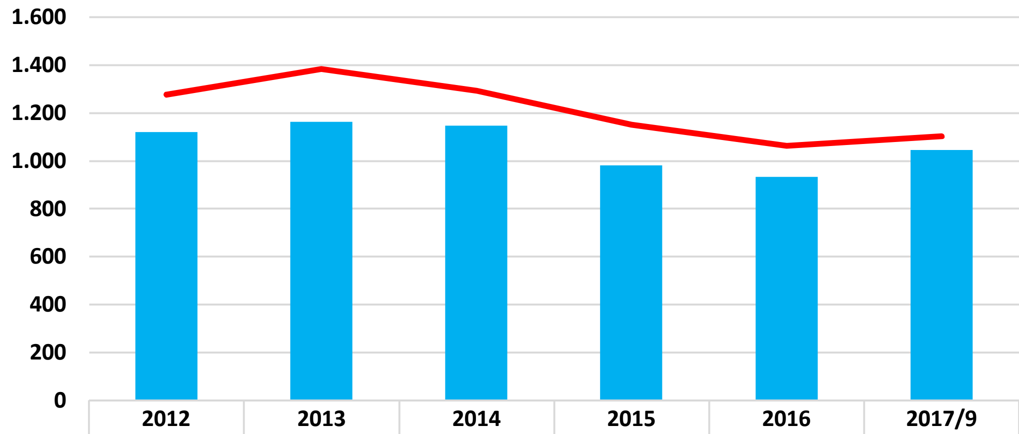
Table 10: PVC Exports of Turkey by Countries (2017/9)
Source: Turk Stat and ITC Trade Statistics

4.6. IMPORTS AND EXPORT PRICES

Turkey's PVC average export prices have been above the average import prices in the last 5 years. The unit import price of USD 1,119 / Kg in 2012 decreased to USD 931 / kg in 2016, while the export price of USD 1,277 / Kg decreased to USD 1,063 / Kg. During this period, the import and export prices fell by an average of 4.5% per annum. It is estimated that import price to increase by 12% and export price by 3, 9% compared to 2016.

	2012	2016	2017/9	CAGR % 2016/2012	% Increase 2017/2016 (E)
Import Price	1.119	931	1.044	-4,5	12,0
Export Price	1.277	1.063	1.104	-4,5	3,9

Table 11: PVC Import and Export Prices of Turkey (USD /Ton)
Source: Turk Stat and ITC Trade Statistics



	2012	2013	2014	2015	2016	2017/9
Import Prices	1.119	1.163	1.145	980	931	1.044
Export Prices	1.277	1.385	1.293	1.152	1.063	1.104

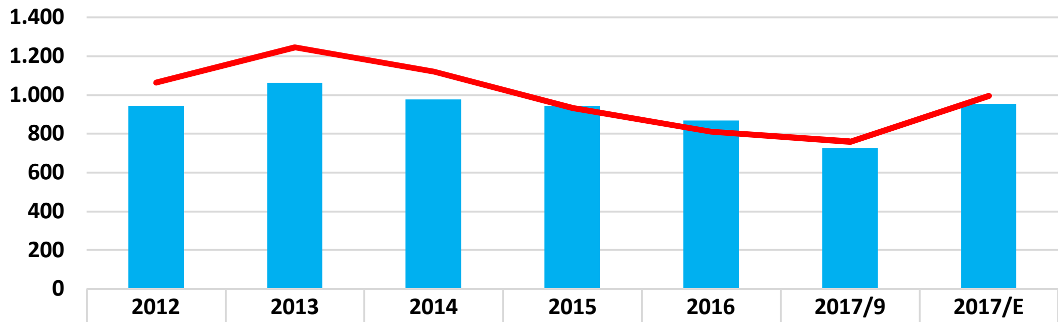
Graphic 5: PVC Import and Export Prices of Turkey (USD /Ton)
Source: Turk Stat and ITC Trade Statistics

5. DOMESTIC CONSUMPTION BY INDUSTRIES

PVC consumption in Turkey declined by an average of 2.1% per annum in 2012-2016, decreasing to 865 thousand tons and 812 million dollars in 2016. At the end of 2017, domestic consumption is expected to increase by 10, 1% on amount and by 22, and 8% on value basis compared to 2016.

	2012	2016	2017/9	2017 / E	CAGR % 2016/2012	%Increase 2017/2016 (E)
1000 Ton	943	865	725	952	-2,1	10,1
Million $	1.063	812	759	997	-6,5	22,8

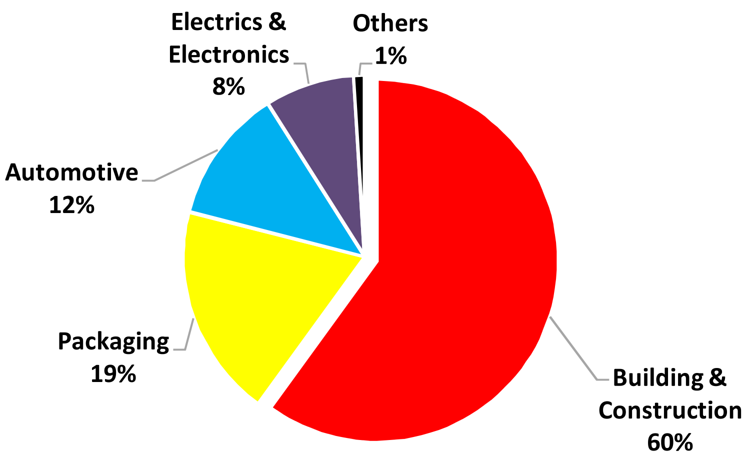
Table 12: PVC Domestic Consumption of Turkey
Source: Turk Stat and ITC Trade Statistics



	2012	2013	2014	2015	2016	2017/9	2017/E
1000 Ton	943	1.062	976	943	865	725	952
Million $	1.063	1.245	1.122	932	812	759	997

Graphic 6: PVC Domestic Consumption of Turkey
Source: Turk Stat and ITC Trade Statistics

The main industries where PVC is used in Turkey are; Building and Construction, Packaging, Electrical and Electronics and Automotive. The packaging industry uses 60% of total PVC consumption. The packaging shares 19%, automotive 12% and electricity and electronics 8% in total PVC consumption. About 3% of consumption comes from exports in Turkey as of 2016.



Graphic 7: PVC Consumption by End Users Industries in Turkey

The main materials made using PVC in these sectors are summarized in the table below

Construction Sector	Automotive industry
Connection parts for pipe and water distribution, irrigation and sewerage; Gray water recycling kits; Electrical conduit; Exterior coverings, tents, moldings, skirting, air stripping, landings and landing pipes; Decking and fencing; Windows, door frames and coverings; Debone shirts & Geomembranes; Swimming pool liners; Single store roof; Conveyor belts; Pipelines used in food processing, chemical processing and other manufacturing; Floor and wall coverings; Coated panels; adhesives.	Inner laying; "Soft" panel and arm rests; Panel instrument components, air cushion covers; Body side seals, bumper protectors; Glass system components, rearview mirror cradles; Under-cable; Vehicle wear coatings underneath; mats; Adhesives and sealants; Boots and bellows; Battery separators; Audio and video components; Lighting elements; Lid and gearbox parts steering; Components of the A / C system.
Health sector	**Electric - Electronic Sector**
Blood bags and hoses; cannula; covers; catheters; connectors; Cushioning products; Device packages; Dialysis machines and tubing; Drainage pipe; Dripping rooms; Ear protection; glasses; Swelling alter; Inhalation masks; IV containers and components; Laboratory equipment; masks; spokesmen; Oxygen delivery components; seals; Surgical wire; Sheathing; Thermal blankets; Urine and colostomy bags	Computer housing and cabling; Printed circuit board tray; Power wire insulation & mantle; Communication cable mantle; Support for power cable; Electrical plugs and connectors, wall plates, junction boxes; Soft keyboards; Keyboard tray; Coating for optical mouse pad; Memory stick and USB / enclosures; LED product components; Laminate and smart cards for plastic security
Packaging Sector	**Other Consumption Materials**
Sterile medical packaging; Sabotage rehearsed over-the-counter drug; Shrink wrap for software, games, and home products; Toys such as eggs and meat, hardware, electronics, personal care products, and blisters and capped packaging to protect food; Household and personal care products, cooking oils and bottles for automotive oils; Covers for bottles and jars; Glass coverings.	Wind turbine blades; Machine parts; Enclosures and arms for vehicles; Garden hoses; Brenda; Patio furniture, upholstery; Device bodies; Window shutters and shutters; Table covers, floor cushions, shower curtains; Sports equipment, beach collectibles; Vinyl leather goods; Luggage, shoes, gloves, raincoats; bag; clothing; coated paper; Holiday ornaments; toys.

Table 13: The Main Areas Where PVC Used in Turkey

6. SUPPLY AND DEMAND

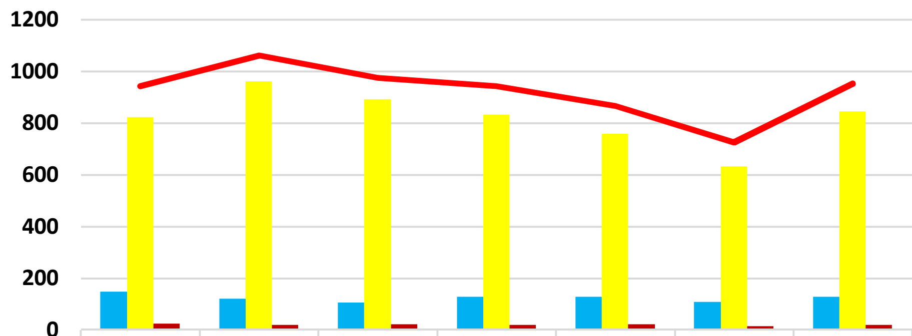
During the period from 2012 to 2016, total PVC production in Turkey declined by 3.2% on average, imports by 2%, exports by 3.7% and domestic consumption by 2.1%.

At the end of 2017 compared to 2016, it is estimated that production will remain at the same level. On the other hand, imports will increase by 11,3% exports by 5,4% and domestic consumption by 10,1%.

In the 9 months of 2017, Turkey met 87% of PVC domestic market consumption with imports and exported 13% of domestic production. The import coverage ratio of PVC exports was 2%.

	2012	2016	2017/9	2017 / E	CAGR % 2016/2012	% Increase 2017/2016 (E)
Production	146	128	107	128	-3,2	0,0
Imports	821	757	633	843	-2,0	11,3
Exports	23	20	14	19	-3,7	-5,4
Domestic Consumption	943	865	725	952	-2,1	10,1
Foreign Trade Deficit	-797	-737	-618	-824	-1,9	11,8
Imports / Domestic Consumption (%)	87	88	87	89		
Exports/ Production (%)	16	16	13	15		
Exports/ Imports (%)	3	3	2	2		

Table 14: Supply and Demand for PVC in Turkey (1000 Ton)
Source: Turk Stat and ITC Trade Statistics



	2012	2013	2014	2015	2016	2017/9	2017/E
Production	146	121	105	128	128	107	128
Imports	821	960	892	833	757	633	843
Exports	23	19	21	18	20	14	19
Domestic Consumption	943	1.062	976	943	865	725	952

Graphic 8: Supply and Demand for PVC in Turkey (1000 Ton)
Source: Turk Stat and ITC Trade Statistics

Turkey is one of the important PVC importer countries of the world. However, since domestic production is not carried out in emulsion PVC, demand is fully covered by imports. Domestic consumption estimates suggest that import dependency of PVC will be over 90% in coming years. From this point of view, Turkey seems to have an important market qualification for existing or possible petrochemical plants for PVC production.

7. PAGEV PROJECTS

PAGEV which is the "Unifying Power "of the Turkish plastics industry develops different projects aiming to solve the problems outlined above. These are in summary: "Plastic Center of Excellence" and "International Regional Plastics Production Center".

7.1. PAGEV PLASTICS CENTER OF EXCELLENCE

Plastic materials, used in all areas of life, are rapidly taking place of other alternative products, because of their superior properties, in Turkey as well as in all over the world. Plastics, which usage in all sectors Increasing is becoming an indispensable material for the 21st century.

Turkish Plastics Industry which is one of the fastest growing sectors in our country despite being young, is the 6th in the world and the 2nd in Europe. Growing with the goal of leadership in Europe, the Turkish Plastics Sector aims to increase the certification and added value of its products.

PAGEV, "Unifying Power" of the Turkish Plastics industry, is leading the industry with the "PAGEV Plastic Excellence Center" for realizing this purpose. The mission of the PAGEV Center for Plastic Excellence, will include the following activities.

- ✓ Test and Laboratory Services
- ✓ Research and Development
- ✓ Certification
- ✓ Training
- ✓ Competent Consulting

With the Center of Excellence, the test and laboratory support that the plastic industry needs; will be provided to the industry. So, many problems that lead to loss of time and energy such as high test costs, overseas shipping, customs clearance, and long test times will be removed.

The platforms that will provide information to and knowledge sharing in the industry will be developed by the Center and detailed training programs will be prepared and presented for the benefit of the industry. While working on the newest technologies, the Center of Excellence will work together with industry organizations, universities, research institutes, professional associations and non-governmental organizations to work for the Turkish plastics industry to be the world leader with R & D and innovation based work.

Established with the support of the Ministry of Science, Industry and Technology, PAGEV Plastic Center of Excellence will provide to the plastics industry and Turkish economy, especially the development of industrial skills and capabilities that will form the basis of Turkey's national projects.

By PAGEV Plastic Center of Excellence, which will be established by strategic cooperation, it is aimed to grow the plastic industry faster with its traceable targets, scientific quality and high potential for commercialization,

Upon completion, the Center of Excellence, which will have an area of over 30 thousand m2, rises right beside PAGEV Vocational and Technical Anatolian High School in Küçükçekmece, Istanbul. PAGEV Plastic Center of Excellence, which will make Turkey the center of plastic production in the world, will carry out innovative projects.

In addition to this, the Center will create a control mechanism for the products exported abroad. The Center will also contribute to the preservation of the reliability and reputation of the plastic products produced in Turkey. On the other hand, the introduction of poor quality and non-standard goods into the country will be prevented by determining the technical suitability of the plastic products imported from abroad without any definite importation in the laboratories.

With its superior information infrastructure, the Center of Excellence will present the important documents required by the players of the sector more economically and quickly.

By accelerating the development, we will focus on the development of products and production technologies that will increase the competitive power of our firms.

The Center of Excellence, which will develop innovative ideas by following the developments in the world plastic sector, will increase the competitive power of our firms by providing many field consultancy services from the determination of appropriate input materials to the optimization of production process.

7.2. INTERNATIONAL REGIONAL PLASTIC MANUFACTURING CENTER

Although the Turkish plastics sector, with its process capacity reaching 9 million tons, has the 6^{th} largest plastics production capacity in the world and 2^{nd} in Europe, imports more than 85% of the plastic raw material it needs.

One of the most important advantages of the plastics industry in Turkey is that it is located between the Middle East countries which are the main petroleum and plastic raw material producer and the European market which is the main plastic consumer.

PAGEV aims to unify the plastic raw materials potential of Middle East countries with the Turkish plastics industry's competent production capability and experience at the international regional plastic production center, which Turkey aims to establish in South East Anatolia Region.

In the center, to be established with the win - win principle, the plastics raw materials producer countries will be supplying cheap and reliable raw materials having a large volume and reliable market while Turkish plastics industry will have greater competition possibilities in the global markets with its growing production capacity and falling costs.