**Industrial revolution**

The **Industrial Revolution**, now also known as the **First Industrial Revolution**, was the transition to new manufacturing processes in Europe and the United States, in the period from about 1760 to sometime between 1820 and 1840. This transition included going from hand production methods to machines, new chemical manufacturing and iron production processes, the increasing use of steam power and water power, the development of machine tools and the rise of the mechanized factory system. The Industrial Revolution also led to an unprecedented rise in the rate of population growth.

Textiles were the dominant industry of the Industrial Revolution in terms of employment, value of output and capital invested. The textile industry was also the first to use modern production methods

The Industrial Revolution began in Great Britain, and many of the technological innovations were of British origin. By the mid-18th century Britain was the world's leading commercial nation, controlling a global trading empire with colonies in North America and the Caribbean and with major military and political hegemony on the Indian subcontinent, particularly with the proto industrialized Mughal Bengal, through the activities of the East India Company. The development of trade and the rise of business were among the major causes of the Industrial Revolution.

* **Main Features in Industrial Revolution**

The main features involved in the Industrial Revolution were technological, socioeconomic, and cultural. The technological changes included the following:

(1) The use of new basic materials, chiefly iron and steel.

(2) The use of new energy sources, including both fuels and motive power, such as coal, the steam engine, electricity, petroleum, and the internal-combustion engine.

(3) The invention of new machines, such as the spinning jenny and the power loom that permitted increased production with a smaller expenditure of human energy.

(4) A new organization of work known as the factory system, which entailed increased division of labour and specialization of function.

(5) Important developments in transportation and communication, including the steam locomotive, steamship, automobile, airplane, telegraph, and radio.

(6) The increasing application of science to industry. These technological changes made possible a tremendously increased use of natural resources and the mass production of manufactured goods.

* **The First Industrial Revolution**

In the period 1760 to 1830 the Industrial Revolution was largely confined to Britain. Aware of their head start, the British forbade the export of machinery, skilled workers, and manufacturing techniques. The British monopoly could not last forever, especially since some Britons saw profitable industrial opportunities abroad, while continental European businessmen sought to lure British know-how to their countries. Two Englishmen, William and John Cockerill, brought the Industrial Revolution to Belgium by developing machine shops at Liège (c. 1807), and Belgium became the first country in continental Europe to be transformed economically. Like its British progenitor, the Belgian Industrial Revolution centred in iron, coal, and textiles.

France was more slowly and less thoroughly industrialized than either Britain or Belgium. While Britain was establishing its industrial leadership, France was immersed in its Revolution, and the uncertain political situation discouraged large investments in industrial innovations. By 1848 France had become an industrial power, but, despite great growth under the Second Empire, it remained behind Britain.

Other European countries lagged far behind. Their bourgeoisie lacked the wealth, power, and opportunities of their British, French, and Belgian counterparts. Political conditions in the other nations also hindered industrial expansion. Germany, for example, despite vast resources of coal and iron, did not begin its industrial expansion until after national unity was achieved in 1870. Once begun, Germany’s industrial production grew so rapidly that by the turn of the century that nation was out producing Britain in steel and had become the world leader in the chemical industries. The rise of U.S. industrial power in the 19th and 20th centuries also far outstripped European efforts. And Japan too joined the Industrial Revolution with striking success.

The eastern European countries were behind early in the 20th century. It was not until the five-year plans that the Soviet Union became a major industrial power, telescoping into a few decades the industrialization that had taken a century and a half in Britain. The mid-20th century witnessed the spread of the Industrial Revolution into hitherto nonindustrialized areas such as China and India.

* **The Second Industrial Revolution**

Despite considerable overlapping with the “old,” there was mounting evidence for a “new” Industrial Revolution in the late 19th and 20th centuries. In terms of basic materials, modern industry began to exploit many natural and synthetic resources not hitherto utilized: lighter metals, new alloys, and synthetic products such as plastics, as well as new energy sources. Combined with these were developments in machines, tools, and computers that gave rise to the automatic factory. Although some segments of industry were almost completely mechanized in the early to mid-19th century, automatic operation, as distinct from the assembly line, first achieved major significance in the second half of the 20th century.

Ownership of the means of production also underwent changes. The oligarchical ownership of the means of production that characterized the Industrial Revolution in the early to mid-19th century gave way to a wider distribution of ownership through purchase of common stocks by individuals and by institutions such as insurance companies. In the first half of the 20th century, many countries of Europe socialized basic sectors of their economies. There was also during that period a change in political theories: instead of the laissez-faire ideas that dominated the economic and social thought of the classical Industrial Revolution, governments generally moved into the social and economic realm to meet the needs of their more complex industrial societies. That trend was reversed in the United States and the United Kingdom beginning in the 1980s.

* **Important technological developments**

The commencement of the Industrial Revolution is closely linked to a small number of innovations, beginning in the second half of the 18th century. By the 1830s the following gains had been made in important technologies:

* **Textiles** – mechanized cotton spinning powered by steam or water increased the output of a worker by a factor of around 500. The power loom increased the output of a worker by a factor of over 40.[]](https://en.wikipedia.org/wiki/Industrial_Revolution#cite_note-31)The cotton gin increased productivity of removing seed from cotton by a factor of 50. Large gains in productivity also occurred in spinning and weaving of wool and linen, but they were not as great as in cotton.
* **Steam power** – the efficiency of steam engines increased so that they used between one-fifth and one-tenth as much fuel. The adaptation of stationary steam engines to rotary motion made them suitable for industrial uses. The high pressure engine had a high power to weight ratio, making it suitable for transportation. Steam power underwent a rapid expansion after 1800.
* **Iron making** – the substitution of coke for charcoal greatly lowered the fuel cost of pig iron and wrought iron production. Using coke also allowed larger blast furnaces, resulting in economies of scale. The steam engine began being used to pump water and to power blast air in the mid 1750s, enabling a large increase in iron production by overcoming the limitation of water power. The cast iron blowing cylinder was first used in 1760. It was later improved by making it double acting, which allowed higher blast furnace temperatures. The puddling process produced a structural grade iron at a lower cost than the finery forge.  The rolling mill was fifteen times faster than hammering wrought iron. Hot Blast (1828) greatly increased fuel efficiency in iron production in the following decades.
* **Invention of machine tools** – The first machine tools were invented. These included the screw cutting lawth cylinder boring machine and the milling machine. Machine tools made the economical manufacture of precision metal parts possible, although it took several decades to develop effective techniques.
* **Social effects of Industrial revolution**

1: **Factory system:** Prior to the Industrial Revolution, most of the workforce was employed in agriculture, either as self-employed farmer as landowners or tenants, or as landless agricultural labourers. It was common for families in various parts of the world to spin yarn, weave cloth and make their own clothing. Households also spun and wove for market production. At the beginning of the Industrial Revolution India, China and regions of Iraq and elsewhere in Asia and the Middle East produced most of the world's cotton cloth while Europeans produced wool and linen goods

2: **Standards of living**

Some economists, such as Robert E. Lucas, Jr., say that the real effect of the Industrial Revolution was that "for the first time in history, the living standards of the masses of ordinary people have begun to undergo sustained growth ... Nothing remotely like this economic behavior is mentioned by the classical economists, even as a theoretical possibility." Others, however, argue that while growth of the economy's overall productive powers was unprecedented during the Industrial Revolution, living standards for the majority of the population did not grow meaningfully until the late 19th and 20th centuries, and that in many ways workers' living standards declined under early capitalism: for instance, studies have shown that real wages in Britain only increased 15% between the 1780s and 1850s, and that life expectancy in Britain did not begin to dramatically increase until the 1870s. Similarly, the average height of the population declined during the Industrial Revolution, implying that their nutritional status was also decreasing. Real wages were not keeping up with the price of food.

During the Industrial Revolution, the life expectancy of children increased dramatically. The percentage of the children born in London who died before the age of five decreased from 74.5% in 1730–1749 to 31.8% in 1810–1829.

**3: Housing**

The rapid population growth in the 19th century included the new industrial and manufacturing cities, as well as service centers such as Edinburgh and London. The critical factor was financing, which was handled by building societies that dealt directly with large contracting firms. Private renting from housing landlords was the dominant tenure. P. Kemp says this was usually of advantage to tenants. People moved in so rapidly there was not enough capital to build adequate housing for everyone, so low-income newcomers squeezed into increasingly overcrowded slums. Clean water, sanitation, and public health facilities were inadequate; the death rate was high, especially infant mortality, and tuberculosis among young adults. Cholera from polluted water and typhoid were endemic. Unlike rural areas, there were no famines such as the one that devastated Ireland in the 1840s.

**4: Sanitation**

In The Condition of the Working Class in England in 1844 Friedrich Engels described how untreated sewage created awful odours and turned the rivers green in industrial cities.

In 1854 John Snow traced a cholera outbreak in Soho in London to faecal contamination of public water well by a home cesspit. Snow's findings that cholera could be spread by contaminated water took some years to be accepted, but his work led to fundamental changes in the design of public water and waste systems.

**5: Water supply**

Pre-industrial water supply relied on gravity systems and pumping of water was done by water wheels. Pipes were typically made of wood. Steam powered pumps and iron pipes allowed the widespread piping of water to horse watering troughs and households.

**6: Population increase**

The Industrial Revolution was the first period in history during which there was a simultaneous increase in both population and per capita income.

According to Robert Hughes in The Fatal Shore, the population of England and Wales, which had remained steady at six million from 1700 to 1740, rose dramatically after 1740. The population of England had more than doubled from 8.3 million in 1801 to 16.8 million in 1850 and, by 1901, had nearly doubled again to 30.5 million. Improved conditions led to the population of Britain increasing from 10 million to 40 million in the 1800s. Europe's population increased from about 100 million in 1700 to 400 million by 1900.