



PAGEV

**TURKISH POLYETHYLENE
INDUSTRY FOLLOW-UP REPORT
2017**



PREFACE

The plastic 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

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1. PLASTIC RAW MATERIALS COVERED BY THE REPORT

HS code of 39.01.10.10.00.00 Linear Low Density Polyethylene - LLDPE, 3901.10.90.00.11 Low Density Polyethylene – LDPE, 3901.20.90.00.11 High Density Polyethylene - HDPEE and analyzed separately and all other ethylene polymers in HS Code of 3901 are considered as other polyethylene.

| HS Code | Description |
|------------------|--|
| 39.01 | Ethylene polymers (in the first form): |
| 3901.10 | - Polyethylene with a specific gravity of less than 0.94: |
| 3901.10.10.00.00 | - - Linear polyethylene |
| | - - Others |
| 3901.10.90.00.11 | - - - Low density polyethylene |
| 3901.10.90.00.12 | - - - Polyethylene compounds |
| 3901.10.90.00.19 | - - - Others |
| 3901.20 | - Polyethylene with a specific gravity of 0.94 or more: |
| 3901.20.10.00.00 | - - Polyethylene (one of the forms indicated in note 6 (b) of this chapter, at 23 ° C Specific mass of 0.958 or more, - 50 mg / kg. Or less aluminum, - 2 mgr. /kg. Or less calcium, - 2 mgr. /kg. Or less chromium, - 2 mgr. /kg. Or less iron, - 2 mgr. /kg. Or less nickel, - 2 mgr. /kg. Or less titanium - 8 mg / kg. Or less chlorosulphated polyethylene containing vanadium imingle Special |
| 3901.20.90.00.11 | - - Others |
| 3901.20.90.00.12 | - - - High density polyethylene |
| 3901.20.90.00.19 | - - - Polyethylene feeds |
| 3901.30.00.00.00 | - - - Others |
| 3901.90 | - Ethylene-vinyl acetate copolymers |
| 3901.90.30.00.00 | - Others - - Ethylene terpolymer salt with isobutyl acrylate and meth acrylic acid containing ionomer rosin ; A-B-A block copolymer of polystyrene, ethylene-butylene copolymer And polystyrene (containing 35% or less by weight styrene) (Which is one of the forms specified in note 6 (b) of this Chapter) |
| 3901.90.90.00.11 | |
| 3901.90.90.00.12 | - - Others |
| 3901.90.90.00.19 | - - - Ethylene propylene copolymer |

Table 1: Plastics Raw Materials Covered by the Report

Source: Turk Stat and ITC Trade Statistics

2. PRODUCTION CAPACITY

PETKİM is the only company in Turkey, producing polyethylene (PE). Total installed capacity of PETKİM is to produce 446 thousand tons of polyethylene (PE) a year 190 thousand tons of which is for low density polyethylene (LDPE), 160 thousand tons of low density polyethylene tabular (LDPE – T) and 96 thousand tons for high density polyethylene (HDPE).

| | LDPE (Low Density polyethylene) | LDPE - T (Low Density polyethylene Tabular) | HDPE (High Density polyethylene) |
|---------------------------------|------------------------------------|---|--|
| Date of Operation | 19.04.1985 | 24.05.2005 | 23.07.1985 |
| Initial Capacity | 165.000 Ton/Year | 120.000 Ton/Year | 44.000 Ton/Year |
| History of Extension | 1992 | 2011 | 1993,2001 |
| | 190.000 Ton/Year | 160.000 Ton/Year | 96.000 Ton/Year |
| After Extension Capacity | Ethylene | Ethylene, Propylene, Propane | Ethylene |
| Main Entries | LDPE (F2-12, G03-5, H2-8,S07-21A) | LDPE - T (G03-21T, G08-21T, G08-21TA, F2-21T, H2-21T, H2-26T, H5-21T, F5-21T, I22-19T, I10-19T) | HDPE Injection (I668 (UV), I668) Blow Molding (S0464, S0452, S00356) Trench (B0153, B00552) Film (F00556, F00756) |

Table 2: PETKİM Annual Production Capacity of Polyethylene

Source: PETKİM Annual Reports

PETKİM started to produce low density polyethylene (LDPE) in 1985 with a capacity of 165.000 tons and increased its production capacity to 190.000 tons in 1992. The main uses of LDPE produced by the company are; Heavy duty pouch, greenhouse cover, packaging film, cable sheathing, household goods, toys, pipes, hoses, tubes, bottles, fabric and metal coatings, rotations and molding materials.

In 2005, PETKİM by establishing a new factory, started the production of low density polyethylene tabular (LDPE – T) with a capacity of 120.000 tons/year and invested to increase the production capacity to 160.000 tons in 2011. The main uses of LDPE - T manufactured by the company are: heavy duty bag, greenhouse cover, packaging film, cable sheathing, household goods, toys, pipes, hoses, tubes, bottles, fabric and metal coatings, rotations and molding materials.

PETKİM started producing HDPE with a capacity of 44.000 tons/year in 1985 and increased production capacity of HDPE by 96.000 tons/year with the investments realized in 1993 and 2001. The main uses of HDPE produced by PETKİM are: Household goods, toys, packaging films, pressurized water and natural gas pipes, detergents and cosmetics bottles (non-transparent), water, gas etc. Canister, sheet, casing paper, fabric and metal coverings, forming rotational molding

3. PRODUCTION AND CAPACITY UTILIZATION

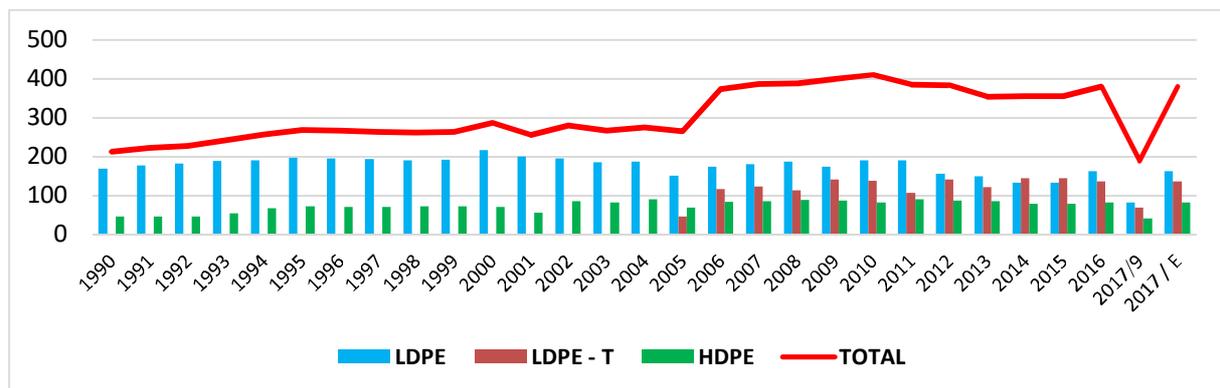
The production of polyethylene by PETKİM in the period of 2012 - 2016 are given in table and graphic below. The company's polyethylene production reached its maximum level in 2010 with 410,000 tons.

In the January – September period of 2017, LDPE shared 45%, LDPE – T 33% and HDPE 22% in total polyethylene production.

| | 1000 Ton | | | | Share in Total PE Production (%) | | |
|--------|----------|------|--------|------|------------------------------------|------|--------|
| | LDPE-T | HDPE | LDPE-T | HDPE | LDPE-T | HDPE | LDPE-T |
| 2012 | 156 | 140 | 87 | 383 | 41 | 37 | 23 |
| 2013 | 148 | 121 | 85 | 354 | 42 | 34 | 24 |
| 2014 | 133 | 143 | 79 | 355 | 37 | 40 | 22 |
| 2015 | 133 | 143 | 79 | 355 | 37 | 40 | 22 |
| 2016 | 162 | 136 | 82 | 379 | 43 | 36 | 22 |
| 2017/9 | 135 | 102 | 66 | 303 | 45 | 33 | 22 |

Table 3: PETKİM PE Production (1000 Tons)

Source: PETKİM Annual Reports



Graphic 1: PETKİM PE Production

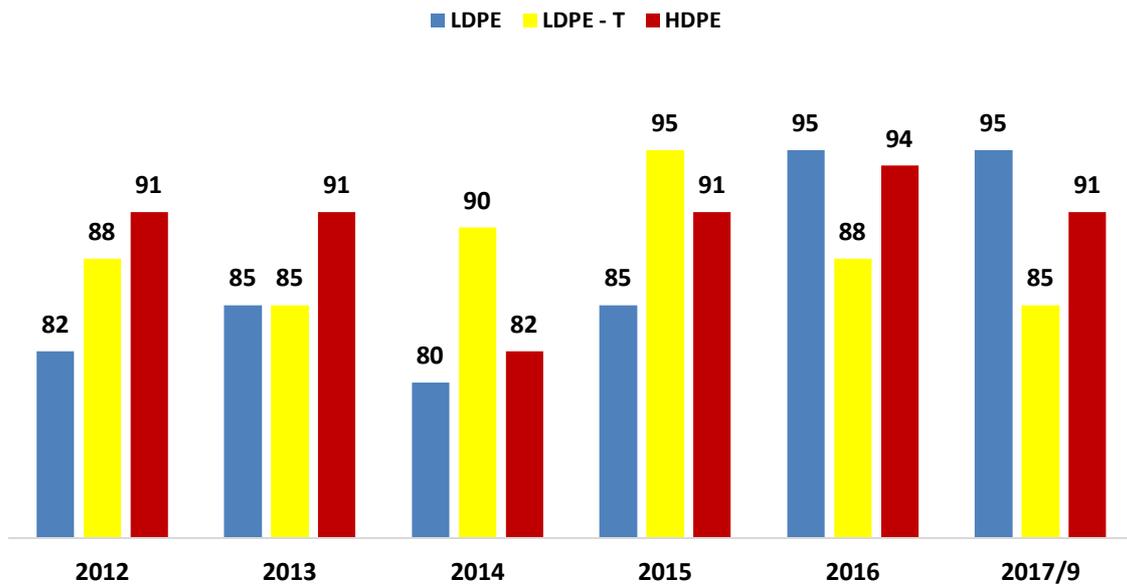
Source: PETKİM Annual Reports

Capacity utilization of PETKİM for the last 5 years is shown in the following table. Capacity utilization realized as 95% for LDPE, 85% for LDPE – T and 91% for HDPE in the January – September period of 2017.

| | LDPE | LDPE-T | HDPE |
|--------|------|--------|------|
| 2012 | 82 | 88 | 91 |
| 2013 | 85 | 85 | 91 |
| 2014 | 80 | 90 | 82 |
| 2015 | 85 | 95 | 91 |
| 2016 | 95 | 88 | 94 |
| 2017/9 | 95 | 85 | 91 |

Table 4: PETKİM’s Capacity Utilization for PE Production (%)

Source: PETKİM Annual Reports



Graphic 2: PETKİM’s Capacity Utilization for PE Production (%)

Source: PETKİM Annual Reports

4. FOREIGN TRADE

4.1. IMPORTS

Total polyethylene imports of Turkey realized in the last 5 years, have increased by 6, 9% per annum and reached to 1 million 710 thousand tons from 1 million 308 thousand tons. At the end of 2017 imports, which was 1 million 385 thousand tons in the January – September

period of 2017 are estimated to reach to 1 million 846 thousand tons increasing by 8% compared to 2016.

The import of LLDPE, which increased by an average of 4.6% per annum between 2012 and 2016, is expected to increase by 26, 4% in 2017 compared to 2016.

It is expected that LDPE imports, which increased by an average of 3, 9% per annum between 2012 and 2016, will increase by 1.6% in 2017 compared to 2016.

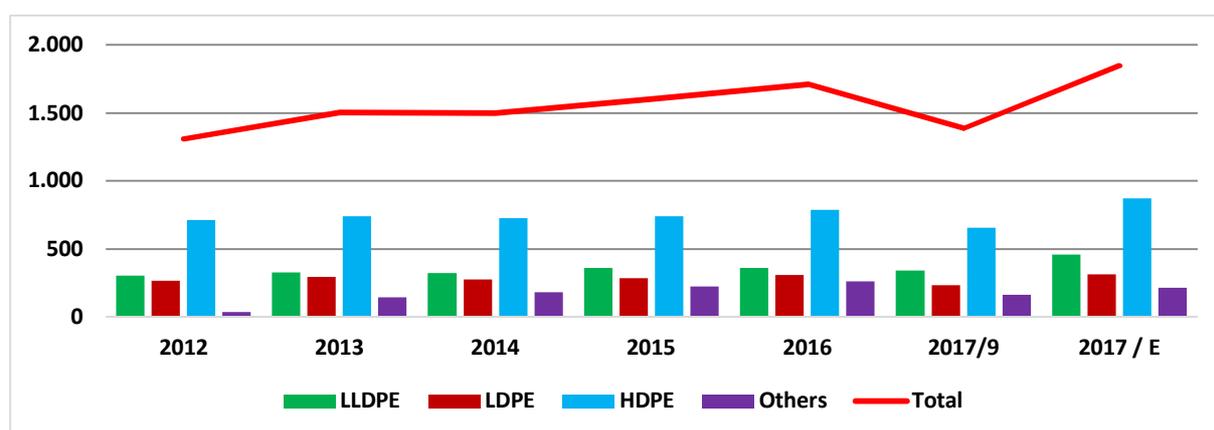
It is expected that imports of HDPE which increased by an average of 2.5% per annum between 2012 and 2016 will increase by 10, 5% in 2017 compared to 2016.

For the other polyethylene types other than LLDPE, LDPE and HDPE, the annual compound growth rate of imports has been seen to be as high as 64.7% in the last 5 years. Imports of these products are expected to decline by 17, 8% in 2017 compared to 2016.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 / 9 | 2017 / E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------------|-----------------------------------|
| LLDPE | 300 | 326 | 323 | 357 | 360 | 341 | 455 | 4.6 | 26.4 |
| LDPE | 262 | 294 | 275 | 281 | 306 | 233 | 311 | 3.9 | 1.6 |
| HDPE | 711 | 740 | 723 | 739 | 786 | 651 | 869 | 2.5 | 10.5 |
| Others | 35 | 144 | 178 | 222 | 258 | 159 | 212 | 64.7 | -17.8 |
| Total Imports | 1,308 | 1,505 | 1,499 | 1,600 | 1,710 | 1,385 | 1,846 | 6.9 | 8.0 |

Table 5: Turkey's Imports of PE (1000 Ton)

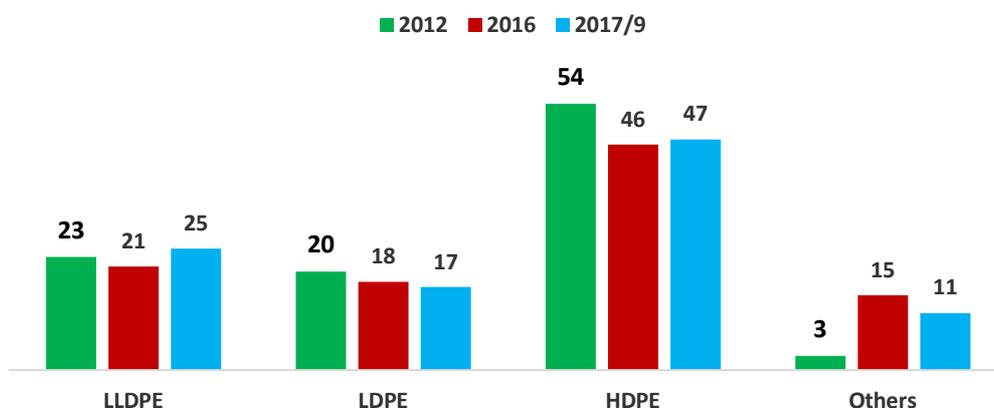
Source: Turk Stat and ITC Trade Statistics



Graphic 3: Turkey's Imports of PE (1000 Tons)

Source: Turk Stat and ITC Trade Statistics

Turkey's total polyethylene imports in the January – September period of 2017 on a quantity basis constituted 25% LLDPE, 17% LDPE, 47% HDPE and 11% other polyethylene grades.



Graphic 4: PE Imports of Turkey by Grades (Ton - %)

Source: Turk Stat and ITC Trade Statistics

The total polyethylene imports of Turkey on value basis in the last 5 years increased by 0, 4% per annum and reached to 2.34 billion dollars from 2, 3 billion dollars. Imports which were 1,87 billion dollars in the January – September period of the year, are estimated to be 2,5 billion dollars by the end of 2017 increasing by 6,6% compared to 2016. On Value basis;

The import of LLDPE, which declined by an average of 0.1% per annum between 2012 and 2016, is expected to increase by 28% in 2017 compared to 2016.

The import of LDPE, which increased by an average of 1, 7% per annum between 2012 and 2016, is expected to increase by 4, 3% in 2017 compared to 2016.

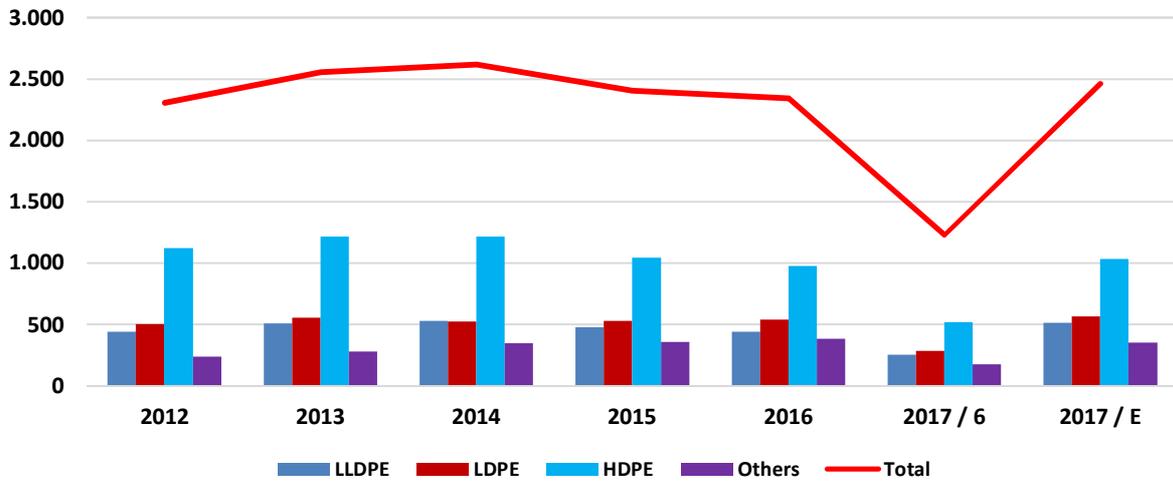
The import of HDPE, which declined by an average of 3, 3% per annum between 2012 and 2016, is expected to increase by 11% in 2017 compared to 2016.

As in imports on amount basis, for the other polyethylene types other than LLDPE, LDPE and HDPE, the annual compound growth rate of imports is as high as 12,5% in the last 5 years and Imports of these types of polyethylene are expected to decline by 11% in 2017 compared to 2016.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | 2017 /E | CAGR % 2016/20 12 | % Increase (2017 / 2016) (E) |
|----------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------------------|---------------------------------------|
| LLDPE | 441 | 510 | 528 | 476 | 440 | 421 | 561 | -0.1 | 27.5 |
| LDPE | 504 | 554 | 525 | 531 | 540 | 387 | 516 | 1.7 | -4.3 |
| HDPE | 1,119 | 1,213 | 1,217 | 1,044 | 977 | 813 | 1,084 | -3.3 | 10.9 |
| Others | 240 | 280 | 348 | 355 | 384 | 251 | 335 | 12.5 | -12.7 |
| Total Imports | 2,305 | 2,557 | 2,618 | 2,406 | 2,341 | 1,872 | 2,496 | 0.4 | 6.6 |

Table 6: Turkey's Imports of PE (USD Million)

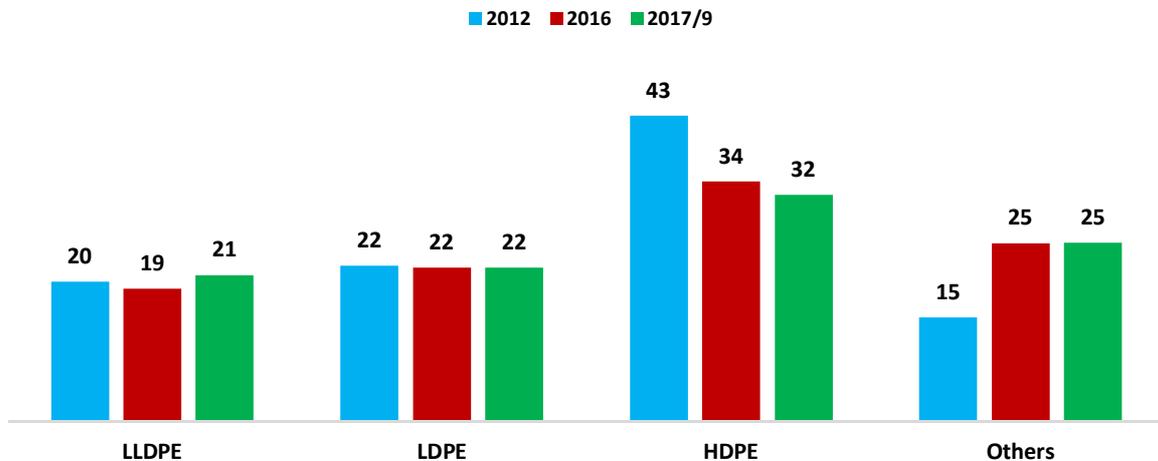
Source: Turk Stat and ITC Trade Statistics



Graphic 5: Turkey's Imports of PE (USD Million)

Source: Turk Stat and ITC Trade Statistics

Turkey's total polyethylene imports in the 9 months of 2017 on value basis constituted 32% for HDPE, 21% for LLDPE, 22% for LDPE and 25% other polyethylene grades.



Graphic 6: PE Imports of Turkey By Grades (\$- %)

Source: Turk Stat and ITC Trade Statistics

The share of polyethylene imports in total plastic raw material imports was 26% on a quantity basis and 25% on a value basis in the 9 months of 2017. It is observed that in the past years this ratio has been realized at the level of these levels.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | 2017 / E |
|--------------|------|------|------|------|------|--------|----------|
| Amount Basis | 23 | 25 | 25 | 26 | 26 | 26 | 26 |
| Value Basis | 23 | 23 | 24 | 26 | 27 | 25 | 25 |

Table 7: Share of Polyethylene Imports in Total Plastic Raw Materials Imports (%)

Source: Turk Stat and ITC Trade Statistics

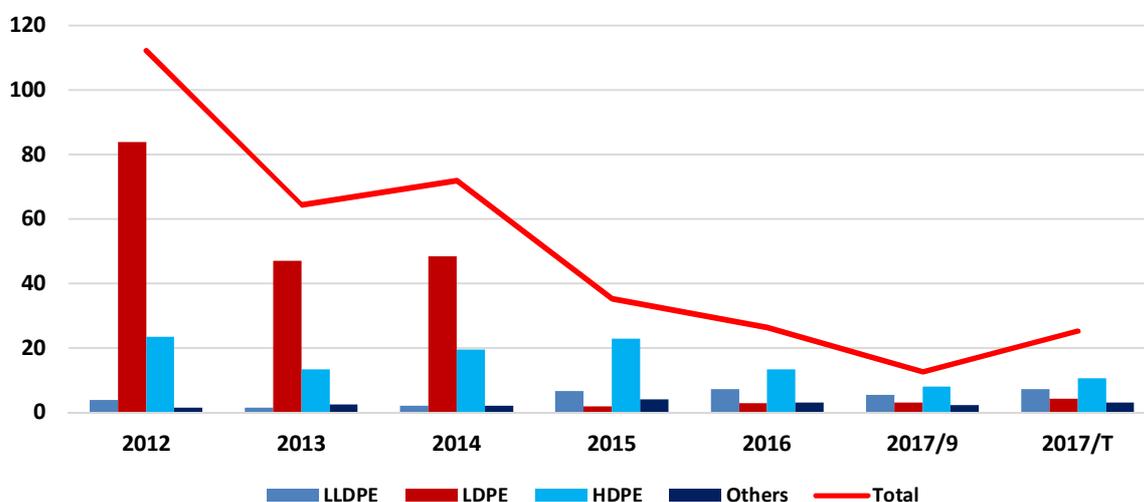
4.2. EXPORTS

Turkey's total polyethylene exports, which amounted to 112 thousand tons in 2012, decreased by 30,4% on average annually in the last 5 years and decreased to 26 thousand tons in 2016. Exports realized as 13 thousand tons in the 9 months of 2017 and expected to increase to 25 thousand tons at the end of the year.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | 2017 /E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|----------------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|---------------------|------------------------------------|
| LLDPE | 4 | 1 | 2 | 7 | 7 | 5 | 7 | 17.3 | -0.2 |
| LDPE | 84 | 47 | 48 | 2 | 3 | 3 | 4 | -57.4 | 50.6 |
| HDPE | 23 | 13 | 19 | 23 | 13 | 8 | 11 | -12.9 | -21.3 |
| Others | 1 | 3 | 2 | 4 | 3 | 2 | 3 | 21.5 | -3.0 |
| Total Exports | 112 | 64 | 72 | 35 | 26 | 13 | 25 | -30.4 | -4.1 |

Table 8: Turkey's Polyethylene Exports (1000 Ton)

Source: Turk Stat and ITC Trade Statistics



Graphic 7: Turkey's Polyethylene Exports (1000 Ton)

Source: Turk Stat and ITC Trade Statistics

As of the 9 months of 2017, total polyethylene exports consisted of 29% for LLDPE, 17% LDPE, 43% for HDPE and 3% other polyethylene grades.

| | 2012 | 2016 | 2017/9 |
|-------|------|------|--------|
| LLDPE | 3 | 31 | 29 |

| | | | |
|--------|----|----|----|
| LDPE | 75 | 12 | 17 |
| HDPE | 21 | 58 | 43 |
| Others | 1 | 4 | 3 |

Table 9: Total Polyethylene Exports By Grades (Ton - %)

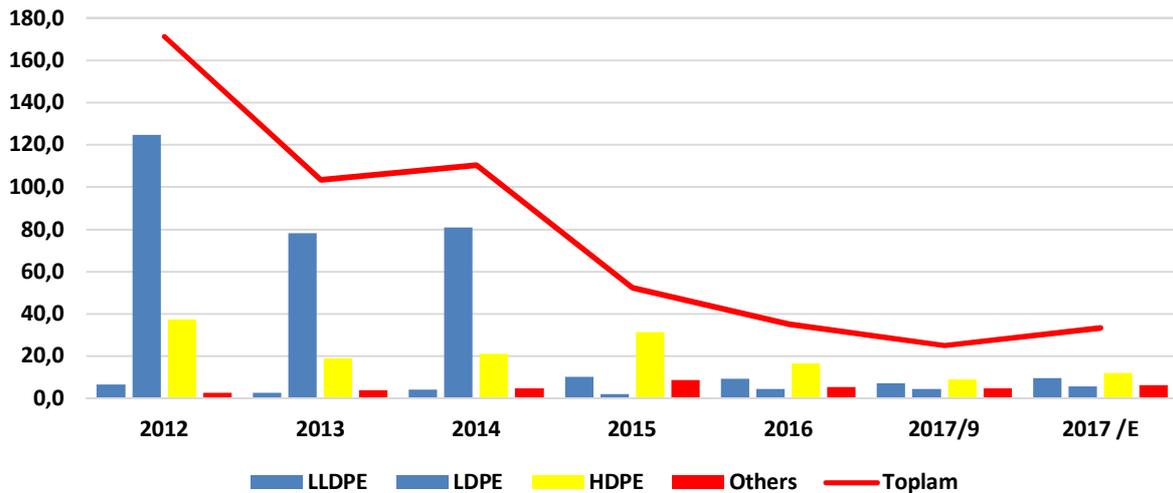
Source: Turk Stat and ITC Trade Statistics

Turkey's total polyethylene exports on value basis of 171 million dollars in 2012 decreased by an average of 32.7% per annum in the last 5 years, reaching to 35 million dollars in 2016.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | 2017 /E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|----------------------|------------|------------|------------|-----------|-----------|-----------|-----------|---------------------|-----------------------------------|
| LLDPE | 7 | 3 | 4 | 10 | 9 | 7 | 9 | 8.4 | 3.1 |
| LDPE | 125 | 78 | 81 | 2 | 4 | 4 | 6 | -57.1 | 33.3 |
| HDPE | 37 | 19 | 21 | 31 | 16 | 9 | 12 | -18.5 | -26.9 |
| Others | 3 | 4 | 5 | 9 | 5 | 5 | 6 | 19.0 | 18.4 |
| Total Exports | 171 | 103 | 111 | 52 | 35 | 25 | 33 | -32.7 | -5.0 |

Table 10: Polyethylene Exports of Turkey (Million \$)

Source: Turk Stat and ITC Trade Statistics



Graphic 8: Polyethylene Exports of Turkey (Million \$)

Source: Turk Stat and ITC Trade Statistics

As of the 9 months of 2017, total polyethylene exports on value basis consisted of 28% for LLDPE, 17% for LDPE, 36% for HDPE and 19% for other polyethylene grades.

| | 2012 | 2016 | 2017/9 |
|--------|------|------|--------|
| LLDPE | 4 | 26 | 28 |
| LDPE | 73 | 12 | 17 |
| HDPE | 22 | 47 | 36 |
| Others | 2 | 15 | 19 |

| | | | |
|----------------------|-----|-----|-----|
| Total Exports | 100 | 100 | 100 |
|----------------------|-----|-----|-----|

Table 11: Exports of Polyethylene by Types (\$ - %)

Source: Turk Stat and ITC Trade Statistics

The share of polyethylene exports in total plastics raw material exports was 3% on amount and value basis in the 9 months of 2017. It is observed that in 2012 this ratio has been realized as 19% on amount and 18% on value basis and decreased to 5% and 6% respectively in 2015.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 / 9 |
|---------------------|------|------|------|------|------|----------|
| Amount Basis | 19 | 11 | 11 | 5 | 4 | 3 |
| Value Basis | 18 | 10 | 10 | 6 | 4 | 3 |

Table 12: Share of Polyethylene Exports in Total Plastics Raw Materials Exports (%)

Source: Turk Stat and ITC Trade Statistics

4.3. FOREIGN TRADE DEFICIT

Turkey provides foreign trade deficit in polyethylene on both amount and value basis. The polyethylene trade deficit is 1 million 372 thousand tons and 1, 85 billion dollars in the 9 months of 2017.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | 2017 / E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|----------------------|--------|--------|--------|--------|--------|--------|----------|---------------------|------------------------------------|
| LLDPE | -296 | -325 | -320 | -351 | -353 | -336 | -448 | 4.4 | 26.9 |
| LDPE | -178 | -247 | -226 | -280 | -303 | -230 | -307 | 14.2 | 1.2 |
| HDPE | -688 | -727 | -704 | -716 | -773 | -644 | -858 | 3.0 | 11.0 |
| Others | -34 | -142 | -176 | -218 | -255 | -157 | -209 | 65.9 | -18.0 |
| Total Deficit | -1,196 | -1,440 | -1,427 | -1,565 | -1,684 | -1,372 | -1,821 | 8.9 | 8.2 |

Table 13: Foreign Trade Deficit for Polyethylene in Turkey (1000 Ton)

Source: Turk Stat and ITC Trade Statistics

In 2017, it is expected that the polyethylene foreign trade deficit will increase by 8,2% on amount and 6,8% on value basis, compared to 2016, increasing to 1,82 million tons and 2.46 billion dollars.

The highest foreign trade deficit was realized in HDPE with 644 thousand tons and 804 million dollars in the 9 months of 2017.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | 2017 / E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|----------------------|--------|--------|--------|--------|--------|--------|----------|---------------------|------------------------------------|
| LLDPE | -435 | -508 | -524 | -466 | -431 | -414 | -552 | -0.2 | 28.0 |
| LDPE | -380 | -476 | -444 | -529 | -536 | -383 | -511 | 9.0 | -4.6 |
| HDPE | -1,082 | -1,194 | -1,196 | -1,013 | -961 | -804 | -1,072 | -2.9 | 11.6 |
| Others | -237 | -276 | -343 | -346 | -378 | -246 | -329 | 12.4 | -13.1 |
| Total Deficit | -2,134 | -2,454 | -2,507 | -2,354 | -2,306 | -1,847 | -2,463 | 2.0 | 6.8 |

Table 14: Foreign Trade Deficit for Polyethylene in Turkey (Million \$)

Source: Turk Stat and ITC Trade Statistics

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4.4. IMPORTS BY COUNTRIES

In the 9 months of 2017, Turkey has realized 69% of total polyethylene imports on amount and 67% on value basis from 10 countries, in this period, S. Arabia, Iran, S. Korea, Belgium and Germany have made the top 5 polyethylene import partners of Turkey.

| | 1000 Ton | USD Million | % Share (Ton) | % Share (\$) |
|--------------------|----------|-------------|-----------------|--------------|
| S. Arabia | 350 | 431 | 25 | 23 |
| Iran | 174 | 201 | 13 | 11 |
| S. Korea | 93 | 128 | 7 | 7 |
| Belgium | 51 | 82 | 4 | 4 |
| Germany | 47 | 80 | 3 | 4 |
| Spain | 52 | 79 | 4 | 4 |
| Italy | 46 | 68 | 3 | 4 |
| Singapore | 52 | 68 | 4 | 4 |
| France | 39 | 64 | 3 | 3 |
| Uzbekistan | 55 | 63 | 4 | 3 |
| 10 Countries Total | 959 | 1,263 | 69 | 67 |
| Others | 426 | 609 | 31 | 33 |
| Total | 1,385 | 1,872 | 100 | 100 |

Table 15: Polyethylene Imports 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 53% of its total polyethylene exports on amount and 54% on value basis to 10 countries. Bulgaria, Italy, Algeria, Belgium, Germany and Iran made up the top 5 polyethylene export partners of Turkey.

| | 1000 Ton | USD Million | % Share (Ton) | % Share (\$) |
|---------------------------|----------|-------------|-----------------|--------------|
| Bulgaria | 1.8 | 2.1 | 9 | 8 |
| Italy | 1.6 | 1.8 | 8 | 7 |
| Algeria | 1.1 | 1.5 | 6 | 6 |
| Belgium | 1.2 | 1.5 | 6 | 6 |
| Iran | 0.5 | 1.3 | 2 | 5 |
| Germany | 0.8 | 1.3 | 4 | 5 |
| France | 0.7 | 1.2 | 4 | 5 |
| Greece | 0.8 | 1.0 | 4 | 4 |
| North Cyprus Turkish Rep. | 0.7 | 1.0 | 4 | 4 |
| Aegean Free Trade Zone | 0.8 | 0.9 | 4 | 4 |
| 10 Countries Total | 9.8 | 13.4 | 53 | 54 |

| | | | | |
|--------------|-------------|-------------|------------|------------|
| Others | 8.8 | 11.6 | 47 | 46 |
| Total | 18.6 | 25.0 | 100 | 100 |

Table 16: Polyethylene Imports by Countries (2017/9)

Source: Turk Stat and ITC Trade Statistics

4.6. AVERAGE IMPORT AND EXPORT PRICES

Turkey's polyethylene average import price, remained above the average export price for all years. During the period 2012-2016, import prices decreased by 4.9% on average and export prices by 2.7%.

In the 9 months of 2017, the average import price decreased by 1, 2% and the export price increased by 1%, compared to 2016

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 /9 | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------------|------------------------------------|
| LLDPE | 1,471 | 1,563 | 1,637 | 1,333 | 1,224 | 1,234 | -3.6 | 0.8 |
| LDPE | 1,923 | 1,887 | 1,912 | 1,887 | 1,764 | 1,661 | -1.7 | -5.8 |
| HDPE | 1,574 | 1,639 | 1,683 | 1,413 | 1,243 | 1,248 | -4.6 | 0.4 |
| Others | 6,837 | 1,940 | 1,952 | 1,594 | 1,487 | 1,579 | -26.3 | 6.2 |
| Total | 1,762 | 1,700 | 1,747 | 1,504 | 1,369 | 1,352 | -4.9 | -1.2 |

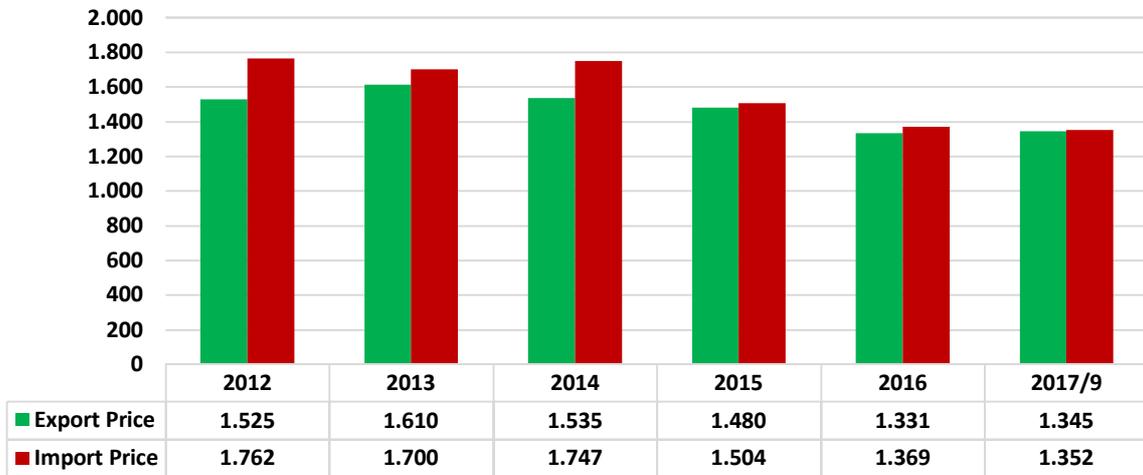
Table 17: Average Import Prices of Turkey for Polyethylene by Grades (\$ / Ton)

Source: Turk Stat and ITC Trade Statistics

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017/9 | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------------|------------------------------------|
| LLDPE | 1,750 | 1,819 | 1,971 | 1,521 | 1,275 | 1,318 | -6.1 | 3.3 |
| LDPE | 1,489 | 1,666 | 1,667 | 1,140 | 1,538 | 1,361 | 0.6 | -11.5 |
| HDPE | 1,598 | 1,408 | 1,085 | 1,370 | 1,227 | 1,140 | -5.1 | -7.1 |
| Others | 1,884 | 1,536 | 2,268 | 2,211 | 1,731 | 2,114 | -1.7 | 22.1 |
| Total | 1,525 | 1,610 | 1,535 | 1,480 | 1,331 | 1,345 | -2.7 | 1.0 |

Table 18: Average Export Prices of Turkey for Polyethylene by Grades (\$ / Ton)

Source: Turk Stat and ITC Trade Statistics



Graphic 9: Polyethylene Average Foreign Trade Prices (\$/kg)

Source: Turk Stat and ITC Trade Statistics

5. DOMESTIC CONSUMPTION

In line with the rapid development in the Turkish plastics industry, the polyethylene consumption of the industry has shown a rapid increase trend and increased by 6, 9% compound growth rate in the period covering 2012-2016. Consumption of 1 million 579 thousand tons in 2012, increased to 2 million 64 thousand tons in 2016.

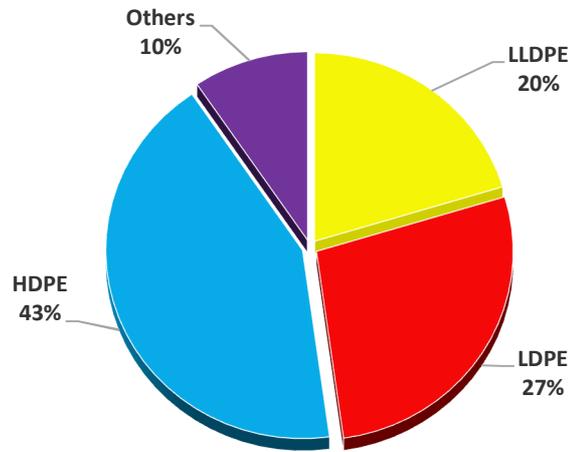
Domestic consumption realized as 1 million 657 thousand tons in the 9 months of 2017 and expected to increase to 2 million 201 thousand tons at the end of the year.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 / 6 | 2017 / E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------------|-----------------------------------|
| LLDPE | 296 | 325 | 320 | 351 | 353 | 336 | 448 | 4.4 | 26.9 |
| LDPE | 474 | 516 | 502 | 556 | 601 | 454 | 605 | 6.1 | 0.6 |
| HDPE | 775 | 812 | 783 | 795 | 855 | 705 | 940 | 2.5 | 10.0 |
| Others | 34 | 142 | 176 | 218 | 255 | 157 | 209 | 65.9 | -18.0 |
| Total Consumption | 1,579 | 1,794 | 1,782 | 1,920 | 2,064 | 1,657 | 2,201 | 6.9 | 6.7 |

Table 19: Domestic Consumption of Polyethylene in Turkey (1000 Ton)

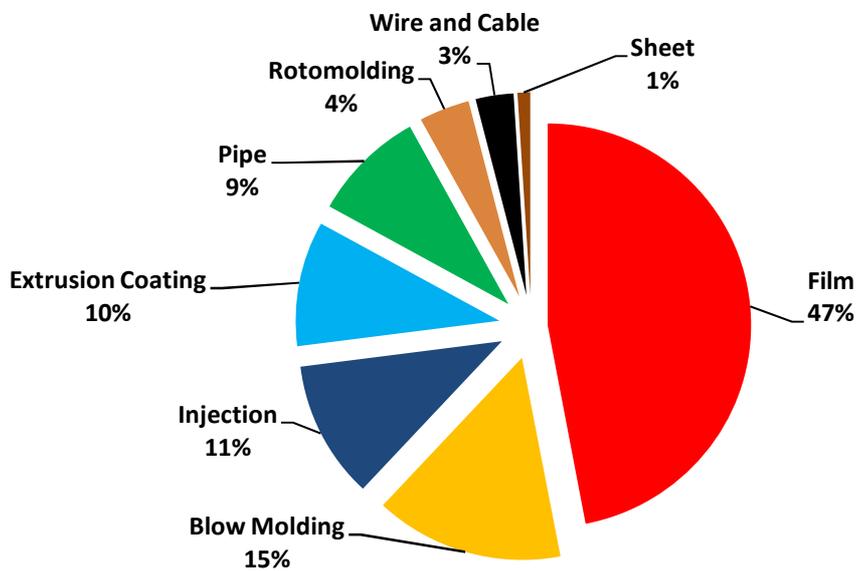
Source: Turk Stat and ITC Trade Statistics

In the 9 months of 2017, HDPE shared 43 %, LDPE 20 %, LLDPE% 20 and other polyethylene received % 9 of total polyethylene consumption.



Graphic 10: Domestic Consumption of Polyethylene by Grades in Turkey (2017/9)
Source: Turk Stat and ITC Trade Statistics

Total consumption of polyethylene by the main process types constitutes as; % 47 film, % 15 blow molding, % 11 injection, % 10 extrusion coating, % 9 pipes, % 4 rotomolding, % 3 wire and cables and % 1 sheet.



Graphic 11: Total PE Consumption by Process Types
Source: Turk Stat and ITC Trade Statistics

6. SUPPLY AND DEMAND

It is observed that Turkey's total polyethylene production decreased by 0.2% per annum, imports increased by 6.9%, domestic exports decreased by 30.4% and average annual consumption increased by 6.9% in the last 5 years.

Turkey's import dependence on polyethylene was 84% in 9 months of 2017. It is observed that 29% of domestic production is exported in 2012, but the share of exports in production falls to 4% in 9 months of 2017. The import coverage rate of polyethylene exports fell from 9% in 2012 to 1% in 9 months of 2017.

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 / 6 | 2017 / E | CAGR % 2016/2012 | % Increase (2017 / 2016) (E) |
|---------------------------------------|-------|-------|-------|-------|-------|----------|----------|---------------------|-----------------------------------|
| Production | 383 | 354 | 355 | 355 | 380 | 285 | 380 | -0.2 | 0.0 |
| Imports | 1,308 | 1,505 | 1,499 | 1,600 | 1,710 | 1,385 | 1,846 | 6.9 | 8.0 |
| Exports | 112 | 64 | 72 | 35 | 26 | 13 | 25 | -30.4 | -4.1 |
| Domestic Consumption | 1,579 | 1,794 | 1,782 | 1,920 | 2,064 | 1,657 | 2,201 | 6.9 | 6.7 |
| Imports/Domestic Consumption (%) | 83 | 84 | 84 | 83 | 83 | 84 | 84 | | |
| Exports/ Production (%) | 29 | 18 | 20 | 10 | 7 | 4 | 7 | | |
| Exports/Imports (%) | 9 | 4 | 5 | 2 | 2 | 1 | 1 | | |

Table 20: Polyethylene Supply and Demand in Turkey (1000 Ton)

Source: Turk Stat and ITC Trade Statistics

Turkey is one of the major polyethylene importer countries of the world. The rapid growth trend in the plastics industry has also led to a rapid increase in demand for polyethylene. However, the domestic production of polyethylene is far to meet this demand.

Domestic consumption forecasts indicate that import dependency will reach to 100% in LLDPE, 61% in LDPE, 92% in HDPE and 88% in total polyethylene in 2020.

From this point of view, Turkey seems to have an important market for the existing or possible petrochemical plants for polyethylene 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 6th largest plastics production capacity in the world and 2nd 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.

CONNECTING POWER OF PLASTICS INDUSTRY



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