

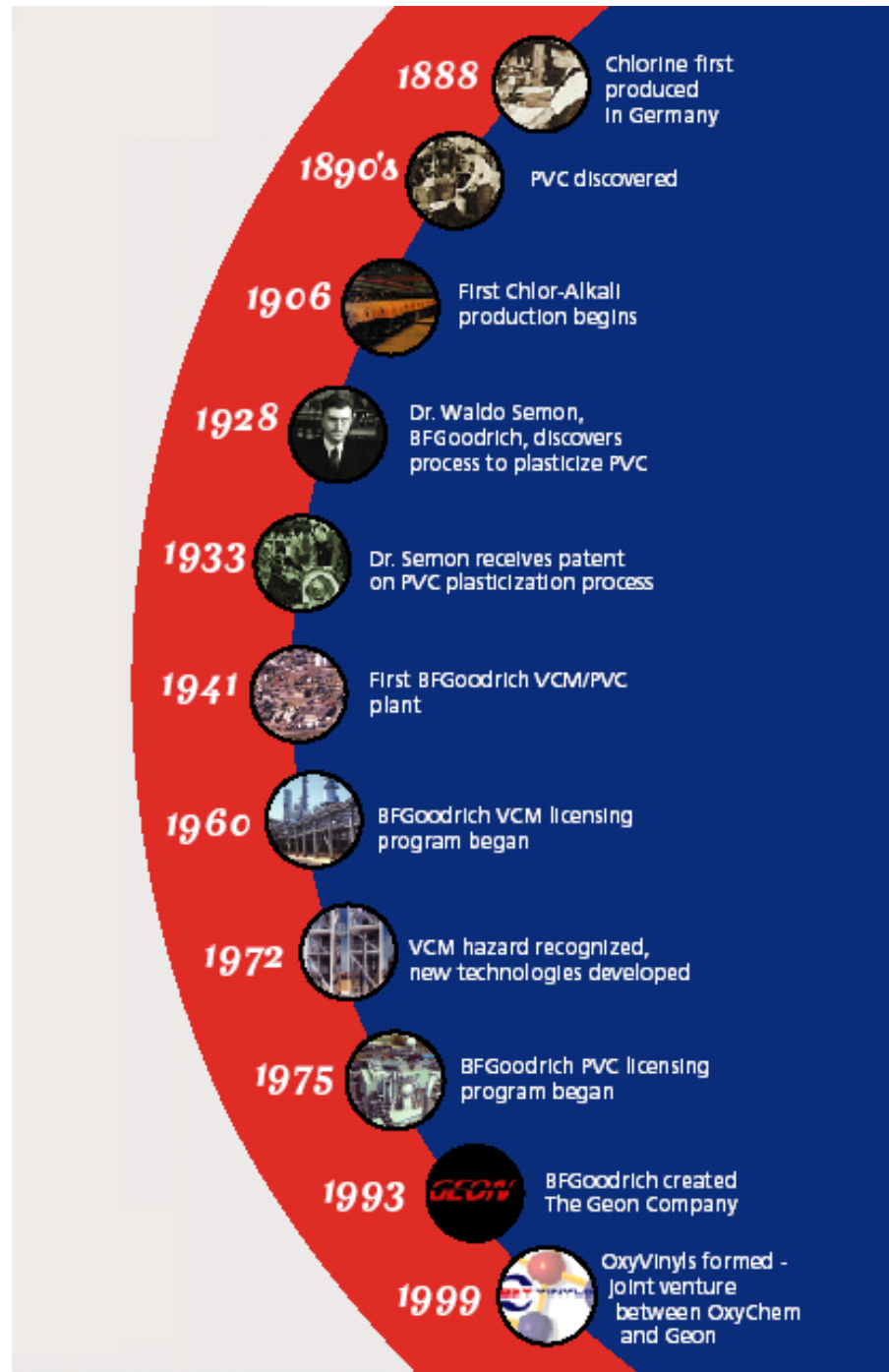
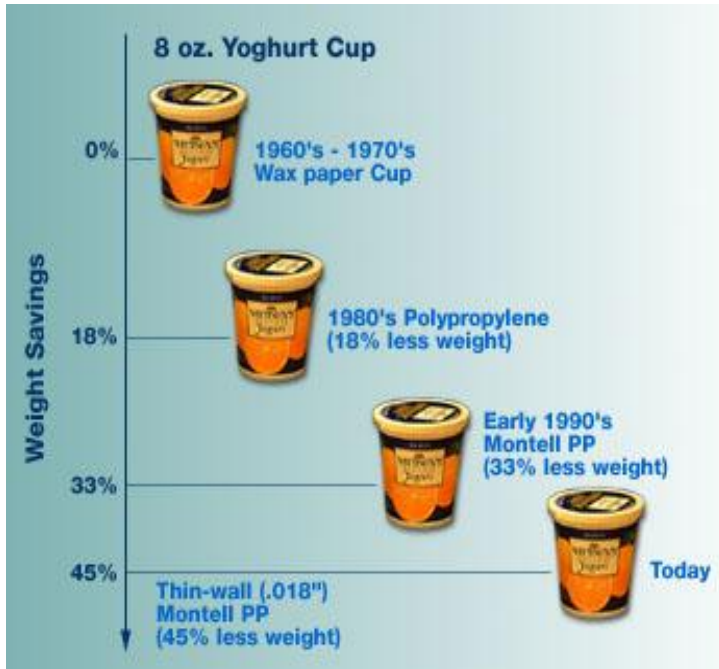
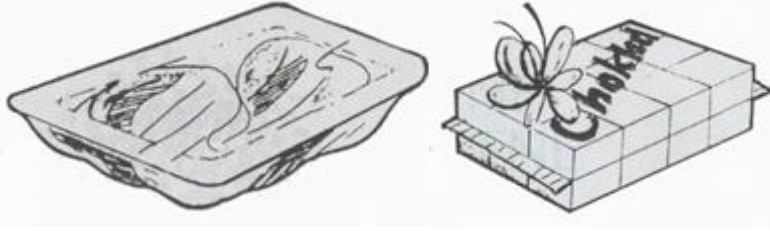
Temel Ambalaj Filmleri ve Üretim Teknolojileri



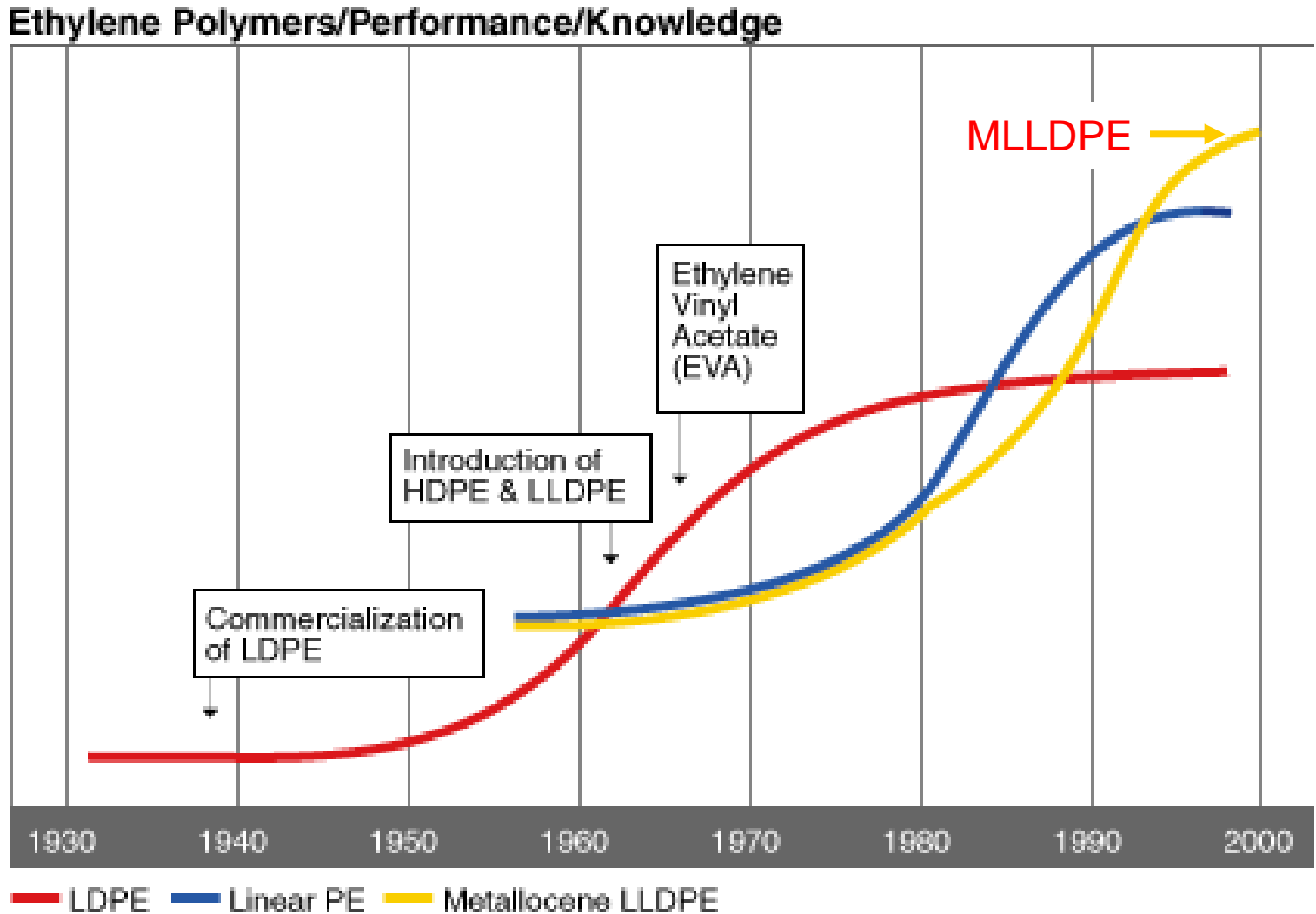
Muharrem DEMİR

www.apack.com.tr

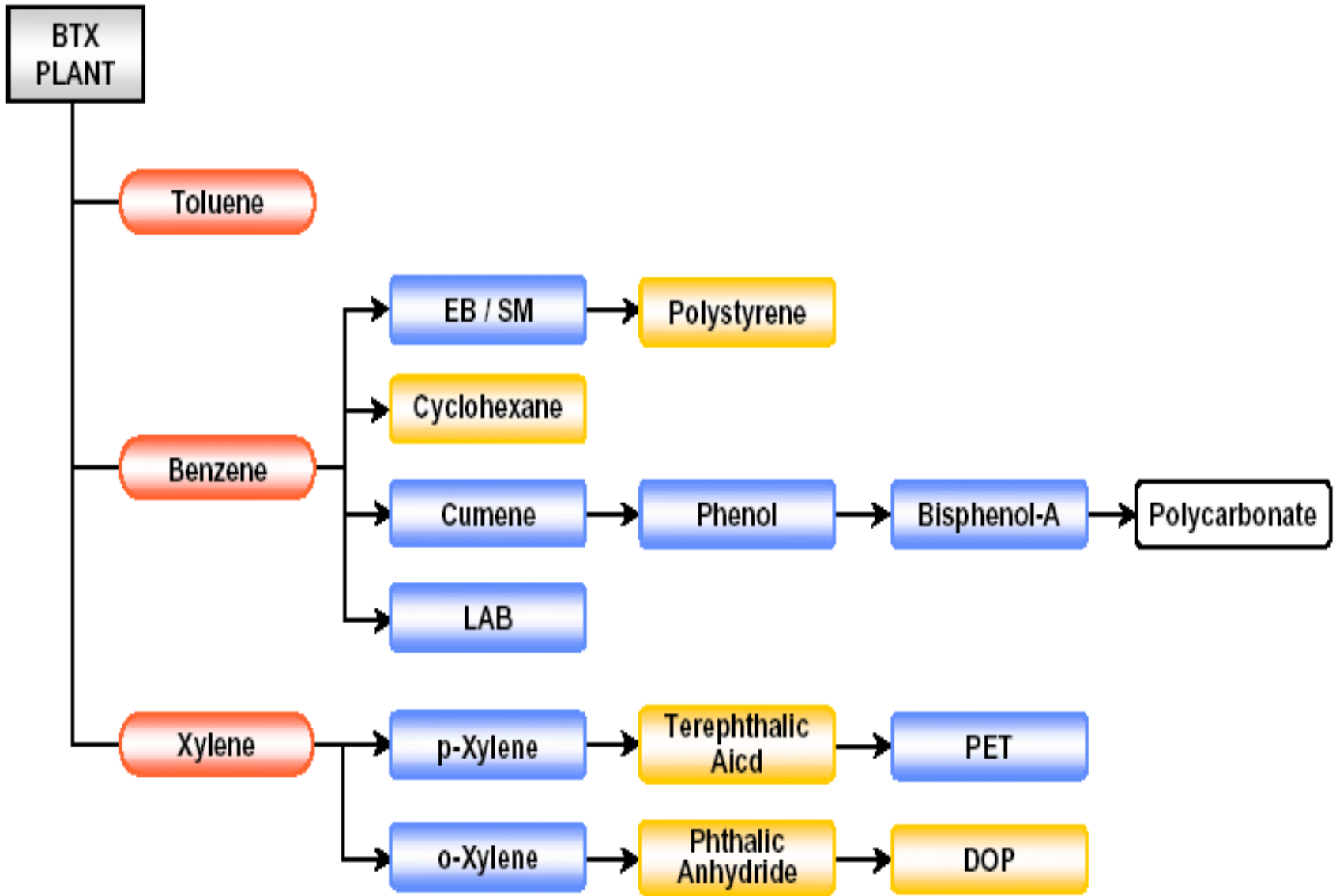
Ambalaj Malzemeleri Tarihçesi



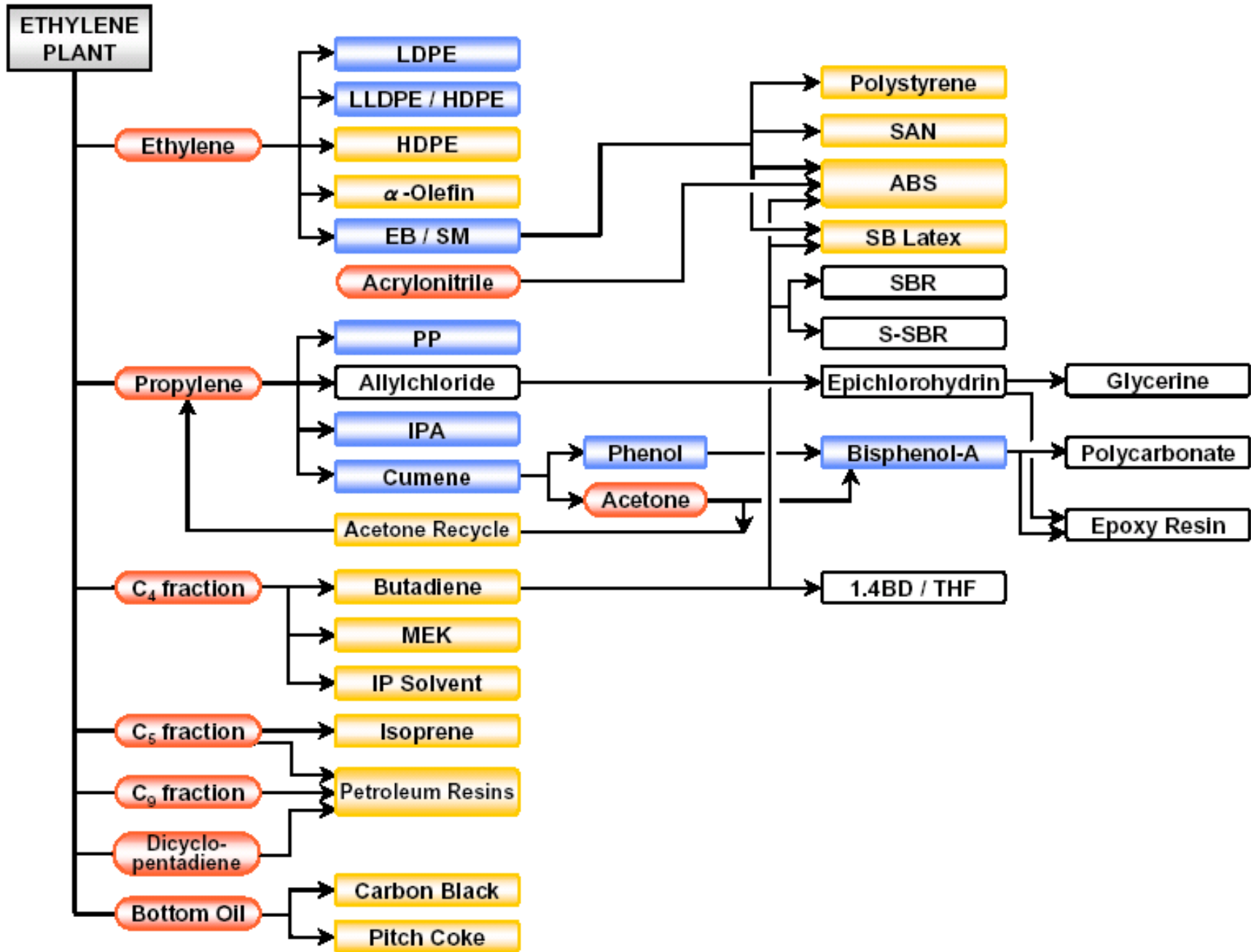
Ethylene Polymers Timeline



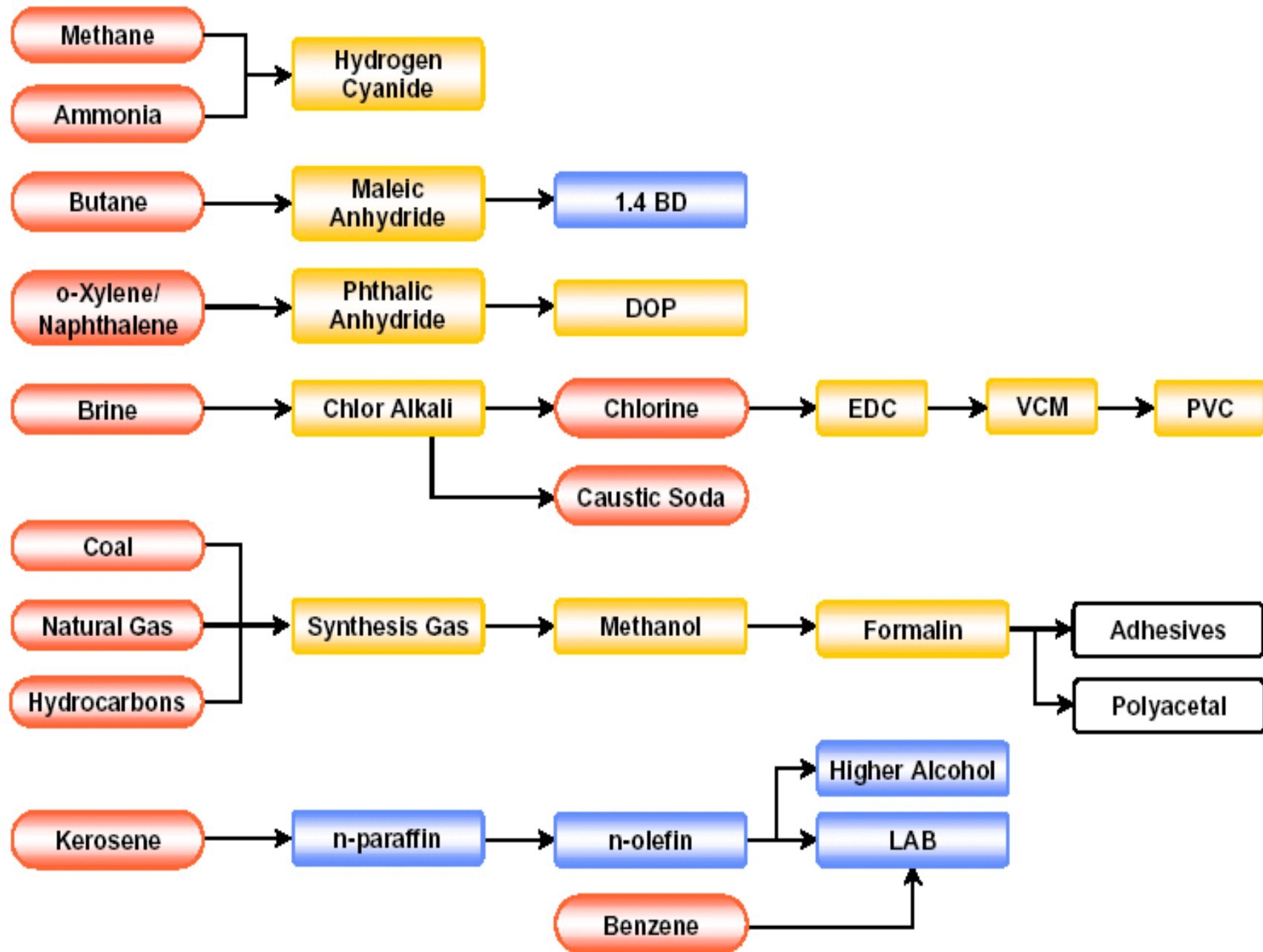
Polymer Üretimi



Polymer Üretimi

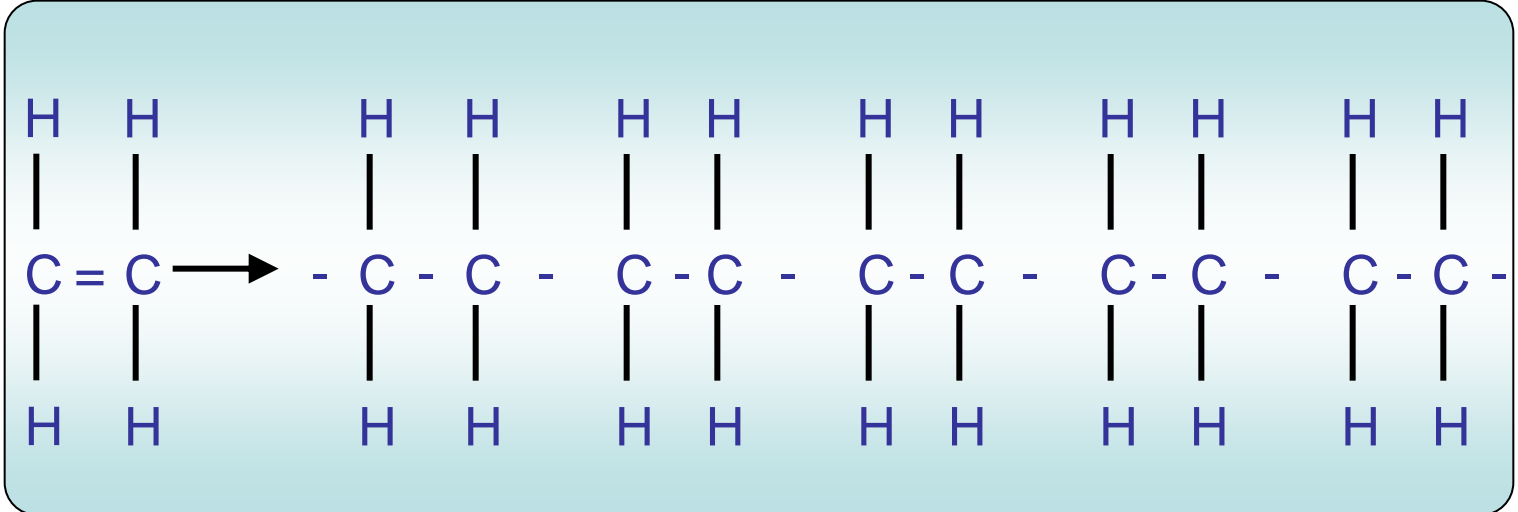


Polymer Üretimi



The Chemical Structure of Polyethylene

Ethylene - - > Polyethylene

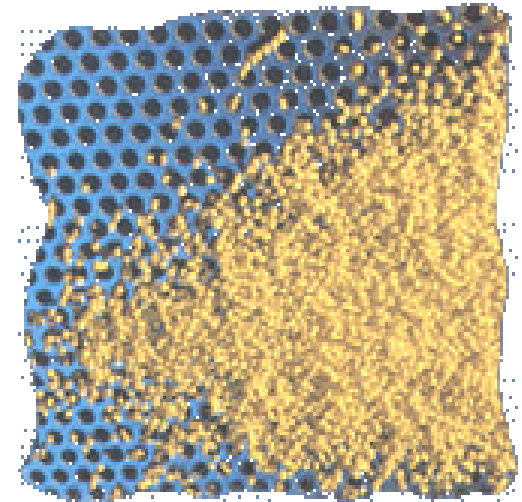
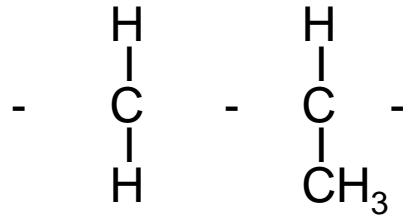


| | |
|------|---------------------------------|
| LDPE | 0.910 – 0.925 g/cm ² |
| MDPE | 0.926 – 0.940 " |
| HDPE | 0.941 – 0.965 " |

The Structure of Some Other Polymers

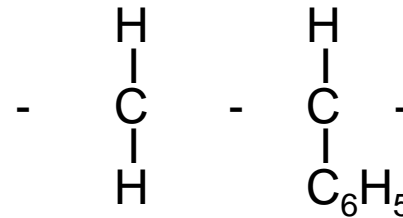
Polypropylen

0,910-0,965 gr/cm³



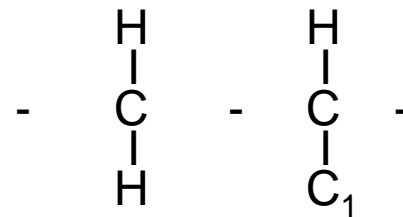
Polystyrene

1,05 gr/cm³



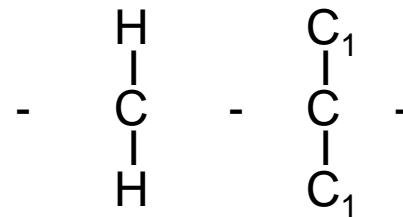
PVC

1,35-1,45 gr/cm³



PVdC

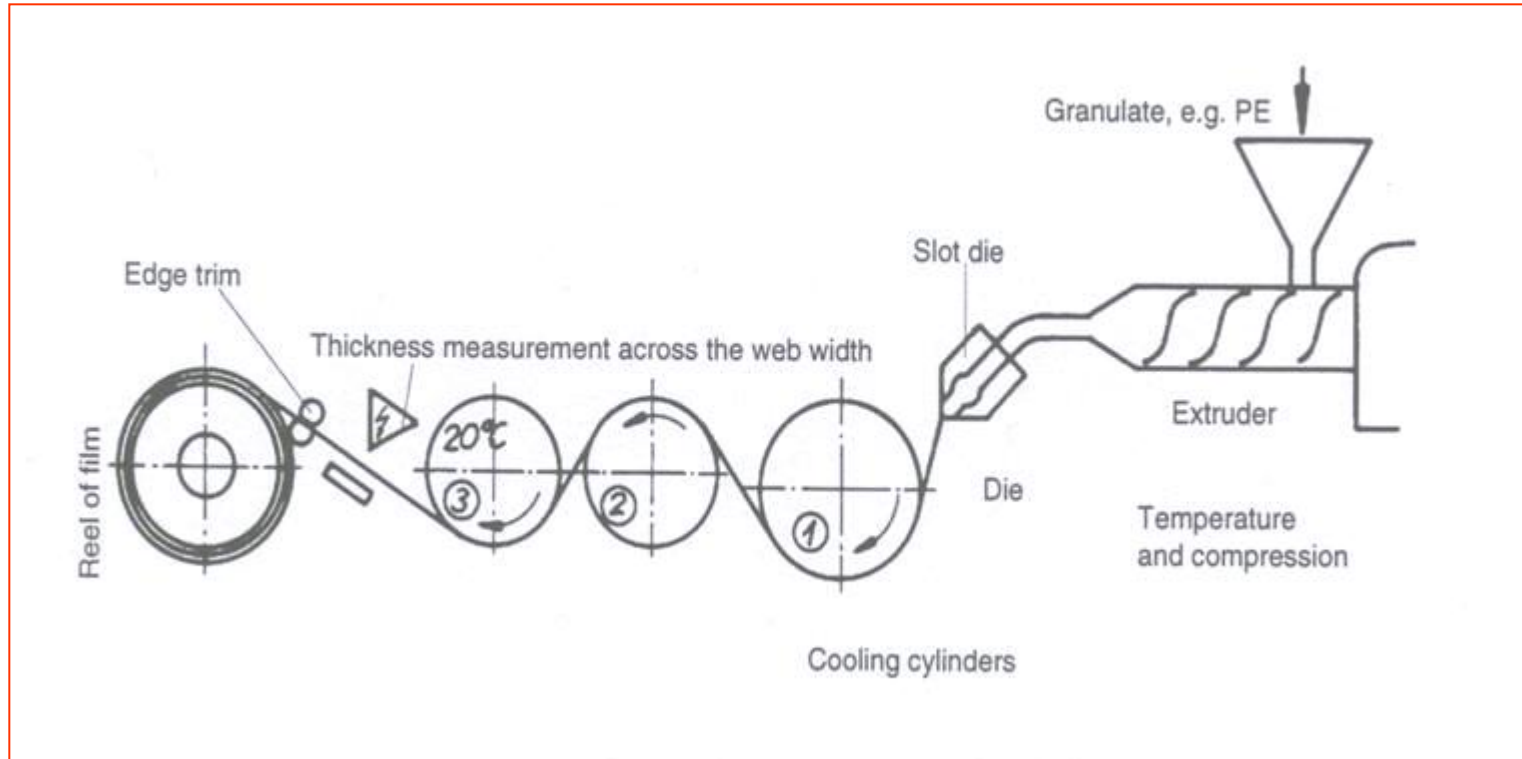
1,68-1,75 gr/cm³



Mono Filmler ve Özellikleri

| | | Flexible | Rigid | Thermoformable | Shallow pocket | O2 barrier | Water vapour barrier | Sealable |
|---------------------------|------------------|----------|-------|----------------|----------------|------------|----------------------|----------|
| Polyamide | PA | X | | X | | X | | |
| Oriented polyamide | OPA | X | | | X | X | | |
| Polyethylene | PE | X | | X | | | X | X |
| High density polyethylene | HDPE | X | X | X | | | X | X |
| Amorphous polyester | A-PET | | X | X | | X | X | |
| Expanded polyester | EPET | | X | X | | X | X | |
| Polyester | PET | X | | X | | | | |
| Oriented polyester | PETP | X | | | X | | | |
| Polypropylene | PP | X | X | X | | | X | X |
| Expanded polypropylene | EPP | | X | X | | | X | X |
| Oriented polypropylene | OPP | X | | | X | | X | |
| Polystyrene | PS | | X | X | | | | |
| Oriented polystyrene | OPS | | X | X | | | | |
| Polyvinyl chloride | PVC | | X | X | | X | X | |
| Polycarbonate | PC | | X | X | | | | |
| Polyacrylonitrile | PAN | | X | X | | X | | |
| Cellulose film | ZG | X | | | X | | | |
| Surlyn | | X | | X | | | X | X |
| Heat seal lacquer | HS lacquer | | | | | | | X |
| Cold seal lacquer | CS lacquer | | | | | | | X |
| Silicon oxide | SiO _x | X | | | | X | X | X |
| Ethyl vinyl alcohol | EVOH | | | X | | X | | |
| Polyvinylidene chloride | PVdC | | | X | | X | | |
| Alu foil < 20 mic | Al | | | | X | X | X | |

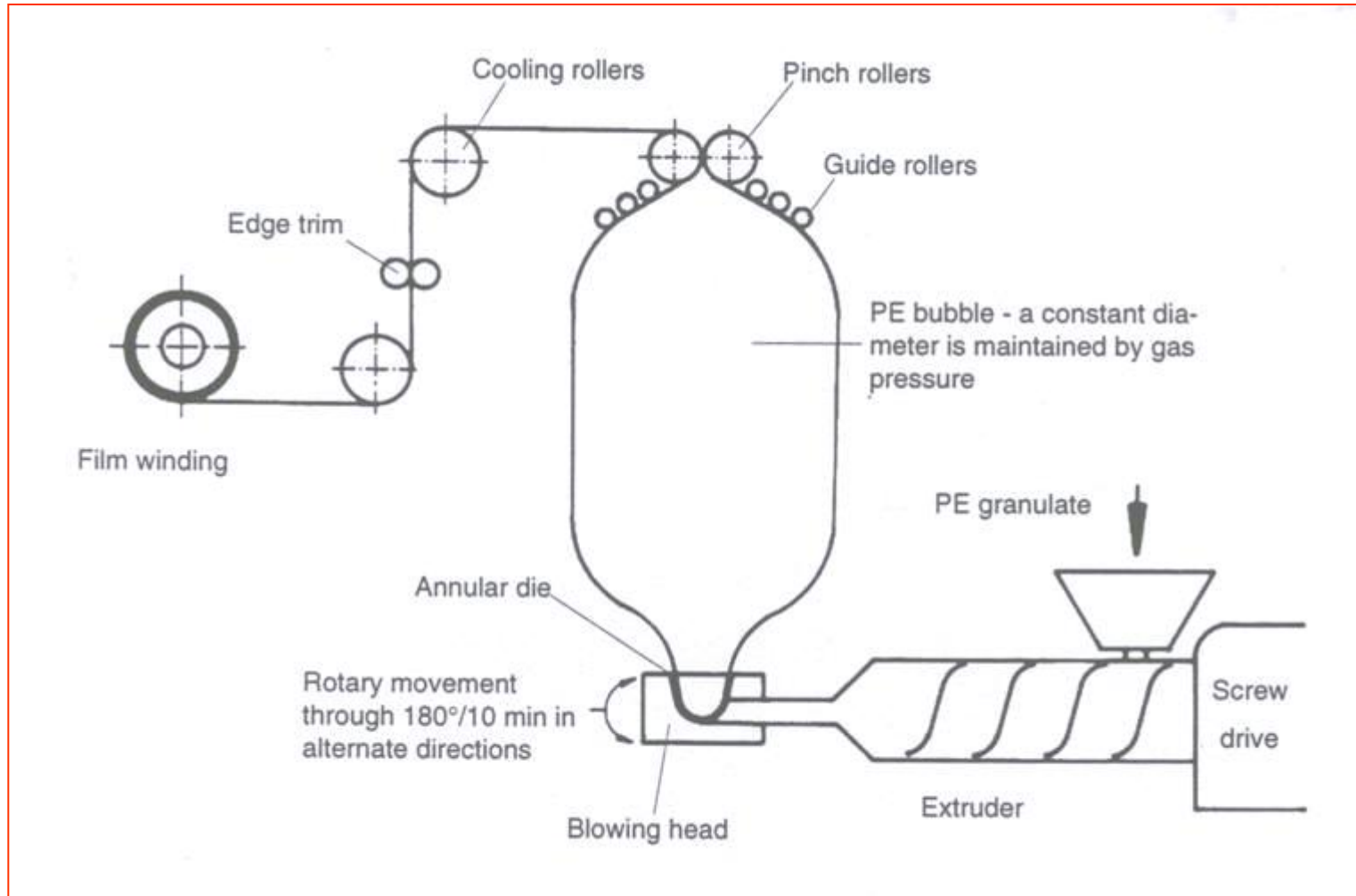
Casting of PA, PE, HDPE, PP, PS, transparent PETP



Film thickness in cross direction is regulated by exact setting of the die gap (tension and pressure screw). Modern equipment has fully automatic control facilities.

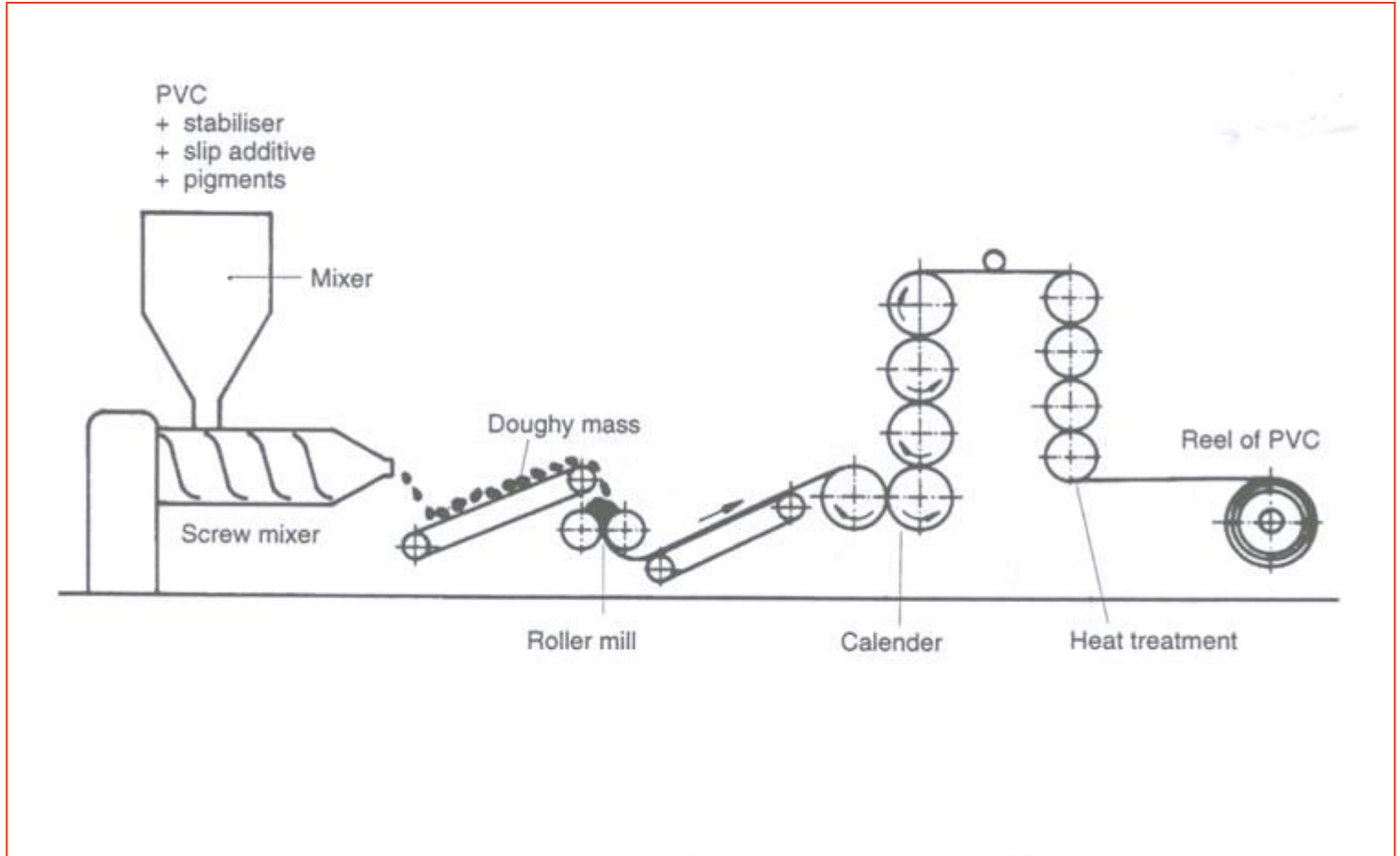
Longitudinal regulation via extruder output and take-off speed.

Blowing



Film thickness is regulated by exact setting of the annular die gap, the extruder output and the take-off speed.

Calendering of PVC



The thickness tolerances are as follows

| | | |
|-------|--------------------------|-------|
| Films | up to 200 microns thick: | +10 % |
| | from 200 to 400 microns: | + 7 % |
| | over 400 microns thick: | + 5 % |

Biaxial Orientation

