

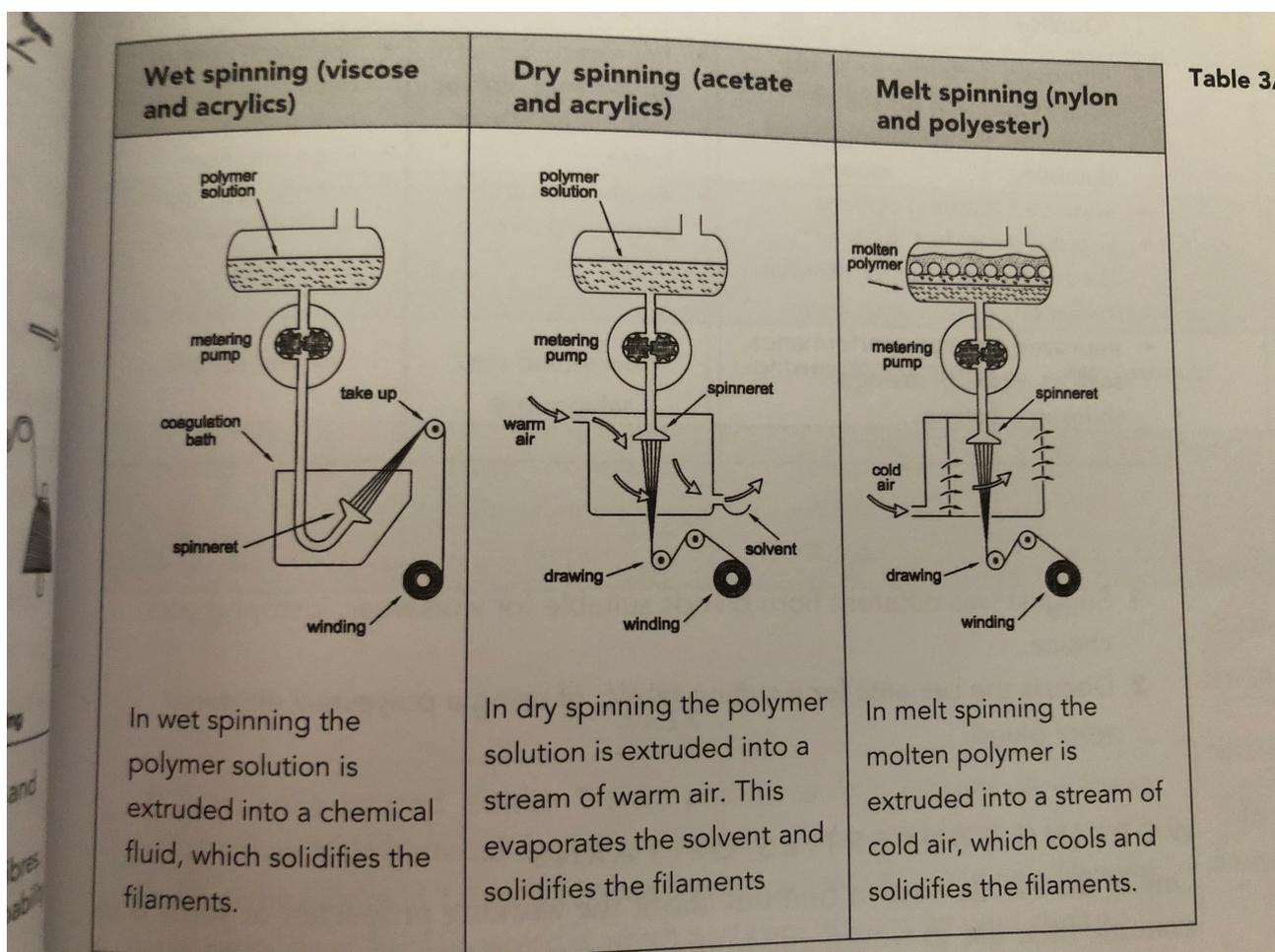
Repairwhatyouwear

Polymers, chemically made fibres:

There are two key types of manufactured fibres:

- Synthetic polymers
- Natural polymers.

The manufacturing process is similar. The fibres are created by extruding a scientifically engineered chemical solution through a Spinneret (similar to a shower head) and cooling before stretching to specification.



- Textiles at the cutting edge - Lesley Cresswell.

Synthetic Polymers.

- The start of the process is the creation of solution or solid “chips”.
- These are either liquid at the outset or melted and extruded through a “Spinneret” - similar to a shower head - which creates continuous lengths of fibre. These are then processed through rollers that stretch, heat and cool the fibres to the desired final width (denier) and the final yarn is spun onto cones for weaving or knitting.
- If textures or multi fibres are being created, the yarn will be stretched or crimped to the desired specification before being put onto the cone.
- Synthetic yarns are dyed with synthetic dyes at high temperatures, mostly on the cones, and it is necessary to dye large volumes to make it cost effective. It is not possible to hand dye synthetic fibres.

The key fibres used in fashion are listed below with their key characteristics:

Polyester - Most popular in clothing, cheap, versatile, microfibres in sportswear.

Polyamide (Nylon) - Non woven are in all PPE, fine, cheap and strong.

Polyvinyl (Acrylic) - tends to be used as replacement for wool as can be successfully textured as filament or spun fibres.

Polyvinyl Chloride (PVC) - Fibres always blended but can be solid. Used in weather proof coatings.

Polyurethane: Elastane - Always covered by another fibres and behind the success of stretch clothing. Common mixes: Swimwear 15-20%, Jeggings and jersey fabric 3-5%.

Polyester	Properties	Blends
Versatile, cheap to produce, most used synthetics in fashion.	Non-absorbent. Can be designed to transport moisture away.	Wool, Cotton, Viscose, Modal, Linen, Silk.
Can be smooth or textured	Very strong, abrasion and tear resistance.	Blend ratios 50/50 to 70/30.
Can be textured or as fine as a microfibre.	Crease resistant. Thermoplastic - can be heat reset.	Polyester mixes increase strength, reduce price, decrease absorption.
Engineered to meet the final technical requirement	Resistant to acids, solvents, mildew and fungus.	

Environmental issues:

- Synthetic yarns are derived from non renewable sources (oil).
- They are essentially based on plastics so last a long time and don't easily biodegrade.
- Dye stuffs are chemical and dye effluent can be dispersed into the natural environment, which is common in less controlled processing where legislation is poor.
- Since synthetic fibres are cheap, they are the fibre of choice for cheap clothing. The construction of cheap garments may mean they do not last, they may lose their shape or be Fast Fashion and not be worn many times - the fibres themselves are very hard wearing

so this use is contrary to the best use of the resource. End of life commonly means land-fill where they don't decompose.

- Some clothes are made from recycled synthetic solutions e.g. Polatec is a fleece fabric made from recycled bottles. Recycled polyester is now a fibre more commonly found in clothing and the demand to develop this has increased.
- Polyester fleece is versatile, warm, easy to wear but the fibres migrate in washing and enter the water system. They are found in ocean water samples around the globe.

Synthetic fibres are vital to many areas of textile manufacture:

- Sportswear, where stretch, strength, quick drying Modern fabrics aid performance.
- PPE and medical clothing.
- Waterproof clothing
- Safety equipment e.g. Kevlar which is made of microfibres.
- Specific industrial textiles.

We cannot manage today's world without synthetic fibres and fabrics. However, as consumers we should only buy synthetic clothing that is going to be worn at least 30 times and last many years.

The textile industry should focus developing recycling or energy generation from the recycling of these product and develop specific streams for recycling synthetic garments.

YouTube videos:



Comprehensive video of chip to yarn process



From 2009, not a great quality video but it shows plastic bottles being made into fibre. Shows a lengthy process with worker's role. China has banned the import of this waste - what is happening to it now?

Natural Polymers.

Also called Cellulosic Fibres

The key difference between synthetic and natural polymers is the chemical origin. Natural polymers are made with a solution that derives from the cellulose of trees.

The natural - or cellulosic - solutions are mixed with chemical solvents, which are essential to the creation of the fibre, and this solution is the start of the manufacturing process.

- This solution is heated and extruded through a “Spinneret” - similar to a shower head - which creates continuous lengths of fibre.
- These are then processed through rollers that stretch, heat and cool the fibres to the desired final width (denier) and the final yarn is spun onto cones for weaving or knitting.
- Unlike synthetic polymer, not all cellulosic fibres can be pulled as fine as synthetics. Viscose is a single filament, Modal can be a staple fibre (cut to lengths) but Acetate can be made into microfibres.

Names of different types include:

- Viscose,
- Modal,
- Acetate,
- Tencel
- Lyocell

Tencel, Lyocell and others are brand names for cellulosic fibres developed with specific features or manufacturing process. These developed products are often developed with circular technology and environmental consideration e.g more reuse of chemicals and effluent minimised. This is part of the marketing message and attracts a specific end user, so can be marketed at a higher price.

This YouTube video shows an ideal system - clean, environmentally friendly and low waste.



Key characteristics:

Fibre	Characteristics	Blends
Viscose - tends to be continuous fibre but can be crimped or styled.	Absorbent, fine, soft handle, non static, prints well. Shrinks, not so strong, creases.	Linen - to add weight and softness (helps drape). Cotton, wool and synthetics.
Modal - tends to be staple fibre and blended.	Highly absorbant, non static, naturally breathable, smooth, good drape. Creases, lower strength, dyes well.	Cotton (underwear), silk, polyester and wool.
Acetate - can be both filament and microfibre. Common lining fabric.	Fast drying, breathable, smooth, soft, dyes well. Poor insulator, creases.	Wool, cotton and linen.

Environmental issues:

Initially, the key wood pulp source was the fast growing pine and eucalyptus but as the demand for basic printed cellulosic cloth has increased the search for wood has widened. Forests have been cut down to be replace with fast growing wood sources or forests cut down have themselves been used as the wood source - meaning very ancient habitat is being destroyed.

Further information and relationship with Fashion: <https://canopyplanet.org/campaigns/canopy-style/>