

	1750	1760	1770	1780	1790	1800	1810
Fibre Source	1750: Cotton and Linen rags are exclusively used for papermaking.		1774: Deinking with bentonite is discovered by Justus Claproth in Germany allowing easier paper recycling.			1800: Quality recycled paper is produced by Mathias Koop 1801: Mathias Koop patents a deinking and paper recycling process in the UK 1800-1802: Straw is used to produce paper for a book by Mathias Koop	
Technology	1756: James Whatman produces the first wove paper in Europe for John Baskerville.		1774: Deinking with bentonite is discovered by Claproth in Germany allowing easier paper recycling.		1790: Rag fermentation in stock preparation dies out. 1795: Hydraulic press is invented by Joseph Bramah in England 1798: A papermaking machine is patented by Nicholas Robert in France	1800: Quality recycled paper is produced by Mathias Koop 1800: Possible date for the improved laid mould to prevent pulp build up around chain lines. Start of modern laid paper. 1803: The first Fourdrinier papermaking machine is made by Donkin with the financial support of the Fourdrinier brothers in England 1807: The 'Shake' mechanism for papermaking machines is patented by Louis Robert 1809: The cylinder mould machine is invented by John Dickinson	1817: Two ply papers and a single steam heated drying cylinder are researched by John Dickinson
Pulping	Rag fermentation, Hollander beater, hand made paper using a wire mould		1772: Jacob Christian Schaffer proposed using plant fibre directly to make paper		1790: Rag fermentation in stock preparation dies out.		
Mechanical Pulp							
Soda Pulp							
Sulphite Pulp							
Sulphate Pulp							
Sizing	Sizing was external, (Tub sizing), using gelatine often mixed with alum to help prevent it from going off.					1807: Moritz Illig publishes his findings on Internal sizing with Alum-rosin in Germany	
Bleach	1750: Bleaching by using lime, sun bleaching, stale urine or sour milk.		1774: Chlorine is discovered by Karl Scheele	1789: Sodium hypochlorite is produced and popularized by Claude Berthollet 1788: James Watt discovers the bleaching properties of sodium hypochlorite in Scotland	1792: Bleaching paper and textiles with chlorine is patented by George & Clement Taylor 1799: Charles Tennant invents bleaching powder, calcium hypochlorite, in Glasgow, Scotland	1804: Calcium hypochlorite started to be used as a bleach in the USA. 1807: Sodium hydroxide is discovered by Humphrey Davy	1818: Louis Thenard discovers Hydrogen Peroxide
Fillers, Coating, Optical Brighteners	Paper is dyed blue with woad, indigo and logwood 1754: Coated paper is first patented by George Cummings	1764: A mixture of lead white, plaster of Paris, lime size, and nut or linseed oil is patented by George Cummings as a coating	1770: Prussian blue used to dye paper blue 1775: Zinc white is reportedly used	1780: Kaolin in general use	1797: Chrome yellow is used as a paper colourant in Europe	1807: Kaolin is used as a filler	
Watermarks, Wove and Laid marks	1756: James Whatman produces the first wove paper in Europe for John Baskerville.					1800: Improved laid mould is developed to prevent pulp build up around chain lines. Start of modern laid paper.	1818: Coloured watermarks are patented by Sir William Cosgreve
Mills, History						1809: Tracing paper is developed by Canson	1817: First cylinder papermaking machine installed in the USA, at Gilpin Mill, Delaware

1820	1830	1840	1850	1860	1870	1880
1829: Straw is used for the first time in the USA 1829: Security threads in paper is patented by John Dickinson	1838: Cellulose is first isolated and its chemical formula determined by Anselme Payen 1839: Esparto grass is experimented with by Miles Berry, but with no success	1841: Groundwood softwood pulp starts to be used 1841: Groundwood paper is made in Halifax, Nova Scotia, Canada 1845: Groundwood mechanical pulp is produced and commercially used in Germany 1848-55: Price of rags for papermaking doubles	1855: Parchment paper produced in the UK 1856: The pulping of Esparto grass is developed by T. Routledge 1856: Bagasse may have been used by Henry Howe in Baltimore 1857: T. Routledge imports Esparto grass into the UK for papermaking	1860: Straw is regularly used as a pulp additive 1860: Esparto paper production increases, especially in book paper	1870: Groundwood mechanical pulp in common use in Europe 1870-90: Straw commonly used in cheap printing, writing and newspaper	1880: Esparto use in newspaper ceases 1884: Bagasse used in Louisiana, USA
1820: Drying cylinders are patented by Thomas Crompton 1824: Board making patent by John Dickinson 1825: A dandy roll to produce a laid paper is patented by John and Christopher Phillips 1826: Technique for sewing watermarks into a covered roller is patented by Thomas Barrett 1826: The first dandy roll is made by John Marshall 1829: Security threads in paper is patented by John Dickinson	1830: Duplex paper is invented by John Dickinson using a twin wire 1839: Improved "Ronson" drying cylinder is patented by Robert Ranson 1830: Calendaring starts to be used in the UK 1836: The vacuum box is added the Fourdrinier machine by James Brown. 1839: Technique for fixing letters to a dandy roll is patented by William Joynson		1855: Parchment paper developed in the UK 1856: Pleated and corrugated paper is patented by Healey and Allen in the UK 1856: The disc refiner is patented by Laban Stuart	1860: Joseph Jordan invents the cone refiner 1863: First multi-vat board making machine invented by John Jones in the USA	1870: The corrugated cardboard box is patented by Robert Gair in the USA 1871: Corrugated cardboard is patented by Albert Jones in the USA 1874: First single sided corrugated board making machine is made	1884: True Twin wire machine is invented by Escher Wyss
		1840: A woodgrinding machine is patented by Friedrich Keller and Heinrich Voelter 1841: Groundwood paper is made in Halifax, Nova Scotia, Canada	1851: Soda Pulping process is developed by Hugh Burgess and Charles Watt for softwood pulp	1860: First Soda Pulp Mill opens in the USA 1865: A method for the recovery of the spent liquors is patented by Hugh Burgess and Charles Watt 1866: The Sulphite pulp process is developed by Benjamin Tilghman	1870s: Steam pre-treatment of mechanical pulp is developed 1874: First Sulphite pulp mill opens in Sweden	1884: Sulphate pulp process is patented by C.F. Dahl 1885: First Sulphate Pulp mill opens in Munksjo, Sweden
	1835: Charles Fenerty conducts experiments on making papermaking fibre from wood ground against a revolving grindstone in Halifax, Canada. 1836: Friedrich Keller makes a small amount of pulp by grinding wood against a wetted grindstone in Germany.	1845: Friedrich Keller produces paper from pressing wood against a revolving grindstone with about 30% rag content. October 11th 1845 edition of the Hainichen weekly paper uses this first example of mechanical pulp	1852: Johann Voith constructs the "Defibreure" Voith grinder 1852-1860: Johann Voith produces 21 Voith grinders for use in Germany and elsewhere.	1866: First ground wood pulp grinder is installed in North America in Buntin Mill, Valley field, Quebec, Canada 1867: A Heinrich Voelter designed and Voith build grinder is installed at Albrecht Pagenstecher mill, Curtisville, Massachusetts, USA	1873: Word Fair in Vienna, the latest Voith grinder is exhibited, with a power of 100hp 1870s: Steam pre-treatment of mechanical pulp is developed	
			1851: Soda Pulping process is developed by Hugh Burgess and Charles Watt for softwood pulp	1860: First Soda Pulp Mill opens in the USA 1865: A method for the recovery of the spent liquors is patented by Hugh Burgess and Charles Watt		
				1866: The Sulphite pulp process is developed by Benjamin Tilghman, and patented the following year	1874: First Sulphite pulp mill opens in Sweden	1880-1930: Sulphite process is the dominant pulping process
						1884: Sulphate pulp process is patented by C.F. Dahl 1885: First Sulphate Pulp mill opens in Munksjo, Sweden
1829: Tub-sizing is done on a paper machine for the first time	1830: Internal alum-rosin sizing is introduced in the USA by Joseph Krah				1876: Papermakers alum, $Al_2(SO_4)_3$, is first introduced	
						1889: A process using a mixture of ozone and chlorine gas for bleaching is patented by Brin and Brin
1823: Gypsum, calcium sulphate, is used as a filler in Europe. 1827: A lead white, isinglass, gum and animal size mixture is used to coat paper.	1830: Synthetic ultramarine used to dye paper blue		1850: Casein is used as an adhesive in coated papers. 1852: A coating machine is introduced to replace hand coating paper		1870: Kaolin usage increases	
1825: A dandy roll to produce a laid paper is patented by John and Christopher Phillips 1826: Technique for sewing watermarks into a covered roller is patented by Thomas Barrett 1826: The first dandy roll is made by John Marshall 1829: John Murray publishes Practical Remarks on Modern Paper, in which he outlines paper degradation caused by bleaching and alum. 1827: First Fourdrinier machine assembled in the USA in New York. 1829: First Fourdrinier machine built in the USA at Norwich Falls, Connecticut.	1839: Technique for fixing letters to a dandy roll is patented by William Joynson 1830: About half of England's paper is produced by papermaking machines. 1838: Cellulose is first isolated and its chemical formula determined by Anselme Payen.	1848: Shade tonal watermarks are invented by W.H. Smith 1849: Shade tonal watermarks are developed for the Bank of England by William Brewer and John Smith	1851: Shade tonal watermarks are exhibited by T.H. Saunders			
			1856: Coal Tar dyes developed by William Perkins 1856-1869: Soda pulp process used in Lyndon Mill, Gloucester, UK	1863: First newspaper in the USA printed on groundwood pulp, the Boston Weekly Journal 1863: First groundwood pulp paper produced in the USA 1866: The last commercial hand made paper mill closes in the USA		1888: Sulphite pulp produced in Ontario, Canada

1890	1900	1910	1920	1930	1940	1950	1960
		1914: Aspen and Poplar are used in chemical pulp 1914-18: Straw is used in place of Esparto due to WW1 1916: Eucalypt fibre is started to be researched by M.Boas in Australia.	1920: Cotton linters started to be used 1921-27: L.R. Benjamin conducts research into using Eucalypt pulp in Australia	1935-40: Experimental work on using hardwood being used for paper making 1916-38: Experimental work on Eucalypt wood being used for paper making in Australia 1938: Eucalyptus used for paper pulp 1939-1945: Straw is used as a replacement for Esparto due to WW2		1950: Froth flotation used to deink recycled paper	1960s: Bagasse is researched by Crown Zellerback and the Hawaiian Sugar Planters Association
1897: Vacuum couch roller is added to the papermaking machine by George Dickinson.	1908: Suction couch is patented by Millspaugh Ltd, UK	1912: First Suction couch is produced by Millspaugh, UK	1924: Suction couches in widespread use 1928: Disc refiner is used to make pulp in Hartsville, USA	1931: Arne Apslund makes pulp in a steam pressurized refiner 1938: A disc refiner is used to make pulp from woodchips at the Blandin Paper Company, Grand Rapids, USA	1940s: Replacement of natural stone with manufactured stone embedded with silicon carbide or aluminium oxide 1948: Continuous cooking digester developed by Johan Richter for sulphate pulp	1950s: Flow spreader is developed	1960: Synthetic forming wires developed. Polyester replaces phosphorous bronze in the wet end wire. 1963: Grooved rollers in the press section are introduced
			1925: 60% of chemical pulp is Sulphite pulp, 20% is Soda and 20% Sulphate pulp 1928: Disc refiner is used to make pulp in Hartsville, USA	1934: Tomlinson recovery boiler invented to recover processing chemicals. Sulphate pulping becomes the predominant method			1967: 20% of global pulp is sulphite pulp.
1896: About 500 wood grinders are in operation in the USA		1910: Voith Company introduces electric engines and a hydraulic magazine grinder	1926: The first Great Northern Grinder is commercially installed at East Milloncket mill 1926: Artificial grinding stone successfully introduced by Norton Company	1939: Roberts Ring grinder is installed Algonquin paper company, New York	1940: Commercial newsprint is produced from Southern pine at the Southlands Paper mill, Texas, USA		1961: Thermomechanical pulping is patented by Anglo Paper Products Research and Development 1964: Grinding at pressure is investigated by Powell, Luhde and Logan
						1955: Cold-Soda process is used to make printing papers at the Gould Paper Company, New York, USA	
			1926: Neutral Sulphite semi-chemical pulping is developed by US Forestry Products Laboratory, Madison, Wisconsin	1934-1950: Sulphite pulping mills decrease in number			
	1909: First Sulphate pulp mill in the USA			1934: Tomlinson recovery boiler invented to recover processing chemicals 1934-1950: Sulphate pulp processing becomes predominant pulping process	1948: Continuous cooking digester developed by Johan Richter for sulphate pulp 1934-1950: Sulphate pulp processing becomes predominant pulping process	1934-1950: Sulphate pulp processing becomes predominant pulping process	
				1930: Rosin-wax sizing starts to be used		1952-1954: Alkyl ketene dimer (AKD) sizing is researched at Hercules Co. 1955: AKD is marketed with the name Aquapel.	1962: Modified fortified rosin is developed
1894: A continuous bleaching system of four tanks used on soda pulp in Cumberland Mill, Maine, USA	1904: Continuous bleaching system of sulphite pulp in Cumberland Mill, Maine, USA. 1905: Hydrogen peroxide bleaching of pulp is patented in Germany			1930s: Continuous bleach plant developed by Johan Richter for sulphate pulp 1930s: Elementary chlorine is commercially introduced as a bleach 1934: Sequential ozone and chlorine bleaching is patented by Campbell and Rolleston	1940s: Chlorine dioxide bleaching is introduced 1941: Hydrogen peroxide bleaching on chemical woodpulp in the USA 1946: Chlorine dioxide is first commercially introduced	1950s: Five stage, CEDED, introduced allowing Kraft pulp to be bleached to a high level 1950: Hydrogen peroxide bleaching of mechanical pulp 1952: Oxygen bleaching is invented by Nikitin and Akim in the USSR	1966: Displacement bleaching is first investigated by Rapson and Andersson 1968: Oxygen bleaching commercialized
1890: Casein replaces animal glue as the most commonly used coating adhesive 1890: White lead is used in some papers	1901: Indanthrene blue is invented 1904: Modified starches introduced as a coating adhesive		1925: Calcium carbonate starts to be commercially used as a filler 1928: Titanium Dioxide starts to be used	1932: Zinc Sulphide loading is introduced 1933: Zinc oxide loading is introduced 1936: Fluorescent whitening agents first used as optical brighteners 1937: Urea-formaldehyde resins used for wet strength introduced 1937: Soy protein adhesive used in coatings 1938: Diatomaceous earth used as a filler		1950: Polyethylene imine is patented as a retention aid 1952: Polyvinyl alcohols used as adhesives in coated papers. 1953: Cationic starches are introduced 1955: Polymeric retention aids are developed to work with AKD 1957: Kymene 557 Wet strength resin is developed by Keim and Meginnis	1960: AKD sized and Kymene 557 wet strength resin paper developed as permanent paper by W. Barrow for Virginia State Library 1963: Polyethylene imine and polyacrylamides used as retention aids
1891: Kelmscott press established, using handmade paper from the Joseph Batchelor Mill, Little Chart, Kent.	1908: Cellophane is invented by Jacques Brandenberger 1909: First Sulphate pulp mill in the USA			1938: Burnie, Tasmania, APPM mill begins producing eucalypt soda pulp fine writing and printing paper in Australia 1939: Maryvale, Victoria, APPM mill begins producing Kraft eucalypt pulp in Australia.			1960: AKD sized and Kymene 557 wet strength resin paper developed as permanent paper by W. Barrow for Virginia State Library

1970	1980	1990	2000	2010
1978: Recycled fibre constitutes 22.5% of global fibre source 1978: Kenaf is trialled to make newsprint at C.E. Baur, Ohio, USA	1980: Esparto no longer imported to the UK, still imported to France 1981: Kenaf is trialled commercially for newsprint at the International Paper mill, Mobile, USA. 1986: Bagasse newsprint mill opens in Tamil Nadu, India	1992: Kenaf printing and writing paper is printed by Vision Papers 1992: Recycled fibre constitutes 33.5% of global fibre source	2000: Recycled fibre constitutes 44% of global fibre source.	
1970: First off machine blade coater is used in Canada.				
1971: Organosolv pulping patented by Theodore Kleinert 1975: Thermomechanical pulping widely used 1979: 9.2% of global pulp is sulphite pulp	1985: Neutral sulphite anthoquinone pulping introduced		2000: 6% of global chemical pulp is sulphite, 94% is sulphate pulp	
1970: A pressurized grinder is patented in Sweden by Logan and Luhde for Anglo Paper Products 1975: Thermomechanical pulping widely used 1979: First commercial application of enclosed pressurized grinding in Bure mill, Sweden	1981: First PGW plant in the USA at Madison Paper Industries mill, Madison, Maine, USA			
1979: 9.2% of global pulp is sulphite pulp.	1985: Neutral sulphite anthoquinone pulping introduced		2000: 6% of global chemical pulp is sulphite, 94% is sulphate pulp	
1979: 9.2% of global pulp is sulphite pulp.			2000: 6% of global chemical pulp is sulphite, 94% is sulphate pulp	
1974: Alkenyl succinic anhydride (ASA) introduced as a size	1980s: Synthetic polymer mordants replace alum			
1970: Oxygen bleaching to a high consistency first achieved in South Africa 1973: Displacement bleaching pilot plant first installed 1975: Displacement bleach is first commercially installed	1980s: Growing environmental and health concerns about elemental and chlorine dioxide bleaching	1990: Shift away from elemental chlorine bleaching to TCF and ECF bleaching, in regulation and practice 1990: 90% of kraft pulp is elemental bleached 1990: Ozone is industrially commercialized 1999: TCF pulp is 25% of the European market	2001: 96% of the bleached chemical pulp in the USA, Canada and Europe is ECF 2005: Elemental chlorine bleaching is used in 20% of kraft pulp globally, the rest being TCF and ECF	
1970s: Calcium carbonate filler starts to be widely used in Europe as alkaline sizing gains popularity	1986: Precipitated calcium carbonate satellite plant attached to paper mill in Wisconsin, USA.			