

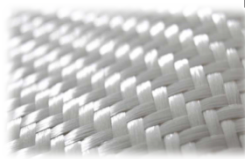
CLASSIFICATION OF POLYMERS BASED ON END USES

Polymer Science and Technology I
February 12, 2018

PLASTICS



FIBERS



ELASTOMERS



PLASTICS

Plastics are derived from synthetic polymers. A typical commercial plastic resin may contain two or more polymers in addition to various additives and fillers.

Plastics are categorized as;

- Thermoplastics
- Thermosets

Thermoplastics

High demand.

Easily shaped with heat.

When heated up again after cooling, it can be re-shaped.

Thermosets

Cured or crosslinked compounds.

Durable and heat resistant.

Reprocessing or shaping is not possible.

Most common Thermoplastics



Polyethylene (PE)



Polypropylene (PP)



Polyvinyl chloride (PVC)



Polystyrene (PS)



Polyester, PET

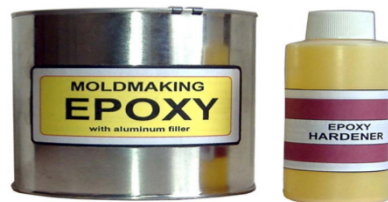


Acrylic

Most common Thermosets



Polyurethanes (PU)



Epoxies



Phenol-formaldehyde resins (PF)



Unsaturated Polyesters

FIBERS

Fibers are typically semicrystalline polymers that can be spun into long strands that have high strength-to-weight ratios for textile as well as composite applications.

Fibers are categorized as;

- Natural
- Synthetic

Natural Fibers

Obtained from natural resources which are animals, vegetables or plants and minerals were used for textile applications.

Synthetic Fibers

Generally semicrystalline polymers that are capable of being spun into filaments of length to diameter ratios in excess of 100.

Melt, dry or wet spinning processes are possible.

Most Common Natural Fibers



Wool



Cotton



Silk

Most Common Synthetic Fibers



Acrylic fibers



Rayon



Acetate Fibers



Saran



Nylon



Vinyon

ELASTOMERS

Elastomer materials are made of polymers that are joined by chemical bonds, acquiring a final slightly crosslinked structure.

Rubber is an elastomer—that is, a polymer that has the ability to regain its original shape after being deformed. Rubber is also tough and resistant to weathering and chemical attack.

Rubbers are categorized as;

- Natural
- Synthetic

Natural rubber

Grown on the *Hevea brasiliensis*, or rubber tree.
Mature rubber trees produce latex.
Limited supply.

Synthetic rubber

Created from petroleum.
Classified as an artificial elastomer.
Able to be deformed without sustaining damage, and can return to its original shape after being stretched.

Most Common Synthetic Rubbers



Styrene-butadiene (SBR)



Polybutadiene rubber



Ethylene propylene rubber (EP)



Nitrile rubber

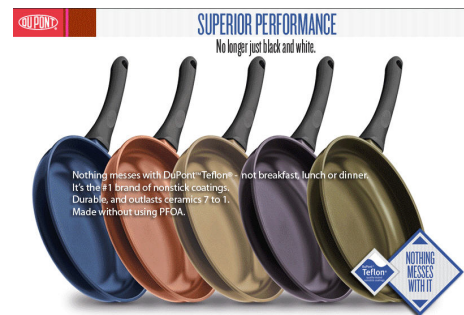


Polychloroprene (Neoprene)

POLYMER INDUSTRY IN TURKEY



- Agriculture
- Automotive
- Electronics
- Energy
- Food and Beverage
- Health Care and Medical
- Mining
- Plastics
- Packaging and Printing
- Marine
- Safety and Protection



E. I. du Pont de Nemours and Company, commonly referred to as DuPont, is an American chemical company that was founded in July 1802 as a gunpowder mill by Éleuthère Irénée du Pont. In the 20th century, DuPont developed many polymers such as Vespel, neoprene, nylon, Corian, Teflon, Mylar, Kevlar, Zemdren, M5 fiber, Nomex, Tyvek, Sorona and Lycra. In 2014, DuPont was the world's fourth largest chemical company based on market capitalization and eighth based on revenue.



- Food and Beverage
- Industrial
- Consumer
- Agricultural
- Medical



The company was founded in 1897 by Canadian-born chemist Herbert Henry Dow. After a period of major diversification it achieved the status of a major chemical company, involved as a significant player in the world market, and being part of the military-industrial war effort during both World Wars.

As of 2015, Dow was the third largest chemical company in the world by revenue.

In 1971, Dow established its representative office and in 1990 Dow Chemical Industrial Inc. was established in Turkey.



- Thermoplastics
- Fiber raw materials
- Liquid products
- Aromatics
- Others



Petkim is the leading petrochemical company of Turkey. Founded on April 3, 1965, the main plant complex is located in Yarımca, Izmit. From 1985 on a second complex has been constructed in Aliğa, Izmir.

Specializing in petrochemical manufacturing, the company produces ethylene, polyethylene, polyvinyl chloride, polypropylene and other chemical building blocks for use in the manufacture of plastics, textiles, and other consumer and industrial products.

The company has 14 manufacturing plants supplying a significant portion of petrochemicals used in Turkey. The company also exports products to the United States, and countries in Europe, the Middle East, Africa, and Asia.



LOW DENSITY POLYETHYLENE (LDPE) PLANT

- Autoclave Reactor and High Pressure Continuous Process
- Heavy Duty Bags , Greenhouse Cover , Film for Packing , Cable Coating , Kitchen Utensils , Toys , Pipes , Hoses , Tubes , Bottles , Textile and Metal Coatings , Rotating Molds , Blow Molds , etc.



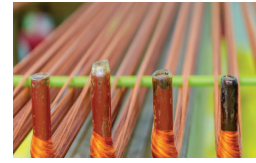
POLYPROPYLENE (PP) PLANT

- Polymerising propylene with Ziegler-Natta catalyst.
- Braid, bag, rug thread, rope, table cloth, doormat, filter fabric, seal, cord fabric, pipe, cable case, fishnet, brush, etc.



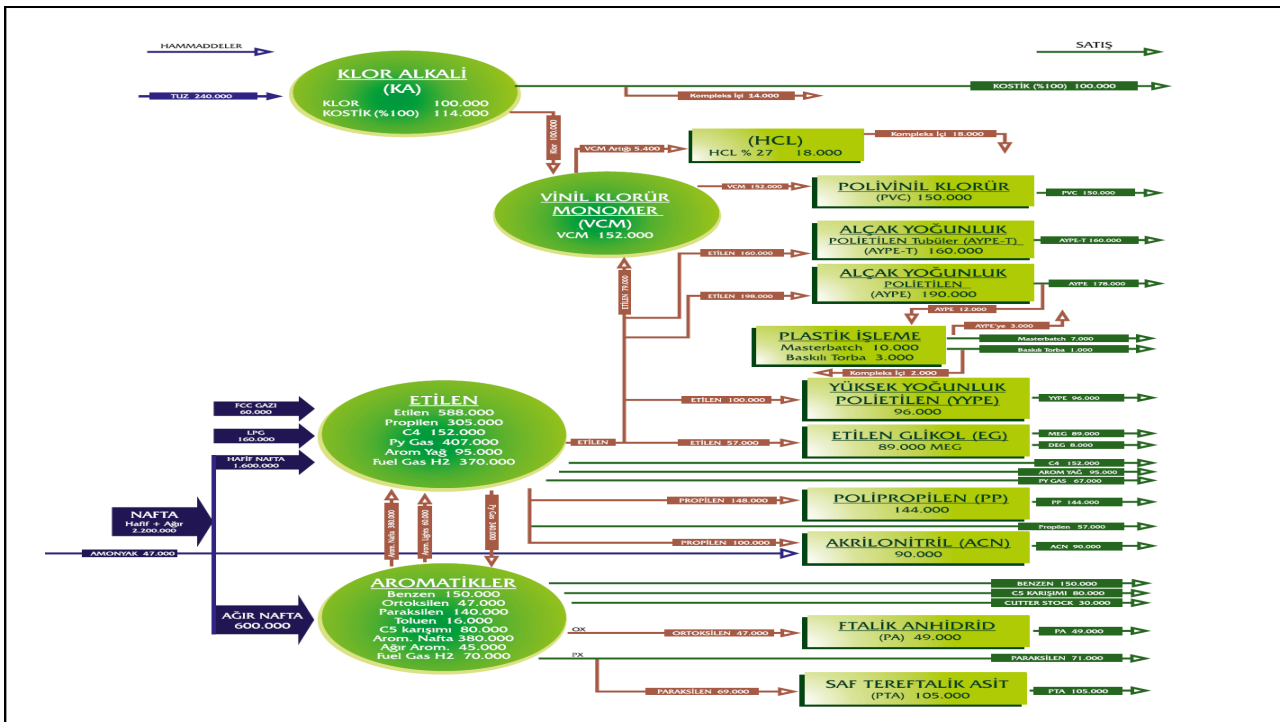
PURE TEREPHTHALIC ACID (PTA) PLANT

- Catalytic liquid phase oxidation of paraxylene with air.
- Resins for Polyester Fibers, Films and molded products, In the production of Polyethylene Terephthalate (PET).



ACRYLONITRILE (ACN) PLANT

- Sohio Process-ammoxidation
- Acrylic fibers, Elastomers, synthetic resins, Acrylonitrile polymers, nitrile rubbers.

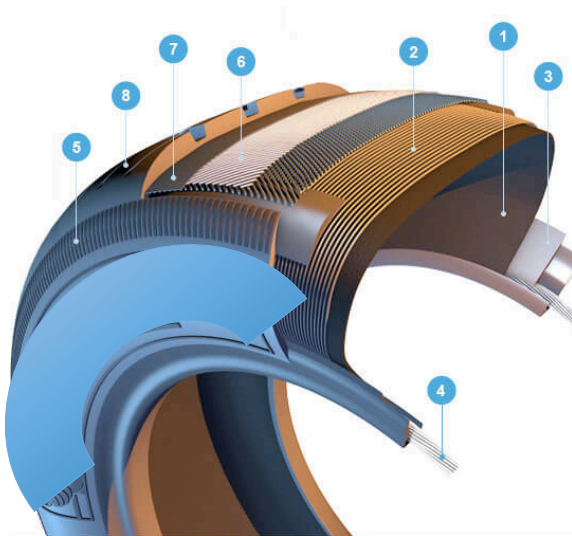




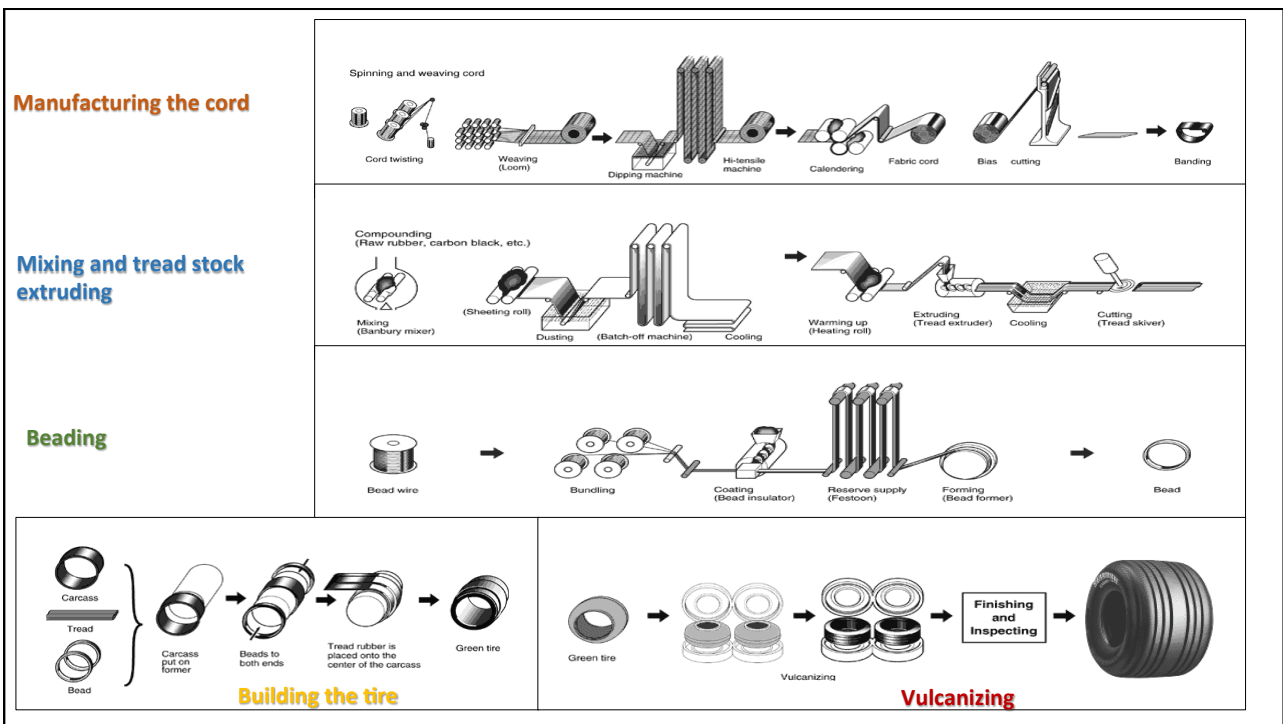
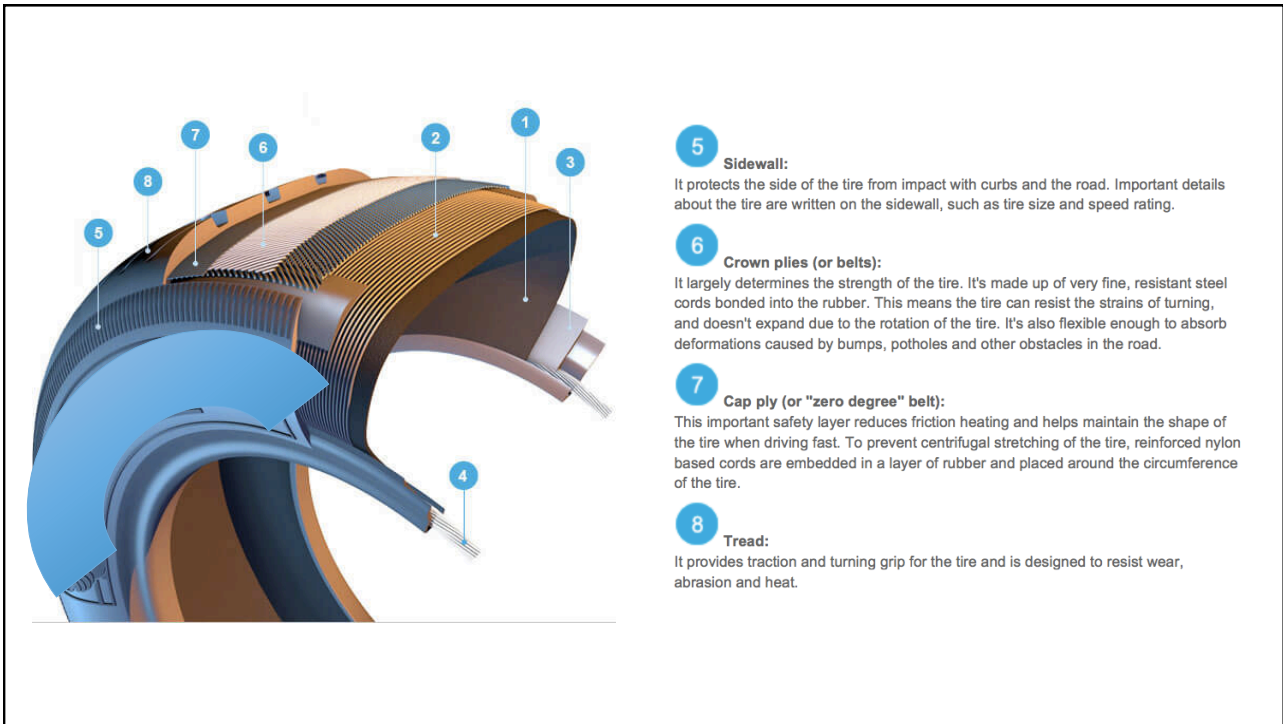
- Ultra High Performance Tires
- High Performance Tires
- Standard Car Tires
- Winter Tires
- 4X4 Vehicle Tires
- Light Duty Commercial Vehicle Tires
- Steel Radial Van/ Light Truck Tires
- Bias-Ply Van/Light Truck Tires
- Steel Radial Bus/Truck Tires
- Bias-Ply Bus/Truck Tires
- Agricultural Tires
- Off The Road Tires
- Forklift Tires
- Construction Machinery and Heavy Equipment Tires
- Motorcycle Tires



Brisa was originally established by the Sabancı Group , the leading industrial conglomerate in Turkey, under the licence agreement signed with American BF Goodrich Company in 1974. The Company, a 100% Turkish investment, was named Lassa Tire Manufacturing and Trading Inc. at that time. Until 1988, the Company produced tires under the Lassa brand, expanding its product range from tires for passenger cars, trucks and buses to farm and off-the-road vehicles. In response to the developments in the world tire industry, a joint venture agreement was signed between the Bridgestone Corporation of Japan , one the world's largest manufacturers of tires and the Sabancı Group , on November 1st, 1988. As a result of this agreement, the Company name was changed to BRISA Bridgestone Sabancı Tire Manufacturing and Trading Inc. Today Brisa is the number one tire manufacturer in Turkey and the sixth biggest tire producer in Europe.



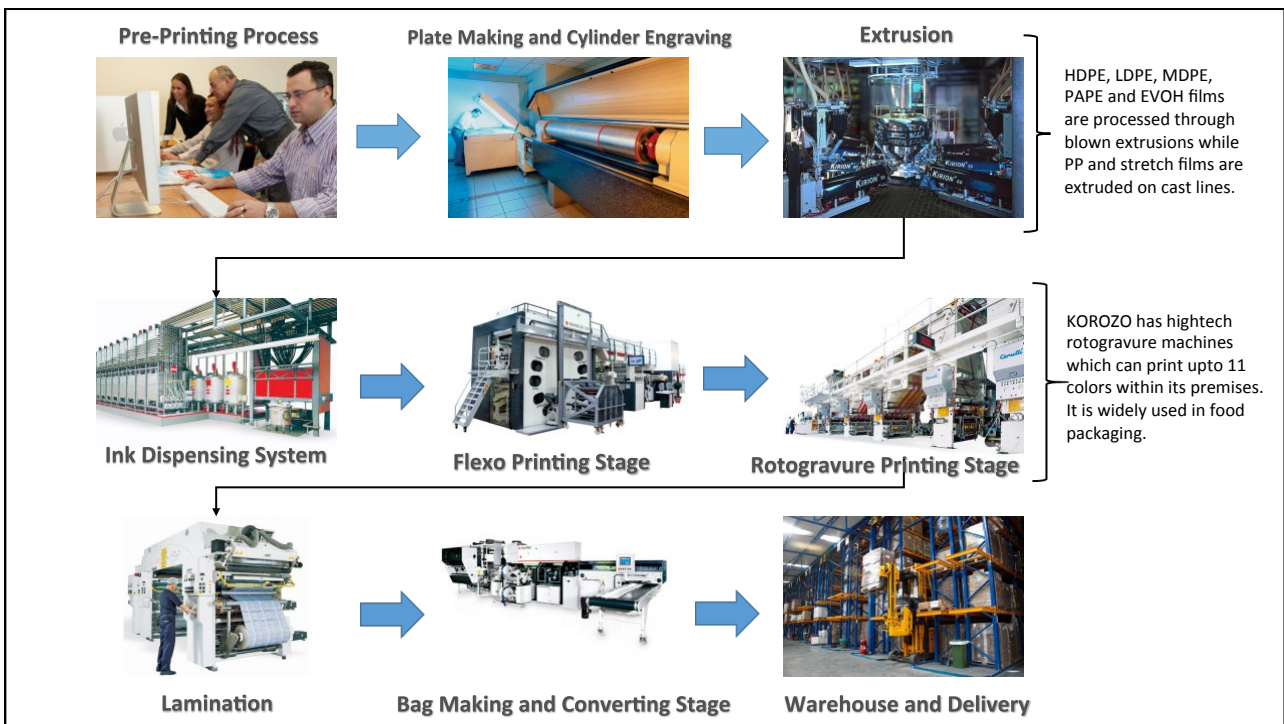
- 1 Inner liner:**
An airtight layer of synthetic rubber (the modern equivalent of an inner tube)
- 2 Carcass Ply:**
The layer above the inner liner, consisting of thin textile fiber cords (or cables) bonded into the rubber. These cables largely determine the strength of the tire and help it resist pressure. Standard tires contain about 1,400 cords, each one of which can resist a force of 33lb.
- 3 Lower bead area:**
This is where the rubber tire grips the metal rim. The power from the engine and braking effort is transmitted from the rim of the tire to the contact area with the road's surface.
- 4 Beads:**
They clamp firmly against the tire's rim to ensure an airtight fit and keep the tire properly seated on the rim. Each wire can take a load of up to **3,968 lbs** without risk of breaking. There are eight of them on your car - two per tire. That's a massive **31,746 lbs** of resistance strength. An average car weighs about **3,307 lbs**.





- Flexible Packaging
- PE Bags
- Pallet Wrap
- Silage Film
- Personal Care Packaging
- Koroplast Products
- Rigid Films
- Artificial Casings

KOROZO commenced its activities within the packaging industry in 1973. The sector leader has broken new grounds in the packaging field, with its continuous investments year by year while growing rapidly. Today, with its wide product range, and its annual production capacity of over 90.000 tonnes per year, KOROZO has become one of the largest production plant in the Middle East and Europe. KOROZO produced the first garbage bag and freezer bag in Turkey, under the brand name "KOROPLAST". KOROZO always ranks top amongst the first 500 industrial companies in Turkey, as per the surveys of Istanbul Chamber of Commerce.





- Decorative Paints
- Furniture Paints
- Industrial Paints
- Car Refinish
- Marine Paints
- Printing Inks

Yasaş, Bayraklı and Akрил companies under the management of Yaşar Paint Group were merged under the name of DYO Paint Factories Industry and Trade SA in 2002. The business unit for construction paints has a modern factory, which can compete internationally with its automation level, in Gebze. Product range of the factory exceeds 2,500 in color and package and its annual manufacturing capacity is 120.000 tons. Today, export is done to various 30 countries in Europe, Balkans, Africa and Asia. Also, factory investments are being done in foreign countries. There is a factory in Romania manufacturing construction paints.



- **Water-Based Interior Wall Finish Paints**
- **Water-Based Exterior Wall Finish Paints and Coatings**
- **Metal-And Wood Paints**
- **Dr. DYO Products**
- **Wood Stain and Varnish**
- **Linning, Paste and Thinners**
- **Paint Application Tools and Auxiliary Products**
- **Road Marking Paint and Thinner**
- **Klimatherm**

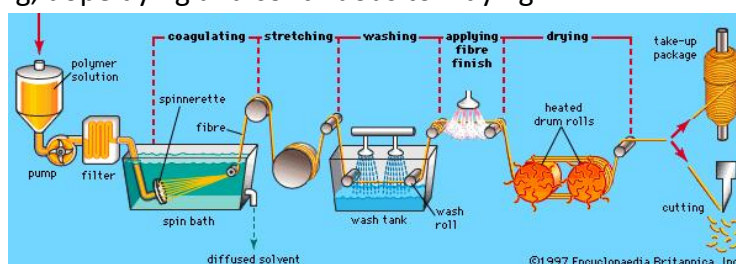


- Knitting
- Hand Knitting
- Carpet
- Home Textiles and Upholstery
- Toy and Hi-pile Products
- UV resistant products
- Technical Applications

Aksa Akrilik Kimya Sanayii A.Ş., a company of Akkök Holding, one of the established industrial groups of Turkey, was founded in 1968 in Yalova to meet Turkey's need for acrylic fiber and started manufacture with a capacity of 5000 tons per year in 1971. Aksa supplies raw materials for textiles and technical textiles in many diverse areas ranging from carpets to upholsteries, sweaters to socks, silk to handwoven products, velvet to rugs, blankets, awning and industrial fibers due to its wide product range. Becoming the world's greatest producer of acrylic fiber with the investments it has made and the innovations it has introduced over the years, Aksa is now a global giant with approximately 300 customers in over 50 countries across 5 continents.

Aksa Process

- The Aksa manufacturing process is based on wet spinning process .
- The fiber has a kidney shaped cross-section.
- Aksa produces tow, top or staple fiber in both ecru and in a broad range of colors by gel dyeing, dope dyeing and continuous tow dyeing.



End Uses of Acrylic Fiber:

- Apparel: Sweaters, socks, fleece wear, circular knit apparel, sportswear and childrens wear
- Household Textiles: Carpet, blankets, area rugs, upholstery, pile fabrics
- Outdoor end uses: Car tops, boat covers, awnings, outdoor furniture
- Industrial end uses: Filtration materials, reinforcement materials in construction, car batteries

FIRAT

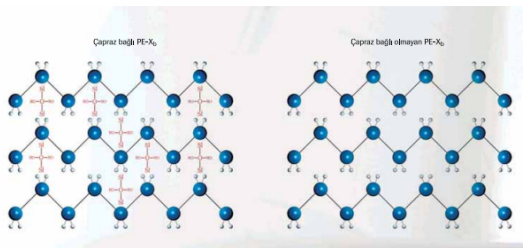
- PVC Window and Door
- Sanitary Piping Systems
- Infrastructure Pipe
- PE-PP Sheet
- Drainage Pipe Systems
- Rain Gutters
- PVC Hoses
- Agricultural Drip Irrigation
- PVC Curtain Rails
- Medical



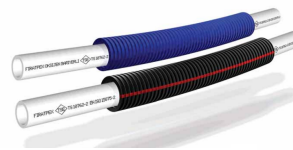
Firat was established to carry out production in the field of plastic building materials in the year 1972. In its production Firat targets various sectors such as construction, agriculture, automotive, medical, domestic appliances sectors with its plastic-based products. It realizes its production targeting those sectors in its modern factories in Büyükçekmece-İstanbul and Sincan-Ankara which have a total area that reaches 750,000 m². Firat owns one of the three biggest plastic production complexes in Europe.

FIRATPEX

- Northern Cyprus Water Supply Project
- Eurasia Tunnel
- Libya Desalination Project



PE -X_c raw material obtained from the polyethylene raw material by a process of crosslinking between the micromolecules. This process is carried out with Silan method.



Long service life
Heat resistant
Pressure resistant