

Program Script

The Industrial Revolution

During the 18th century in England, a revolution took place which was to change people's lives forever. New developments in work and manufacture saw the arrival of the machine age.

For thousands of years the way people had worked and lived was determined by the cycle of days and nights, and the changing of seasons. What they needed for survival was produced by nature from the soil, the sun, wind and water.

But changes began with the manufacture of textiles. Samuel Greg, a textile merchant from Manchester, was looking for a location for his new spinning mill. Like many merchants of the time, he decided not only to buy and sell textiles, but also to make them in his factory.

He found ideal conditions near the village of Styal, where the small river Bollin ran through a valley. In 1780, water was still the main source of energy. For a long time, water mills had been used to grind wheat, so it seemed obvious that water could be used for spinning and weaving textiles.

As England's population grew, the demand for textiles increased as well. This happened not only in Great Britain, but all over the world, especially in British colonies. These were ideal markets for English woollens.

Early in the 18th century, wool went out of fashion, as light weight cotton replaced it. English merchants began to import a large amount of raw cotton which came from plantations in the southern states of North America and the West Indies. The slave trade was developed for the cotton plantations, which has had great social ramifications right up to the present day.

Pressed and tied up in bales, cotton was shipped from American ports to Great Britain. After processing was complete, fabrics were sold back to the colonies. England was guaranteed that the colonies would buy her products.

Samuel Greg, the descendant of a respectable merchant family, was continuing his family's successful textile trade. Educated and well travelled, Greg knew a lot about economics and was looking for innovative ways of manufacturing. Greg belonged to a new class of rich entrepreneurs who wanted to invest their capital profitably. Great Britain offered the greatest opportunities because of their Trade-and-Tariff-Laws. In just a few years, Greg's Quarry Bank Mill was one of the largest textile plants in England. One of the main reasons for this success came from new developments in technology.

For centuries, fabric had been woven on hand looms. The weaver passed the shuttle containing a spool of thread through the warp, using their hands. Because of this, the fabric was only as wide as two arm lengths.

Entrepreneurs like Greg were on the lookout for ways of improving their production, making it faster and more professional. Throughout England new methods developed, changing the textile industry forever.

In 1733, the English wool weaver, John Kay, patented the "flying shuttle". This meant that the weaver now drove the shuttle remotely. The shuttle ran on small rollers along a track, moving through the warp threads by using a lever mechanism. The 'flying shuttle' increased the speed of weaving, and was the first step towards mechanisation of the loom.

With the invention of the "flying shuttle", double the amount of thread was required. England had become "yarn hungry". But spinning the thread on the spinning wheel was still a time consuming and inefficient method. It was carried out by women in their homes as a source of income. Four to ten spinners made just enough yarn for one weaver.

It didn't take long to find a solution. In 1764 James Hargreaves invented the first mechanical spinning machine which he named after his daughter Jenny. The "Spinning Jenny" enabled the spinning of eight, then later over one hundred threads at a time.

However it was still powered by hand.

This changed when Richard Arkwright invented the "Water Frame". This was a throttle or roll drawing machine, which was driven by a water wheel. It spun the threads firmly and evenly.

In 1779, another British inventor, Samuel Crompton, combined the "Spinning Jenny" and the "Water Frame" into a single spinning machine. This was called the "Mule". The great advantage of the Mule was its flexibility because it allowed yarn of different thicknesses to be spun.

In the early part of the 19th century, the Mule was developed into the first automatic spinning machine. Hundreds of reels of yarn twisted simultaneously on widths of more than 30 meters.

The weaving process was also developed. In 1785 Edmund Cartwright invented the power loom, the first mechanical loom. From then onwards the monotonous sound of the machines decided the rhythm of human labour. Manual work at home was replaced by machine work in a factory.

At Quarry Bank Mill, all spinning and weaving machines were powered only by water. To increase the water pressure and power, Samuel Greg built a dam across the river upstream from the factory. This meant that water flowed through a tunnel into the cellar and turned the enormous iron water wheel. This was seven meters in diameter and weighed more than 40 tons. Sometimes, especially in summer, when there was little or no rain, the water wasn't available to turn the enormous iron wheel. So Samuel Greg began to search for other sources of energy that didn't rely on the rain.

And this energy source existed. It was the steam engine, which he installed at the Quarry Bank Mill in 1810.

The steam engine, invented by the Scotsman James Watt, was a technological revolution. It transformed steam into mechanical energy. Later on, Watt changed the up-and-down movement of the pistons into a revolving motion. The steam engine soon became the power source of almost all machines.

This was the first time in human history that we did not need to rely on natural sources of energy like wind and water, or muscle power.

Factories were built all over England. More and more people wanted machines, and the iron to build them. In the middle of the 18th century, iron works were built in Coal Brookdale, west of Birmingham. The valley of the river Severn was full of smoke from chimneys, and the hammering of iron echoed throughout the valley. In 1779, the world's first cast-iron bridge was completed, stretching over the Severn. This halved the distance between Manchester and Liverpool. Visitors came from all over the world to marvel at this wonder of English engineering. The entire bridge was built by iron works in the area.

More and more bridges and canals were built, changing the face of the landscape dramatically. Soon a network of roads and waterways connected the major industrial centres of England.

In 1829 George and Robert Stevenson built the model for all modern locomotives, the 'Rocket'. Many railroads were laid, connecting industrial centres and ports. Liverpool became the main port importing cotton. Manchester was the city of textiles with more than 200 factories and became the world's first industrial city.

The city of Manchester boomed with entrepreneurial wealth.

But industrialisation came at a heavy price. Thousands of people left rural areas for work in the cities. In only 40 years the population of Manchester grew fourfold, creating enormous housing problems. Ghettos grew and families had to live in degrading and inhuman conditions. To survive, women and children were forced to work in factories for low wages, in harsh conditions which were dictated by the owner.

A long time passed before trade unions enforced better living conditions and social improvements.

Amongst these developments, Samuel Greg's production boomed.

He installed as many machines as possible to intensify productivity and maximise profits. More than 2000 tons of cotton were processed every day, but it wasn't a safe place to work.

"Workers rush through gangways not wider than 70 centimetres to operate the machines. Everywhere we find driving belts and rotating transmission shafts and wheels...", a visitor at the time reported.

The noise in the halls was deafening. For best processing results, a temperature of 30° Celsius and a high humidity were necessary. The air was unbearably hot, stifling and humid, mixed with dust and cotton fluff.

Injuries - sometimes even severe ones - were part of the everyday working routine, because safety devices on machines didn't exist.

Children made up half the workforce. Their working day began at 6 o'clock in the morning and ended at 8.30 at night.

A young boy reported: "First I had to pick up cotton from the floor. It is easy work, but I am afraid of the machines It is so dusty that I can hardly see and the smoke makes me cough all day."

Women performed some of the more complex tasks, while men worked as mechanics or foremen. A smooth production process was enforced by rewards and penalties. Samuel Greg issued a factory order which dictated everyone's duties. Punctuality was the most important rule. For every minute late, wages were reduced.

Before industrialisation, people organised their daily lives in accordance with days and years. But now they were tiny cogs in the production machine. The beginning and end of a working day was determined by the lord of the machines, the factory owner.

In the first 40 years of the Industrial Revolution, human society and daily life changed more than it had in 7000 years. The Industrial Revolution began in Great Britain, and spread throughout the world. There was no turning back.