What is Abbey Pumping Station?

Background information

Abbey Pumping Station was built as a pump house in 1891. It pumped sewage away from Victorian Leicester up to a new treatment works at Beaumont Leys.

Prior to the pumping station being built, sewage from Leicester was deposited into the River Soar. This building with the 4 huge steam engines was built to manage the increased amount of sewage from the city. Sewage drained to the site through pipes by the force of gravity. (Abbey Pumping Station is built in the lowest point in Leicester) but it needed a push to get uphill to the Beaumont Leys sewage treatment works nearly 4 kilometers away. Pumping the sewage uphill was the job of the steam engines.

Why was it built?

As the population of Leicester grew, the city needed more fresh water and a way of hygienically getting rid of waste. The Public Health Act of 1884 forced local authorities to take responsibility for the city's waste and provide proper facilities for managing sewage.

The building you see before you is hugely significant and important to Leicester. It improved health and sanitation in what was fastly becoming a disease ridden city.

Discussion activity

In small groups think of reasons which contributed to unsanitary living conditions and diseases during early Victorian times.

Reasons to discuss:

- Overcrowding – Leicester's population had nearly doubled in 30 years. In 1861 the population was 68 thousand. In 1891 it had increased to 142 thousand.
- Poor diet - the poor lived on a diet of bread, dripping, tea and sugar. People had difficulty obtaining more protein and vitamin enriched foods such as vegetables, meat, fruit, fish and milk.
- Polluted water - the '9 o'clock horses' was the term given to the men who collected the buckets of human waste from the house. The waste was dumped on fields near the river and canal which at times flooded into homes.
- Horses- cities like Leicester were dependent on thousands of horses for the transport of both people and goods. On average a horse will produce between six and 15 kilos of manure per day. The manure on the streets attracted a huge number of flies which spread typhoid, fever and other diseases. The manure also blocked street drains often creating cesspools of dirty water when it rained.
- Rats, fleas and other vermin could cause infection both inside and outside the home.
- Industry brought many people into the cities to work long hours. The fumes emitted from burning coal for steam power and heating caused air pollution.
- Babies feeding bottles became popular because many women had to go out to work, leaving their baby in the care of someone else. The shape of the feeding bottle was difficult to keep clean, and the advice of only washing the rubber teat once every 2 – 3 weeks meant that germs thrived. At this time 7 in every 10 children died before their 10th birthday.
- Poor houses, often built quickly to house people coming to the city to work were often overcrowded and poorly ventilated. Diseases spread quickly, water had to be collected from a communal pump at the end of the street and many houses shared only one or two ash pail toilets.

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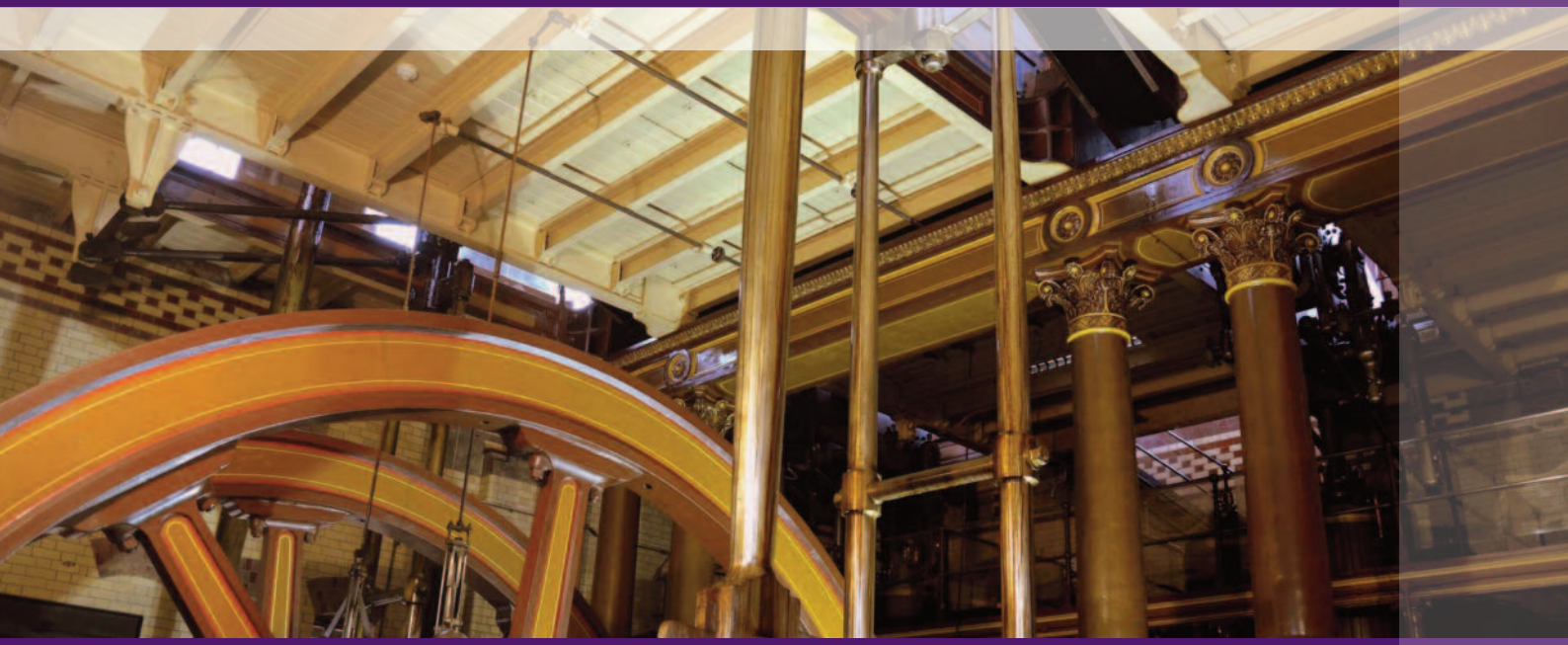

Sewage and Water

Introduction

Before the Industrial Revolution most people obtained their water from wells, standpipes in the street or butts that collected rainwater. Wells often became contaminated with sewage that leaked through the ground from cesspits and ditches. Along with sewage, ditches often contained domestic refuse and waste from the increasing population and factory industries.

Disease in Leicester was rife and between 1882 and 1893 mortality rates in the city were the highest in the country.

Discussion activity

Before the pumping station was built excess sewage was pumped straight into the River Soar.

In pairs or small groups look at the two sewage pipes which are on show in the gallery.

- What shapes are they?
- Why do you think that the more modern of the two pipes is a different shape?
- Why are the pipes made from different materials?
- Discuss why you think pumping sewage into the river was unsanitary.

Imagination activity

The museum's main gallery was originally the pumping station's boiler room. Here eight Lancashire boilers burnt coal, heating up water to create steam for the operation of the engines. The adjoining room was the coal storage area.

The windows which you can see along the far wall would have been openings where the coal was delivered into the building.

Imagine this area full of coal.

- Think about what it would feel like to work in an environment like this.
- Would it be dirty and smelly? Would it be noisy? Do you think it would be hard work shovelling coal into the boilers?
- Imagine that you are working in this environment.

Write a short paragraph describing your imagined experiences.

Investigation activity

Go to the interactive flushing toilet.

Flush toilets are a marvel of physics!

Make sure the artificial poo is in the bowl and check that the cistern (tank) is full of water. This tank containing water has stored potential energy.

Watch what happens when you pull the chain. Wiggle the chain around a bit before you pull it to see what it does - it pulls a vertical rod up to release water into the bowl via a siphon effect. Releasing the water converts the potential energy into kinetic energy.

The force of the water rushing into the bowl creates another siphon effect as it pushes water up and over the U-bend, pulling the rest of the water and the waste over the U-bend.

The water then flows away to the sewage pipes because of gravity.

- Why does the water need to reach a certain level in the tank?

Research what is meant by:

- Potential energy
- Kinetic energy
- Gravity
- Siphon effect

Write a couple of sentences about each.

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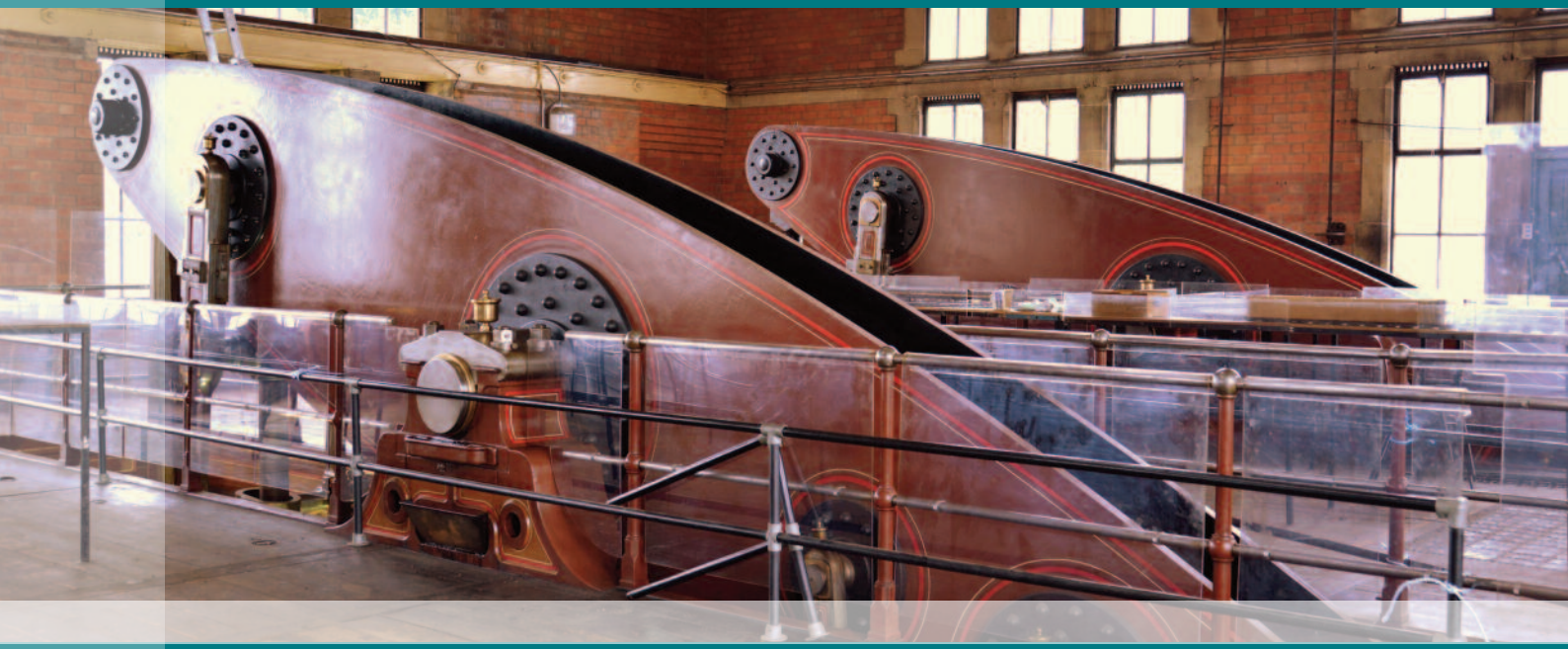
How did the Beam Engines work?



Introduction

Abbey Pumping Station opened in 1891. It pumped Leicester's sewage to a treatment plant in Beaumont Leys and away from the city, helping the city clean up and improve its health. It pumped 208,000 gallons of sewage per hour and the pumping station operated 24 hours a day, 365 days of the year.

The beam engines were built by Gimson's, a local engineering firm. The engines were operated by high pressure steam.

Discussion activity

The steam engine was one of the most important inventions of the Industrial Revolution.

When was the Industrial Revolution in Britain?

What was the Industrial Revolution?

In 1712, Thomas Newcomen developed a steam engine to pump water out of tin mines. His engine worked by condensing steam. By the 1770s, inventor James Watt had improved on Newcomen's and other inventors work. His steam engine went on to contribute towards the powering of machinery, trains and ships during the Industrial Revolution.

Why did the steam engine have an enormous impact as an invention?

Before steam power, most factories and mills were powered by water, wind, horse or man. Water was a good source of power, but factories had to be located near a river. Steam provided reliable power and could be used to power large machines.

Discuss the beneficial impact of steam power on:

- Employment
- Housing
- Transport
- Hygiene
- Production of goods

Investigation activity

What did all the pistons, wheels and rods do?

Sewage was directed to the pumping station. The beam engines were designed to generate force to pump the sewage nearly 4 kilometres away.

The beam engines were powered by steam.

Steam was produced by burning coal in huge boilers.

Steam under pressure was then injected into the steam cylinders. The piston rods in the cylinders moved up and down due to the injection of steam pressure. The piston rods also moved the beam up and down.

The motion of the beam drove the fly wheels. The wheels ensured that the wheels worked in a smooth motion.

Look at one of the beam engines and point out the

- beam
- rods
- cylinder
- flywheel

What did all these components do?

Research in more details how the beam engines worked.

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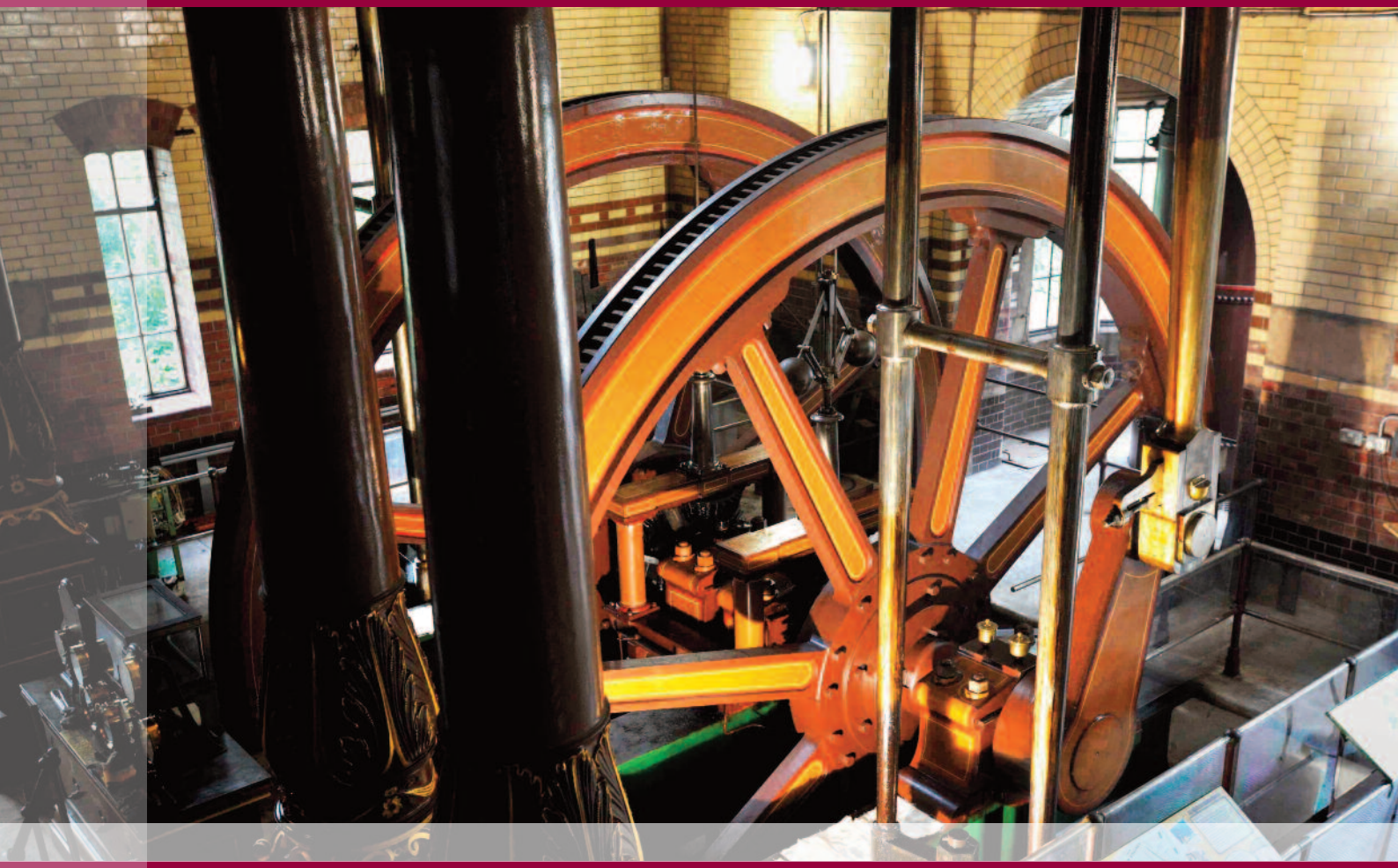
Fossil Fuels



Background information

The invention of the steam engine had a huge beneficial impact on society during the Industrial Revolution, but today there are environmental concerns about using fossil fuels for energy. Environmentalists are concerned about pollution caused by cars, buses, trains, and other things that contain engines.

Discussion activity

In pairs or small groups discuss:

- What are fossil fuels?
  List as many as you can.
- What type of fossil fuels powered the steam engines at Abbey Pumping Station?

Investigation activity

Research the following:

- How fossil fuels were formed.
- Types of modern-day machinery and transport which are powered by fossil fuels. Name machinery which is powered by electricity, coal, petroleum, natural gas, or coal.
- How do you in your everyday life rely on fossil fuels?
- The negative impact of burning fossil fuels. How does the burning of these fuels contribute to global warming?

Literacy activity

There are two types of energy:

- Re-newable
- Non-renewable.

Investigate the two types and write a short paragraph to describe each one and discuss the pros and cons of each one.

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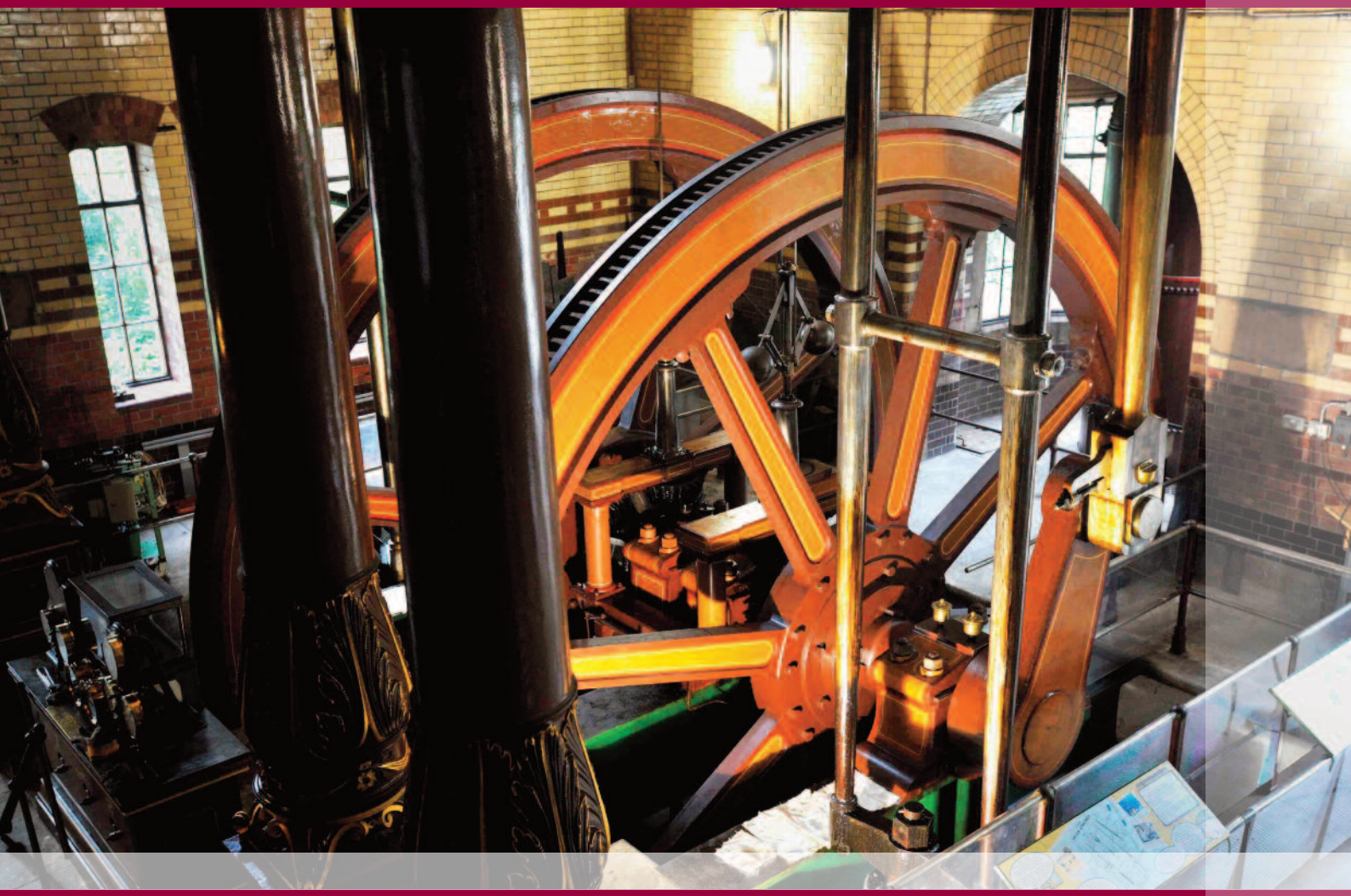
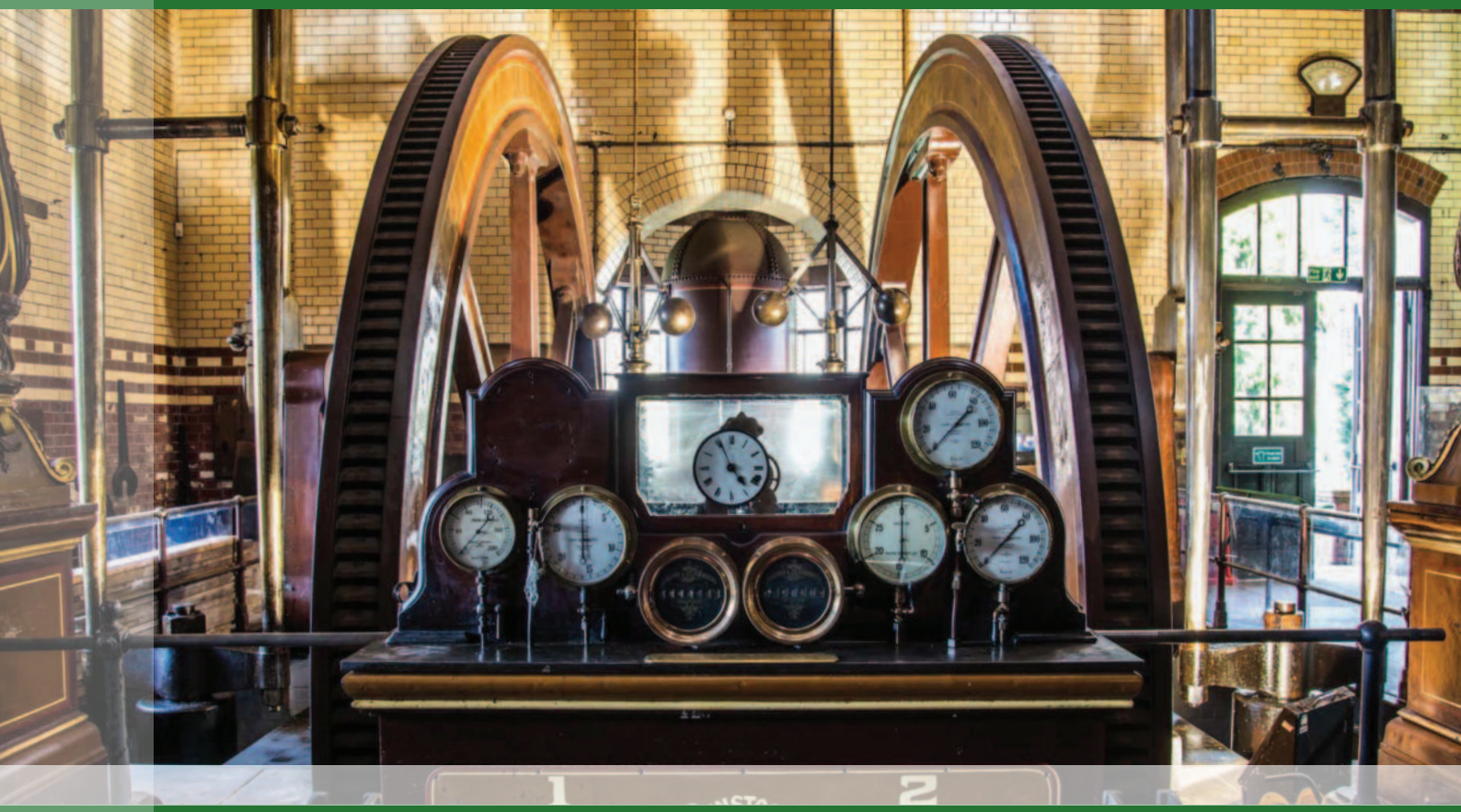


Decoration and Design



Background information

The Victorians were very proud of their triumphs and inventions. Steam power was one of the great achievements of the time and to celebrate this the Victorians designed their pump houses to be grand and elaborate, both inside and out. Abbey Pumping Station is no exception; the building is architecturally impressive with ornately painted ironwork. The building is a proud statement of achievement.

Introduction activity

Stand in the middle of the Beam Engine House. You will see two large flywheels to your left and two to your right.

Take time to look around and take in the atmosphere.

- Look up. What do you see?
- Look down. Look through the floor grates.
- Look at the scale of the machinery. Imagine the heat produced, with all the engines working.
- Look at all the windows. Why was the building designed to let in as much natural light as possible?
- Imagine the weight of the machinery.

Literacy activity

Write about what you can see.
Think of words to describe the colours, texture, shapes and patterns of the machinery. Create a word bank and use this to write a paragraph.

Patterns activity

- look for positive and negative shapes
- look for symmetry
- look for repeat patterns

Create your own pattern back in the classroom taking inspiration from those seen in the Beam Engine House.

Drawing activity

Draw as many different shapes you can see within the Beam Engine House.
Look for shapes within the:

- machinery
- flywheels
- ornate pillars
- cast iron floors
- brickwork

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