

Fact Sheet

The History of Paper

The word, Paper, comes from the Latin papyrus, which in the hands of the early Egyptians (its first known users) comprised the pith of a grass-like plant which was sliced into layers and beaten or pressed into sheets. Specimens bearing written characters have been found in Egyptian tombs of 3500 BC, and its place in history is underlined by the fact that most of the works of the Greek and Roman scholars were written upon it.

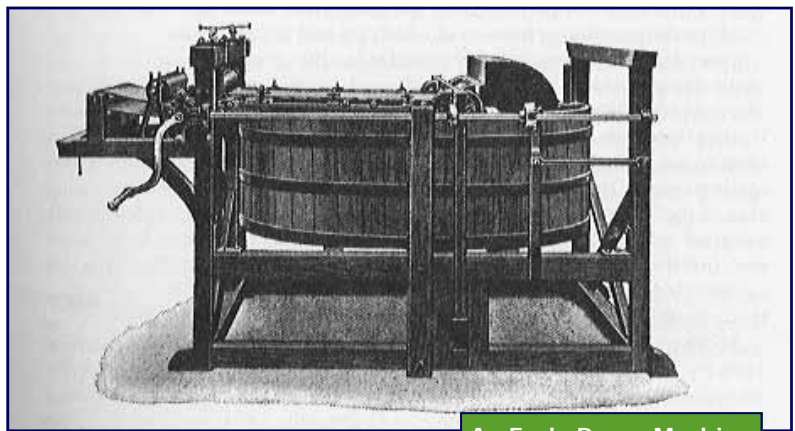
However, paper, as we know it today, had its origins in China. Traditional Chinese records give the credit for its development to T'sai Lun (about 105 AD), who was even defined as the god of papermakers. Samples in the British Museum indicate that early Chinese paper was of a very high quality and comparable with today's hand made rag paper.

Eastern civilisation developed more or less simultaneously with the civilisations of the Middle East and of Europe, but as if in a separate world. This is why paper, which was in general use in China nearly 2,000 years ago, was unknown further west until the capture of Chinese prisoners by Arabs at Samarkand in the eighth century. In 793 AD, Chinese workmen were introduced by Haroun-el-Raschid to a factory in Baghdad. The next centre was Damascus; the main source of supply for Europe for several centuries. From Damascus, the craft travelled westwards, by way of Egypt, to Morocco (around 1110 AD); the Moors introduced the craft to Europe.

Further progress will be appreciated from the following table, showing the dates (doubtful in some cases) of the earliest mills in various countries.

	AD
Spain (Xativa)	1150
France (Herault)	1189
Italy (Fabriano)	1260
Germany (Nuremberg)	1389
Switzerland (Marly)	1400
Belgium	1407
Holland(Gennep)	1428
Great Britain (Hertfordshire)	1488
Sweden (Motala)	1532
Denmark	1540
Russia (Moscow)	1690
USA (Germanstown, Pa.)	1690

The earliest reference to England's first mill was in a book printed by William Caxton, around 1490. Its products were used for an edition of Chaucer's Canterbury Tales. This mill belonged to John Tate and is said to have been near Stevenage in Hertfordshire. Confirmation that a "Tate" had a paper mill in 1498 is provided by an entry in the household book of Henry VII. In 1588, Sir John Spielman had a paper mill at Dartford and was granted special privileges by Queen Elizabeth for the collection of rags and other fibrous



An Early Paper Machine

raw materials. Research has shown that in the reign of James VI of Scotland (James I of England), small mills were established near Edinburgh. Evidence also exists of a mill at Cannock Chase in Staffordshire at this time and by the middle of the 17th century, several mills apparently existed in Buckinghamshire, Oxfordshire and Surrey.

These early mills do not appear to have been very successful. One reason was the belief that the discarded rags used by papermakers helped to spread the Plague. However, the influx of Huguenots from France following the revocation of the Edict of Nantes in 1685 brought fresh blood into the industry. The first effects of the Industrial Revolution in the second half of the 18th century were felt particularly in the cotton, wool and iron trades and, indirectly, in the paper industry. There was a great increase in population and at first, because of the new textile developments, an increase in the supplies of raw materials such as rags. This was a temporary phase, for by the end of the 18th century the shortage of raw materials was as great as ever, as the growth of industry increased the demand for papers of all kinds, at home and for the

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growing export trade. There was more correspondence, the educated classes bought more books (the 18th century being a literary age) and more account books were required.

The daily press, which really came into being at the beginning of the 18th century, was growing and although there was no national free education in England and Wales until 1870, paper was increasingly required for schoolbooks and writing materials.

Education provided, on a voluntary basis, by religious and charitable bodies was at the same time spreading throughout the poorer classes. The consequent demand for rags could not be satisfied. The Napoleonic Wars of 1793-1815 increased the difficulty of importing foreign raw materials. In 1800, 24 million pounds (approximately 11 million kg) of rags were being used annually, and a good proportion were imported, mainly from the Continent.

The increase in population and the spread of industry, commerce and education still further augmented the demand for paper, with a consequent increase in the number of mills. Thus, at the end of the 18th century there were 416 in England and Wales, 49 in Scotland and 60 in Ireland, but nearly all of these were very small. Quite a number also manufactured articles other than paper. All the paper was made by hand so that, although the quality was usually high, output was low. It is not surprising, therefore, that attempts were made to replace the old methods by machinery.

Henry Fourdrinier (right) and Bryan Donkin



The first mechanised paper machine was invented in Holland in 1680. In 1774 this process was taken a stage further with the discovery that fibres could be bleached with chlorine gas. From then, coloured fibres could also be used to produce white paper. This prompted a number of new inventions, including that by Louis Robert, a clerk at the mill of Didot Freres at Essonnes in France in 1799. A model of his paper

machine can be seen in the Science Museum in London. Although the effort was unsuccessful, the idea was passed on through an Englishman, John Gamble, to a London firm of stationers owned by the brothers Henry and Sealy Fourdrinier, who engaged the engineer Bryan Donkin from Donkin and Hall of Dartford. After many trials and at much expense, a machine was erected at Frogmore, Hertfordshire, in 1803. Although it was based on the ideas of Robert, many changes had been made in the design and it is thought that much credit for this success is due to Donkin. Unfortunately, expenses were so high that, so it is said, the Fourdriniers lost a fortune. However, their name is still familiar to many generations of papermakers, due to their share in the development of a machine, the essential principles of which are still in use today.

The first competition to the Fourdrinier machine came in 1809 from English machine builder John Dickinson. He patented a new invention, a machine on which the wire was covered with metallic material, and the fibres were moulded on a rotating cylinder; a machine which could be used to produce heavyweight paper, board and later deckle edge paper. The development of paper machines further progressed about 10 years later, when another Englishman, Robert Crompton, invented a method of drying paper with steam heated cylinders. In 1827 the first machine was exported.

Towards the end of the 19th century paper production methods using wood chips and wood pulps were developed. Improvements to wires and felts led to higher machine speeds, width increases, improved electrical drives and steam technology, and finally full automation. By 1900 a machine in Germany was producing paper at 150 metres per minute and had a working width of nearly three metres. In 2005 the fastest recorded paper machine was in Lontar Papyrus, Indonesia running at 2,110 metres per minute (126.6km/hr). On average, most modern paper machines have an average speed of around 1,500 metres per minute.

Peak employment within the paper industry was reached in 1959, when 100,000 were employed. Since then, employment has declined along with the number of mills, but tonnages have increased. In 1955 UK paper consumption exceeded 4 million tonnes per annum for the first time. In 1981, imports of paper and board exceeded UK production for the first time. Currently, in the UK, there are 61 mills producing an estimated 5.2 million tonnes of paper and board. There are 12,300 people employed in UK paper and board manufacturing and non-federated mills. Paper made by hand is still in demand, although the craft is only practised in a few UK centres.

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