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GUILD OF CLEANERS AND LAUNDERERS

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Viscose Rayon (fibre brand names Modal™, Lyocell and Tencel®.)

For Clean ability see page 3.
Re: newcell making fashion sustainable see page 4. (A Swedish company has developed a system of regenerating old cotton and viscose garments into new viscose fabric making it one of the most sustainable of fibres.)

Viscose is a regenerated cellulose fibre. "Viscose" can mean: A viscous solution of cellulose, which can be made into rayon or cellophane page 2 (see use for cellulose later in this article—could this be our next packaging material that is bio-degradable?)

Viscose is a synonym for rayon

A specific term for viscose rayon—rayon made using the viscose (cellulose xanthate) process

The viscose process dissolves pulp with aqueous sodium hydroxide in the presence of carbon disulfide (Carbon disulfide (CS_2), also called Carbon Bisulphide, a colourless, toxic, highly volatile and flammable liquid chemical compound, large amounts of which are used in the manufacture of viscose rayon, cellophane, and carbon tetrachloride; smaller quantities are employed in solvent extraction processes) . This viscous solution bears the name *viscose*.

The cellulose solution is used to spin the viscose rayon fibre, which may also be called viscose. Viscose rayon fibre is a soft fibre commonly used in dresses, linings, shirts, shorts, coats, jackets, and other outerwear. It is also used in industrial yarns (tyre cord), upholstery and carpets, as well as in the casting of cellophane.

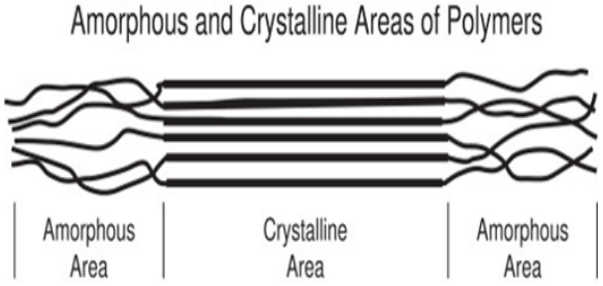
It was French scientist and industrialist Hilaire de Chardonnet (1838–1924)—who invented the first artificial textile fibre, *artificial silk*—who created viscose and British scientists Charles Frederick Cross and Edward John Bevan took out British patent no. 8,700, "Improvements in Dissolving Cellulose and Allied Compounds" in May, 1892. In 1893 they formed the Viscose Syndicate to grant licences, and in 1896 formed the British Viscoid Co. Ltd. to exploit the process.

Rayon may be manufactured using the Lyocell process, which uses N-methylmorpholine N-oxide as the solvent and produces little waste product, making it relatively eco-friendly.

Lyocell is a form of rayon which consists of cellulose fibre made from dissolving pulp (bleached wood pulp) using dry jet-wet spinning. It was developed beginning in 1972 by a team at the now defunct American Enka fibres facility at Enka, North Carolina. The operating name for the fibre inside the Enka Organization was "Newcell", and the development was carried through pilot plant scale before the work was halted. The fibre was developed further as Tencel in the 1980s by Courtaulds Fibres in Coventry, UK and at the Grimsby, UK pilot plant.

The process was first commercialised at Courtaulds rayon factories at Mobile, Alabama (1990) and at the Grimsby plant (1998). In 1998 Courtaulds was acquired by Akzo Nobel, who combined the Tencel division with other fibre divisions under the Acordis banner, prior to selling them off to private equity (CVC Partners). In the year 2000 CVC sold the Tencel division to Lenzing AG, who combined it with their "Lenzing Lyocell" business but maintained the brand name Tencel.

As of 2017, Lenzing's Tencel brand is perhaps the most widely known lyocell fibre producer throughout the world. While cotton and rayon fibres are both made from the same polymer (cellulose), cotton's cellulose is grown in five to six months by plants. Rayon's cellulose is produced from trees, which require a much longer time (years) to grow before they are big enough for harvesting. The trees are chemically processed to remove everything (bark, lignin, etc.) but the remaining cellulose is regenerated into fibres. The molecules in cotton consist of longer cellulose chains than those in rayon cellulose, and the longer cotton molecules are also packed more in-line (crystalline areas) with each other than rayon's more random (amorphous areas) molecules. Both of these molecular qualities combine to make cotton fibre much stronger than rayon fibres.



Unique Properties of Cotton

The same two molecular properties also lead to the amazing fact that cotton fibres increase in strength when wet, whereas viscose rayon fibres lose their strength when wet. Rayon is referred to as a **Regenerated Fibre.**

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Cotton fibres come from plants and there are many varieties of seeds used to grow it. The type of cotton seed used is primarily determined by the conditions in the area where it is planted (wet, dry, short or long growing season, etc.). Viscose rayon can be produced from any number of trees, grasses or even cotton, as they all get their strength from cellulose. Some rayon fibres are produced using bamboo (which is a grass) as the cellulose donor. Cotton is also grown in the USA across the Southern Tier states, from Virginia all the way to California, but there are no producers of viscose rayon in North America. For every pound of cotton fibre harvested, there are roughly 1.6 pounds of other useful products being created, such as cottonseed oil, cattle feed, and mulch. In fact, over the last 20 years modern cotton farming techniques have reduced the energy used by 66%. In addition, over those two decades water usage has been reduced by 49%, carbon dioxide emissions have been lowered by 33%, and soil loss has decreased by 34%. All of this has occurred while new seed varieties have reduced the amount of pesticides used by 23%. With cotton farming techniques, less will always mean more, especially when it comes to sustainability.

Cotton vs. Viscose Rayon Production Steps

Looking at the steps involved in producing purified cotton and viscose rayon, Viscose rayon can be made using any raw scour of cellulose, but since the vast majority produced commercially uses trees, we will take look at that step in production. The process is far simpler for producing cotton fibres.

Viscose is synonymous with rayon, and the name comes from the honey-like texture that occurs during the manufacturing process. The main ingredient in viscose as stated above is wood pulp, making it hard to classify as either synthetic or natural because it is regenerated. Though the wood pulp makes it natural, the manufacturing process is very much driven by man.

Rayon Advantages:

- Inexpensive
- known for its silk-like feel
- drapes beautifully
- breathable, similar to cotton in this regard
- ideal for those seeking a luxurious look and feel at a more economical price point
- blends well with other fibres, particularly woven ones
- dyes easily and produces beautiful, vivid colours

However, like any other fabric, viscose isn't without its disadvantages.

- almost always needs to be dry cleaned with solvents
- manufacturing process is polluting and can be considered harmful to the environment, sometimes classifying it as an unsustainable fabric despite being made of natural materials (wood)
- prone to stretching and bagging and often doesn't recover
- fabric is weak, and even weaker when wet
- not recommended for use in home furnishings (due to stretch factor listed above)
- absorbs moisture, body oils, and water, which may result in spots
- spot treating can lead to permanent marking

These disadvantages are sometimes the main reason customers only use truly natural fabrics like cotton and silk in their wardrobe collection.

Viscose rayon is most appreciated in a fabric blend. For example linen/rayon blends drape beautifully due to the nature of the rayon, as 100% linen is a rather crisp fabric. Together, they make up where the other one lacks. That being said, 100% viscose fabric can often be found in dresses and blouses from "fast fashion" retailers like H&M, Zara, and Forever21 because they feel like silk without the hefty price tag. **However, there is always a trade-off**—don't count on them looking new for very long and the cost of dry cleaning could possibly be more than what the dress cost to purchase, making it tempting to customers to simply throw out the dress when it inevitably loses its shape.

Cellulose from wood, cotton, hemp, or other sources is dissolved in alkali and carbon disulfide to make a solution called viscose, which is then extruded through a slit into a bath of dilute sulphuric acid and sulphates to reconvert the viscose into cellulose. The film is then passed through several more baths, one to remove sulphur, one to bleach the film, and one to add softening materials such as glycerine to prevent the film from becoming brittle.

A similar process, using a hole (a spinneret) instead of a slit, is used to make a fibre called rayon. Chemically, cellophane, rayon and cellulose are polymers of glucose; they differ structurally rather than chemically.

Cellulose film has been manufactured continuously since the mid-1930s and is still used today. As well as packaging a variety of food items, there are also industrial applications, such as a base for such self-adhesive tapes as Sellotape and Scotch Tape, a semi-permeable membrane in a certain type of battery, as dialysis tubing (Visking tubing), and as a release agent in the manufacture of fibreglass and rubber products. Cellophane is the most popular material for manufacturing cigar packaging; its permeability to moisture makes cellophane the perfect product for this application as cigars must be allowed to "breathe" while in storage.

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Cellophane sales have dwindled since the 1960s, due to alternative packaging options. The polluting effects of carbon disulfide and other by-products of the process used to make viscose may have also contributed to this; however, cellophane itself is 100% biodegradable, and that has increased its popularity as a food wrapping and could be seen to have more uses in packaging for our industry because of its biodegradability.

Clean ability of VISCOSE

Appearance: A cellulosic fibre usually derived from wood pulp. May be produced thick or thin, matt or luster finish, short or long pile, with slubs or linen-look. Blended with polyester it can be produced to resemble wool weaves such as twill and barathea.

Uses: Linings. All types of clothing. Blended with other fibres

Benefits: Inexpensive, Versatile, Produced as filament or staple in a wide range of thicknesses, Some elasticity, Good dye affinity.

Drawbacks: Loses up to half its strength when wet. Resins used to improve crease resistance can reduce drape and detract from handle. Heat sensitive fibre which melts at approx. 230°C and softens at lower temperatures. Viscose has low abrasion resistance and can be easily de-lustred by acids and alkalis. Some dyes are not fast to perchloroethylene. Special effects such as fine pleating and velvets can be permanently damaged by drink spillage.

Spotting: Precautions must be taken to prevent colour change, chafing and glaze. Test all reagents on a hidden area to determine dye fastness, prior to use. Treat and dry out all wet-side stains prior to solvent cleaning. When an acid changes the colour an alkali can reverse the change and vice versa. Solvent Cleaning when wet can cause de-lustering, colour loss or damage, hard breaks and wrinkling, try to limit the amount of water used as this can affect water soluble stiffeners. Dry-side stains should be lubricated with glycerin, softened with paint remover and cleaned immediately. Prolonged contact with any reagent can cause colour loss.

Dry cleaning: Generally suitable for cleaning in perchloroethylene or hydrocarbon solvents. Test deep coloured dyes for fastness prior to processing. Check care label carefully for any processing restrictions on novelty fabrics and select appropriate programme. Try to clean with garments of a similar weight and allow plenty of room in the load for tumbling. Remove from cage and hang immediately the cycle ends.

Washing/wet cleaning: Viscose can be damaged by hot water. Do not bleach. Check care label for suitability. If in doubt, dry clean.

Finishing: Viscose can be safely pressed or ironed provided that it is not steamed when wet. (Steaming when wet will cause de-lustring) Care should be taken to keep the temperature to a medium heat setting. Avoid direct pressure on outside seams to prevent glazing.

Making Fashion Sustainable coming from Sweden—a company named re:newcell has developed a system of regenerating old cotton and viscose garments into new viscose fabric making it now into one of the most sustainable of fibres.

When garments are worn out or no longer wanted some are sold second-hand or used as hand-me-downs, but the vast majority end up in landfills or are incinerated. Much too few are recycled due to the fact that cotton and viscose can't be recycled with satisfactory quality on a large enough scale. Normally the cycle stops, because there is a hole in the loop, a crucial part is missing until recently.

Newcell recycling technology dissolves used cotton and other natural fibres into a new, biodegradable raw material, re: newcell pulp and then it can be turned into textile fibre before being fed into the textile production cycle to meet industry specifications. There is now a link that has previously been missing from the cycle. Newcell claim to have closed the loop. The way fashion is produced and consumed can finally be transformed into a never-ending loop.

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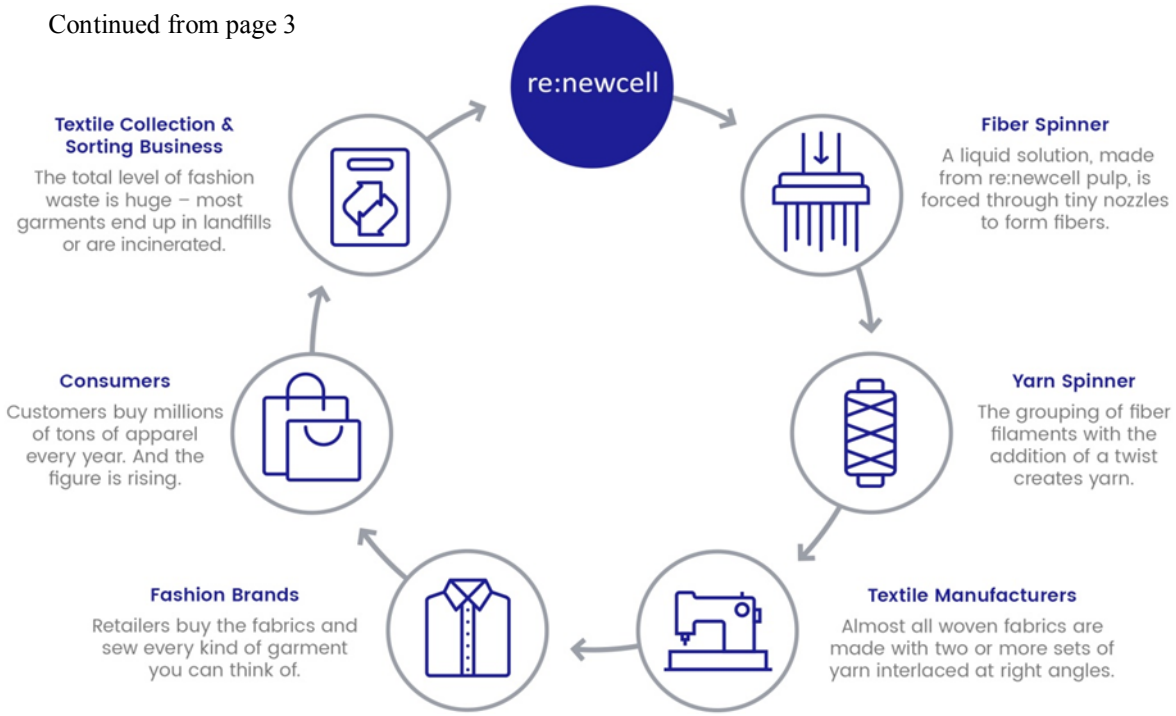

Newcell receive used garments with high cellulosic content (cotton and viscose). The textiles are shredded, de-buttoned, de-zipped, de-coloured and turned into a slurry. Contaminants and other non-cellulosic content are separated from the slurry. The slurry is dried to produce a pure, natural re: newcell pulp, which is packaged into bales and fed into the textile production cycle.

Tests have compared textile fibres made from re: newcell pulp with textile fibres made from dissolving pulp made from wood (viscose). Newcell fibres, it is claimed, have higher quality in a number of areas: tensile strength in both wet and dry condition, dyestuff absorption and in withstanding high abrasion.
Re:newcell happily receive any kind of used garments or textile waste with a high content of natural fibres. Fibres made from re:newcell pulp have a lot in common with cotton fibres.
They are organic, sustainable and allow for a better use of the planet's resources.