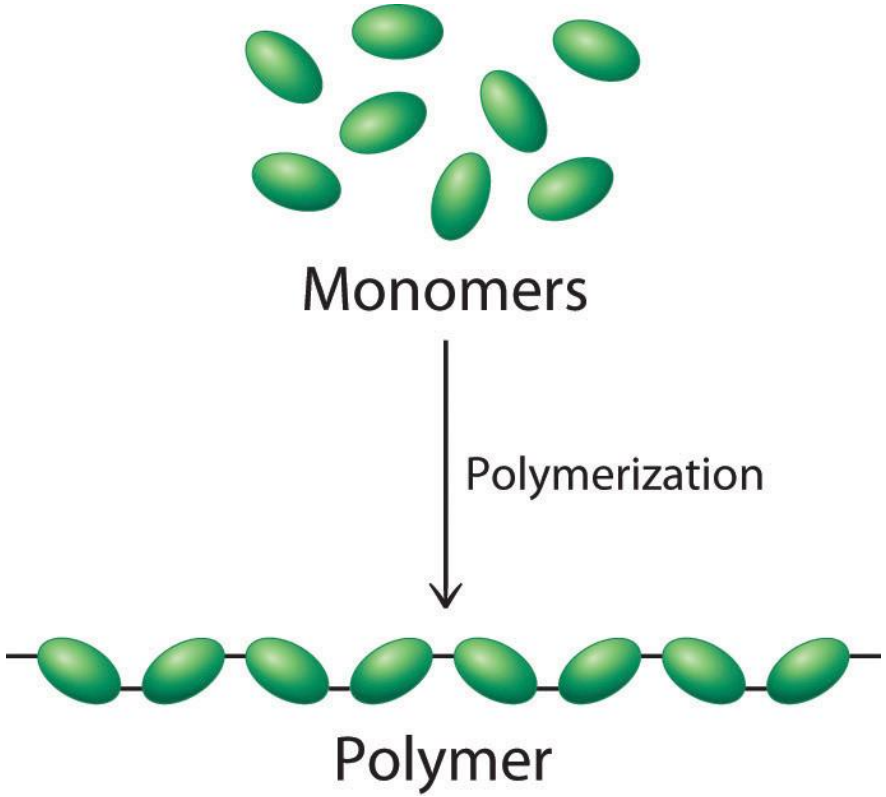
POLYMER FILMS

What Is The Polymer?

- Polymers are long-chain molecules that make up many repeating units called monomer. Polymers can be natural (organic) or synthetic.
- Shampoo, lens, protein, gluten, plastic, DNA is polymers examples.

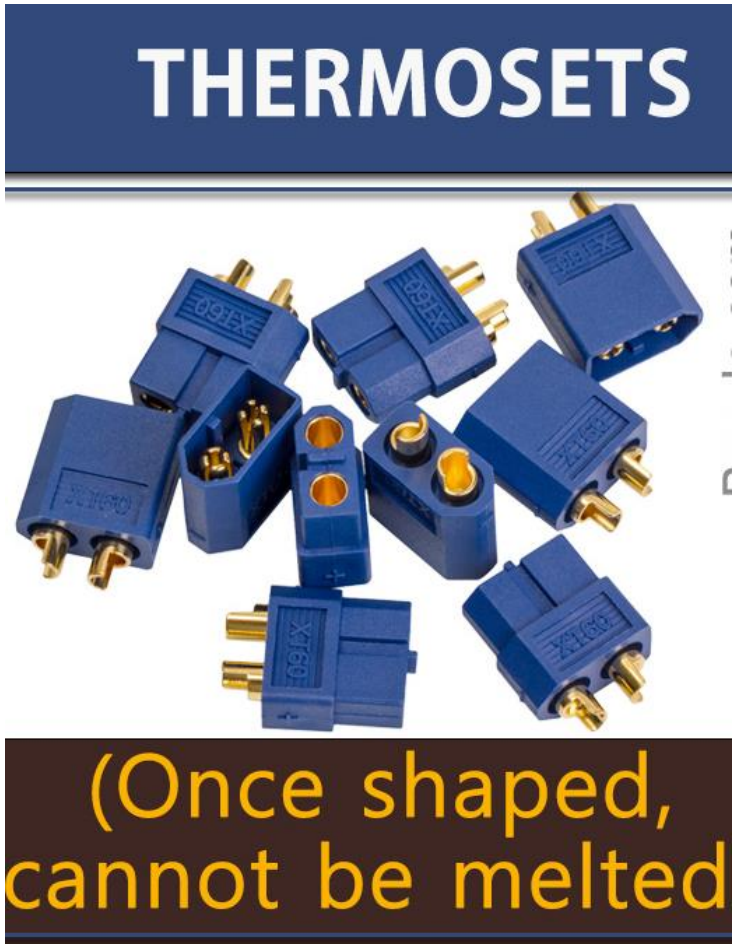
Types of Polymer

- Thermoplastic
- Thermoset
- Elastomers



Thermoplastic polymers can be in amorphous or crystalline form.

Thermoset polymers are always amorphous and generally strong and tough but generally fragile.



Elastomers are always shapeless. They have the property of being deformed in large quantities without permanently damaging the shape.

POLYMER FILMS

- Polymer films are made from natural, artificial, and synthetic polymers.
- Thickness below 0.5 mm (0.020 in)
- All thermoplastic polymers (Polyethylene, Polypropylene, Polyvinylchloride, Cellophane etc.) are polymer films.

CLASSIFICATION OF POLYMER FILMS

- The first group includes films made from proteins, natural rubber, and cellulose. The most common film in this group is cellophane.

CLASSIFICATION OF POLYMER FILMS

- A second, larger group consists of films made of artificial polymers, or products of the chemical treatment of natural polymers. This group includes films produced from cellulose esters and natural rubber (which is undergone hydrochlorination. The most common representatives of this group are films based on polyvinyl chloride, polyamides, polyvinylidene chloride, polystyrene, polyethylene etc.

COMPONENT OF POLYMER FILMS

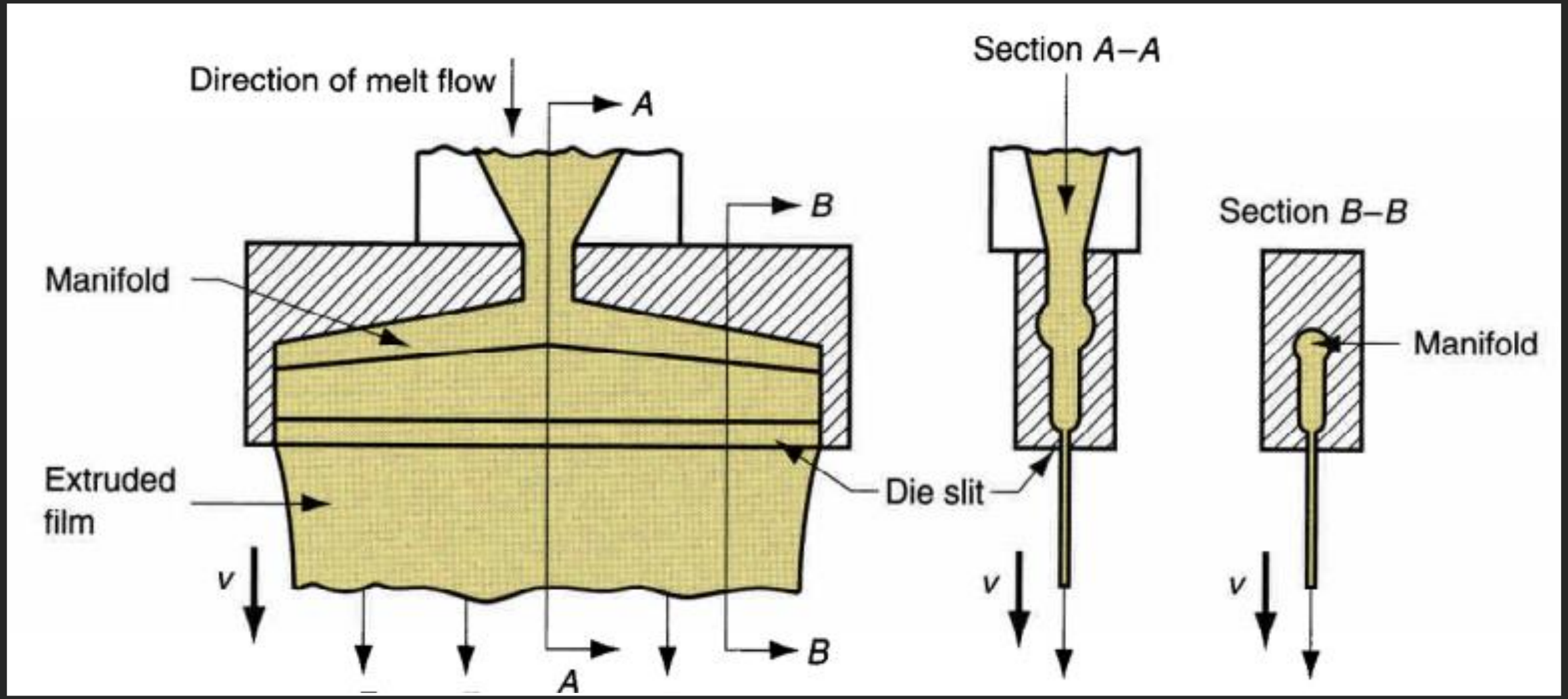
- Polyethylene
- Polypropylene
- Polyester
- Polyvinyl Chloride
- Cellulose Acetate
- Cellophane
- Semiembossed Film
- Nylon

PRODUCTION OF POLYMER FILMS

- The major industrial methods for the production of polymer films are extrusion of a polymer melt, casting of a solution of a polymer on a polished metal surface, casting a dispersion of the polymer on a polished surface, and calendering.

EXTRUSION

- Compression process in which material is forced to flow through a die orifice to provide long continuous product whose cross-sectional shape is determined by the shape of the orifice. Most synthetic polymers are made into films by this method.



Extrusion Method of Polymer Films

- https://www.youtube.com/watch?v=uW202EW7Um4
- https://www.youtube.com/watch?v=76NcaTxFdE8
- https://www.youtube.com/watch?v=6JY4AK550Kk

CASTING OF A SOLUTION OF A POLYMER ON A POLISHED METAL SURFACE

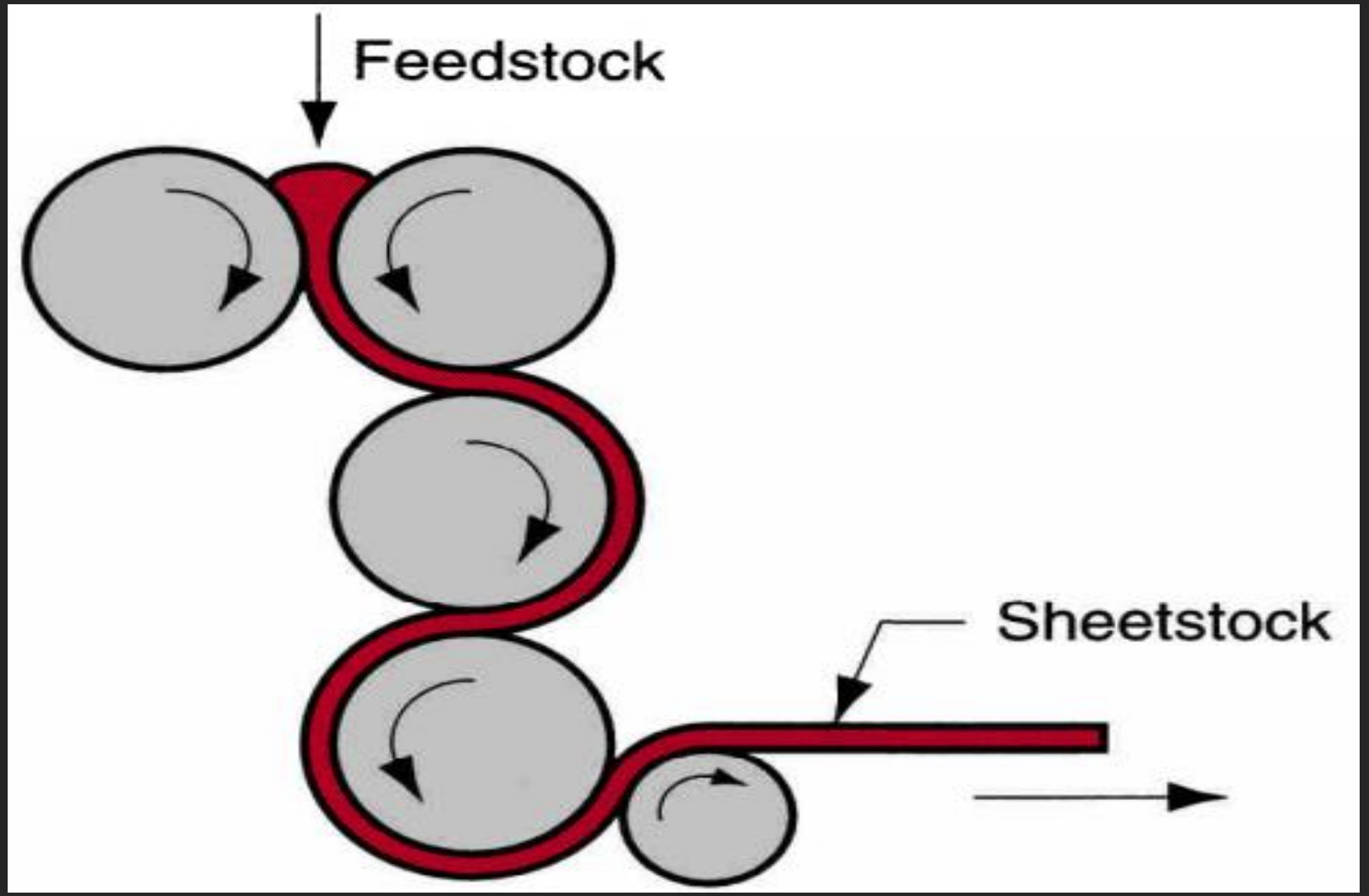
- It is used mainly for films of cellulose and its derivatives, as well as for some films made of synthetic polymers, like polyimides, polyvinyl alcohol, and polycarbonate.
- The method consists of preparation of the solution, casting on the smooth, polished surface of a drum or endless metal belt, and removal of the solvent from the polymer.

CASTING A DISPERSION OF THE POLYMER ON A POLISHED SURFACE

- The production technology of polymer films using polymer dispersions is quite similar to the method of casting a polymer solution. The dispersion is usually a colloidal system—for example, a latex—in which the dispersion medium is water and the dispersed phase consists of particles of the polymer. This method is used, in particular, for producing rubber sanitary items.

CALENDERING

- Feedstock is passed through a series of rolls to reduce thickness to desired gage.
- Typical materials: rubber or rubbery thermoplastics such as plasticized PVC
- Products: PVC floor covering, shower curtains, vinyl table cloths, pool liners, and inflatable boats and toys



A Typical Roll Configuration In Calendering

- https://www.youtube.com/watch?v=0E5L_SsPxDE
- https://www.youtube.com/watch?v=e4XcQY3rXss

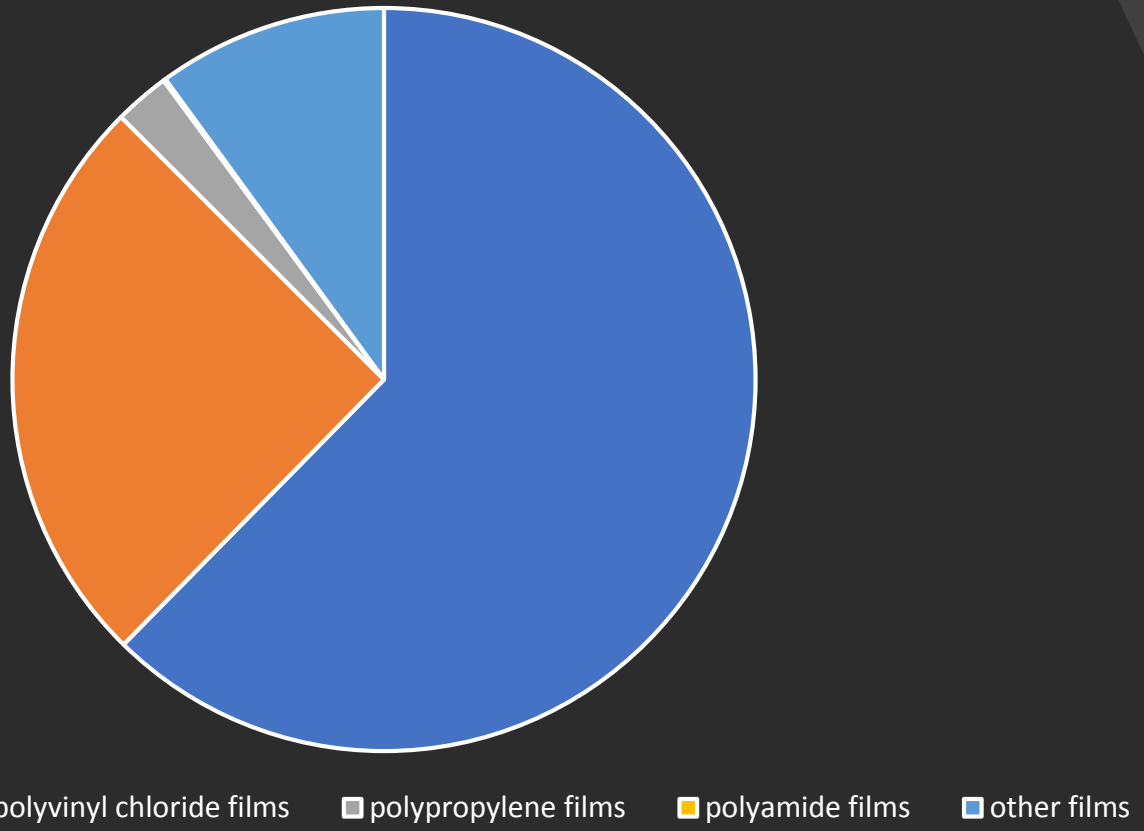
USING AREAS OF POLYMER FILMS

- packing materials for food products
- packing materials for consumer goods,
- packing materials for liquid
- packing materials for bulk chemical
- packing materials for petrochemical products also household purposes
- stretch and shrink films

USING AREAS OF POLYMER FILMS

- Atmosphere-resistant transparent polymer films are used in the production of hothouse frames and roofs and removable protective coverings for shielding plants in open fields from freezing or for creating a microclimate favorable for vegetation.

Percentage Of Polymer Film Types Used In The USA In 1970



REFERENCES

- https://encyclopedia2.thefreedictionary.com/Polymer+Films
- https://en.wikipedia.org/wiki/Plastic_film
- http://blog.aku.edu.tr/evcin/files/2017/05/10-polimer-uygulamalar%C4%B1-polimerik-filmler.pdf