

Machine Paper-making

Like many other inventions that made the range of materials our technological society relies on readily available and cheap enough to change the nature of their use, the mechanical production of paper was an important step forward, and yet is seldom given much attention. Paper had been made by hand for centuries, but was expensive, and this had many implications. Books and printed matter were therefore relatively more expensive than today, and thus opportunities for literacy and the use of written & printed material less widespread. Machine-made paper changed that, and made paper the disposable and often transient medium that we are now used to.

Producing paper as a strip (or 'web') also allowed the development of printing machines that operated continuously using the rotary principle, and thus greatly increased productivity and reduced costs.

The process was invented in France by Fourdrinier in 1801, and while it has been much refined by all the usual gadgetry of modern production methods from motorised mechanisms to electronic sensors for measurement, the basic process is much the same. The vegetable fibres are dispersed in water,

just as in hand-making, but are poured through a slot onto a continuous wire belt (nowadays usually several feet wide). Most of the water drains off through the wire, leaving a weak layer of fibres that is peeled off onto a belt of felt as the wire turns back, and fed through rollers to press out more water. The continuous strip of paper, now self-supporting, is wound round many heated drums to dry it further, & eventually reeled ready for use.

Nowadays, most paper is made from softwood pulp produced from specially bred fast-growing trees that are farmed on a continuous cycle of a few years growth, felling and replanting, but the increasing demand has led to more contentious use of trees from rainforest areas with questions over the environmental effect. Wood fibre produces poorer paper than the traditional linen, cotton and esparto grass, but can be produced in the volume needed, and technical developments have improved the quality achievable. Changing uses also affect the production: letterpress printing used softer, bulkier papers, as the process could force the ink down into any recesses. The increasing use of lithography led to papers with smoother surfaces that also resisted the effects of the dampening solution used, and were not prone to re-

lease fibres. Nowadays papers have to withstand heating in photocopying and related processes, or ink spread in inkjet printing. There are few papers now with rough surfaces, and fewer coloured papers used in printing (since overall colours can be printed when required; not practical in most cases in letterpress).

The smooth surface on paper can be achieved in two ways—by polishing it between rollers, 'calendering', or by coating it with china clay. Most common papers in use today are calendered, and the glossier ones used for full-colour printing are coated. Apart from allowing finer detail printing, because the coating fills the gaps between fibres, it avoids reducing the gloss of the inks. Colour pictures which are glossy give richer colours because of the way they reflect light.

One consequence of machine making of paper is that it has a 'grain'; more fibres lie along the direction of the web than other ways, and the paper folds, bends, tears & expands differently with & across the grain, unlike hand-made paper which has no grain.

A papermaking machine

