

History of the key mills

Processes in the Mansfield and Sutton historic textiles mills

TN
TEACHER'S NOTES

TITLE SLIDE

This lesson is all about the processes in the cotton mills that once stood around the Mill Waters site and along the River Maun in the direction of Mansfield. You'll find out about how centuries ago the people of Sutton used to make stockings on knitting machines and the types of fabric which were later produced at Sutton Mill (also known as Unwin's Mill) which once stood on Eastfield Side at Mill Waters. You'll also find out about how material was made in the cotton mills and there are some fun activities for you to do based on how clothing was made in the olden days.



SLIDE 2

THE FASHION FOR STOCKINGS

Eight centuries ago, it became fashionable for men to wear stockings with breeches. Back in those days the stockings weren't like the stockings (or tights) that ladies wear today, they were more like long ribbed socks.

In 1566, you were not allowed to wear the wrong kind of socks anywhere in the capital. The laws were enforced by the sock police – four people, who were positioned twice a day at the gates of London, checking the legs of those entering or leaving for improper hosiery.

By the 1700s the aristocracy across Europe wore colourful silk patterned socks. By the end of the century horizontal stripes were fashionable; a zig zag pattern was in vogue for a while, but stripes remained the most popular style. Common people wore plain wool stockings.

Socks also had patterns embroidered on the sides, known as clocks. On ladies' socks these often looked like lace.

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SLIDE 3

HOW WERE STOCKINGS MADE?

In 1589, the first knitting machine was invented by William Lee, an English clergyman from Calverton in Nottinghamshire. Soon afterwards he moved to France and set up a stocking factory. The fashion for stockings spread around Europe.

Stockings were knitted in people's homes on knitting machines, or stocking frames. It was a family business with the children and women spinning the yarn and then the men knitting on the frames. The women then carefully sewed up the back seam of the stockings and did any fancy embroidery.

In 1758 Jedidiah Strutt invented the 'Derby rib' attachment for the stocking frame, reflecting the fashion for ribbed hose (long socks). The people who made stockings in their homes were called stockingers.

By the early 1800s the Industrial Revolution really took off and a new knitting frame was invented which made it much quicker to produce socks on bigger frames.

For a time stockingers still continued their work, but they could not make much money as they were now paid for their output and could not compete with the number of socks which could be produced on the bigger frames.

They also had lots of extra costs, such as the yarn which they now had to buy from the factories. To add insult to injury stockingers also had to rent their frames. The days of the stockinger were running out.

The term 'as poor as a stockinger' reflects how difficult it was for them to make enough to feed their families.

SLIDE 4

CUT UP STOCKINGS

The stockingers were not just unhappy because they couldn't make stockings as quickly on their small frames at home as the workshops could, they were also angry because the stockings made in the workshops were of an inferior quality. The larger frames made big pieces of fabric from which a number of sock pieces were cut out and sewed together - known as 'cut ups' - but they often fell apart because they were not made with the same skill and care as the stockingers and their families.

The stockingers protested by going about smashing up the new larger frames in what were known as the Luddite riots.

In actual fact, there was a greater demand for the regular plain stockings, which were sold at a lower cost, so it was probably only a matter of time before the demand for the stockingers' fancy work began to decrease.

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SLIDE 5

WHAT DID THE COTTON MILLS PRODUCE?

In the 18th century people worked in their homes to make small silk items such as silk buttons and ribbons for fine clothing. The first silk mill opened in Derby in 1717. Samuel Unwin began producing silk yarn and textiles at the renowned Sutton Mill built in 1770 on Eastfield Side.

Unwill Mill was the first water-powered cotton and silk reeling mill; it was modelled on Richard Arkwright's pioneering factory at Cromford. He built his family home nearby and his gardens are now what we call 'Sutton Lawn and Pleasure Grounds'.

Later Little Matlock Mill produced silk during the 1840s for a few years. The rest were all cotton spinners.

By the 1820s Mansfield was enjoying a boom in cotton manufacture, with numerous mills previously used to mill flour being converted to the new water-powered system of cotton manufacture, as well as new mills being built, not just for cotton milling but other industries too. Cotton manufacture, however, was the staple trade for the Mansfield and Sutton mills, primarily to serve the lace industry in Nottingham and the local framework knitters/stockingers.

Sutton Mill produced nankeen; a yellowish hard-wearing cloth used for workwear. Nankeen was originally made in China from a yellow variety of cotton, but later it was made from ordinary cotton and dyed a yellow colour. Nankeen also gives its name to a pair of trousers made from this material and to the colour of pale yellow or buff.

Unwin also seized upon the rising popularity of gingham which was a popular choice for bed linen and curtains, and later became fashionable for ladies' dresses. It was originally imported as a striped fabric in the 17th century to Europe from southeast Asia (Ging-Gang in Malaysian). By the mid-18th century, the British mills were selling gingham with a blue and white checked pattern.

Gingham is made from dyed cotton yarn. The fabric and its trademark check became increasingly more popular and is now one of the most recognisable fabrics in the world. The coloured yarns (the warp) go against the uncoloured yarns (the weft), creating a lightweight texture on both faces, making it reversible.

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SLIDE 6 COTTON MANUFACTURE

The key processes of cotton manufacture are carding, spinning, doubling, bleaching and weaving. Many of the processes were brought under one roof, although some mills in Mansfield (and Sutton) specialised in one process alone such as Bleach Mill, which guess what, did bleaching!

Here is an overview of what the Mansfield mills manufactured:

- Spinning: Stanton Mill
- Cotton Doubling: Bath, Old Town Mill, New Town Mill, Field Mill, Little Matlock (includes silk), Bleakhills/Reed, Hermitage
- Bleaching: Stanton Mill
- Garment production: Bath Mill
- Lace Manufacturing: Hermitage Mill (for a short period during the mid-1800s)
- Misc: Other mills in Mansfield produced garments but they were steam powered and set-up after c1880.

To begin with you need to know what cotton is: it's a plant which has fibrous hairs surrounding the seed. Its softness and warmth, as well as its ability to be spun into a fine thread, make it ideal for making into clothes. The raw cotton was imported from the West Indies and the British Colonies grown on huge plantations that used slave labour.

The first stage in cotton manufacture is carding. Carding is the process of separating individual cotton fibres, to untangle, clean and intermix fibres to produce a continuous sliver suitable for processing. To begin with carding would have been done by hand but the cotton mills would have had drum carders which fed the cotton (or silk or wool fibres) before it was spun ready for making into cloth.

Sir Richard Arkwright's water frame, invented in 1775, included a cylinder carding engine, incorporating a crank and comb mechanism. The comb moved up and down, removing the carded fibres from the doffing cylinder in a continuous filmy fleece. The object of the machine was to remove any fragments of leaves or seeds from the cotton and also to straighten out the fibres by a combing action.

SLIDE 7 SPINNING

Before machinery was invented people would have hand spun the fibre, twisting it to form a yarn, on a spinning wheel, which then gets wound around a bobbin.

The invention of the Spinning Jenny by James Hargreaves in 1764 meant that eight threads could be spun all at once.

Sir Richard Arkwright's water frame was capable of making much stronger yarn than the Spinning Jenny and then in 1779, Samuel Crompton's "mule" (1779), made it possible for a single person to operate more than 1,000 spindles at the same time.

The mule was so called because it was a hybrid (a cross) of Arkwright's water frame and the Spinning Jenny. (A mule is a cross between a donkey and a pony.) Yarn could now be mass produced.

By the 1830s the spinning mule became self-acting (automatic). The mule was the most common spinning machine from 1790 until about 1900 but was still used for fine yarns until the 1960s.

A cotton mill in 1890 would contain over 60 mules, each with 1320 spindles.¹

¹https://en.wikipedia.org/wiki/Cotton-spinning_machinery

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SLIDE 8 **COTTON DOUBLING**

Doubling is the term used to describe 'combining threads' during spinning. During the carding stage several strands of roving (a bundle of fibre) are doubled together and drawn, to remove variations in thickness.

After spinning, yarn is doubled to produce warp for weaving; to make cotton for lace, crochet and knitting; and for embroidery and sewing threads.

Herbert Greenhalgh founded the Field Mill cotton doubling factory in 1861. Mansfield Football Club's One Call Stadium is now located at the site where the mill once stood.

SLIDE 9 **BLEACHING**

Bleaching is the process to whiten, or remove the natural colour, from cloth. In medieval times cloth was bleached by 'grassing', that involved washing the cloth in alkali and acid and laying it out on fields of grass. The combined effect of morning dew and sun being allowed to shine on them for several months produced bleaching. Once this process was completed the cloth was dried on frames, which had "Tenter hooks" around the edges to keep the cloth taut. "Tenter Fields" once stood just to the west of Field Mill and are now remembered in the small road known as Tenter Lane in Mansfield.

The invention of a bleaching powder by Charles Tennant, based on chlorine, made grassing redundant after 1774. The bleaching process could be done all year round indoors, although many of the factories continued to be called bleachfields.

By the 18th century a chemical bleach had been invented which reduced damage to the texture of the fabric.

Dutch painters enjoyed painting scenes of the bleachfields centuries ago and they give us an idea of what the bleachfields around Mill Waters might have looked like two centuries ago.

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SLIDE 10 DYING

Dying is the process to change the colour of something permanently by soaking it in a solution containing a dye. For centuries dyes for textiles were made from plant, animal and mineral substances, also known as pigments, these would be mixed with water or oil to create the dye solution.

Plant dyes:

- indigo plant for blue and purple
- saffron (from the dyed stamen of the saffron crocus) for yellow

Animal-derived dyes:

- cochineal, a brilliant red, made from crushed insects

Mineral dyes:

- Ochre, obtained from iron ore or clay, which includes yellow ochre, red ochre, purple ochre, sienna, and umber.
- Different rocks also produce dyes (by mixing particles of the rock with water or oil):
- Hematite for red
- Limonite for yellow
- Lazurite for blue

During the 19th century the most widely available fabrics were those which had been dyed with extracts from the madder plant. 'Turkey red' was very popular at the time because it was considered exotic. British 'Redcoat' uniforms in the 18th century were made with cloth dyed with madder. The madder plant continued to be used for dyeing until the mid-1800s when a synthetic substitute was developed.²

Wool and silk can be dyed by simply dipping them in the dye. Cotton, linen and hemp require a dye fixative, called a mordant, to make the dye take hold on the fabric.

There were many different kinds of mordants, but the main ones used in the cotton mills were mineral salts: aluminium, iron, tin and copper. Before the mineral salts were discovered ancient dyers used animal products – namely urine, blood, milk or dung to bind the colours, but this was less effective.

Modern dyes are derived from petroleum and coal because they are cheaper and easier to obtain than the plants and animal substances traditionally used to make dye. Crafts people still make their own natural dyes at home.

²<http://www.quilthistory.com/dye.htm>

SLIDE 11 WEAVING

Weaving is a method of textile production in which two distinct sets of yarns or threads are interlaced at right angles to form a fabric or cloth.

The threads that run longways are called the warp and the ones running across (from left to right) are the weft or filling.

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SLIDE 12

SILK THROWING

In addition to cotton manufacture, some of the Mansfield mills were involved in the manufacture of silk.

Silk comes from the cocoon of the silkworm of the silk moth (*Bombyx mori*). It was very hard to breed silkworms in England as the temperature was too cold and the silkworms only ate the leaves of the mulberry tree, which did not grow here. Raw silk was imported into England from China, India and Turkey to be made into thread and woven.

- Silk throwing is the term used to describe all three processes in the production of silk yarn: reeling, throwing and doubling.
- Reeling is the process where the silk that has been wound into skeins, is cleaned, receives a twist and is wound onto bobbins.
- Doubling is the process where filaments or threads from three or more bobbins are wound together.

In the early 1800s silk throwing was a hand process which involved turning a wheel (the gate) that twisted four threads while a helper who would be a child, ran the length of a shade, hooked the threads on stationary pins (the cross) and ran back to start the process again. The shade would be a between 23 and 32m long. The child worker would run up to fourteen miles a day, barefoot, to do this job.³

Useful website and information films: <https://www.frameworkknittersmuseum.org.uk/about-us/video-gallery/>

³https://en.wikipedia.org/wiki/Silk_throwing

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LEARNING ACTIVITIES

1. Make your own 18th century stockings

Pupils can have a go at making their own 18th-century 'cut up' stockings by following the instructions provided on Handout 1.

Begin by discussing with pupils the difference between hand-made stockings (sewn made in one piece of fabric and sewn up at the back by hand) and the factory produced 'cut ups'. Ask them why factory production took over and why this progress was good but also, how this affected the stockings' livelihood.

Pupils may need to be shown how to knot their thread to stop it slipping through the fabric and also how to do a simple stitch.

Ideally seams will be hand sewn but it may also be adequate to use a glue gun to fix the seams.

The availability of a teaching assistant with a sewing machine would speed up the construction of the garments.

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LEARNING ACTIVITIES

2. Make your own woven fabric

Pupils can get creative and make their own woven fabric. Start by watching this short instructional film: https://www.youtube.com/watch?v=AWLLy-Um7_0

Now provide pupils with the materials they need to make their own loom and get weaving. Key stage 1 pupils may require help creating their loom and creating their warp before they start on their weft. A good way to remember the difference between the warp and weft is that you are weaving from 'weft' to right!

Encourage pupils to use a variety of colours to create an interesting design.

What you will need:

- 1 piece of strong cardboard for each pupil (at least A5 size).
- An assortment of yarn. Thick wool works best.
- Sufficient large embroidery needles (with a big enough eye for the wool).

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LEARNING ACTIVITIES

3. Get creative with natural dyes

In this activity pupils will get hands-on experience of how natural pigments were used in textile dyeing before synthetic dyes were invented.

What you will need:

- Four big pans
- Raw beetroots
- Spinach or kale (use 1 teaspoon of baking soda to every 3-4 cups of water to act as a mordant)
- Black walnuts in the shell
- Dry onion skins
- Berries
- Vinegar and baking soda (mordant to help release the pigment)
- Paint brushes
- White paper or ask pupils to bring in an old white t-shirt

Step 1: Discuss with the pupils how dyes were used in the cotton mills to make clothing different colours. Show them the nuts and vegetables you have and ask them how the early dyers might have used these materials.

Step 2: The night before the dyeing activity get the children to carefully place the beetroot, spinach or kale, walnuts, and onion skins in separate pans with enough water to barely cover them. Inform them that you are going to take them home and cook them for several hours to release the pigment.

Step 3: Cook the vegetables for at least 4 hours on a low heat adding 1 teaspoon of baking soda per every 3-4 cups of water to help release the pigment (mordant). For berries use a teaspoon per every 3-4 cups of water. If you are using coffee it should not require a mordant.

The beet water will be magenta, the onion water will be amber, the spinach or kale water will be a light green and the black walnut water will be brown.

Transfer your liquid dyes into airtight containers and ensure they can be safely transported to school.

Step 4: Back in the classroom pour a small amount of dye into bowls and ask pupils to smell them. Ask them if they can work out which dye is derived from which of the four ingredients.

Pupils can either bring in an old white T-shirt or you can provide them with white paper for painting.

Pupils can either paint a design on the T-shirt and then hang to dry or create a painting using natural dyes.

Afterwards you could ask them what other natural materials they could use to make dyes, taking inspiration from the cotton mills. If you have time you could experiment with their suggestions.