HEMP AND PAPER: a long history and a new future?

EIHA 2006

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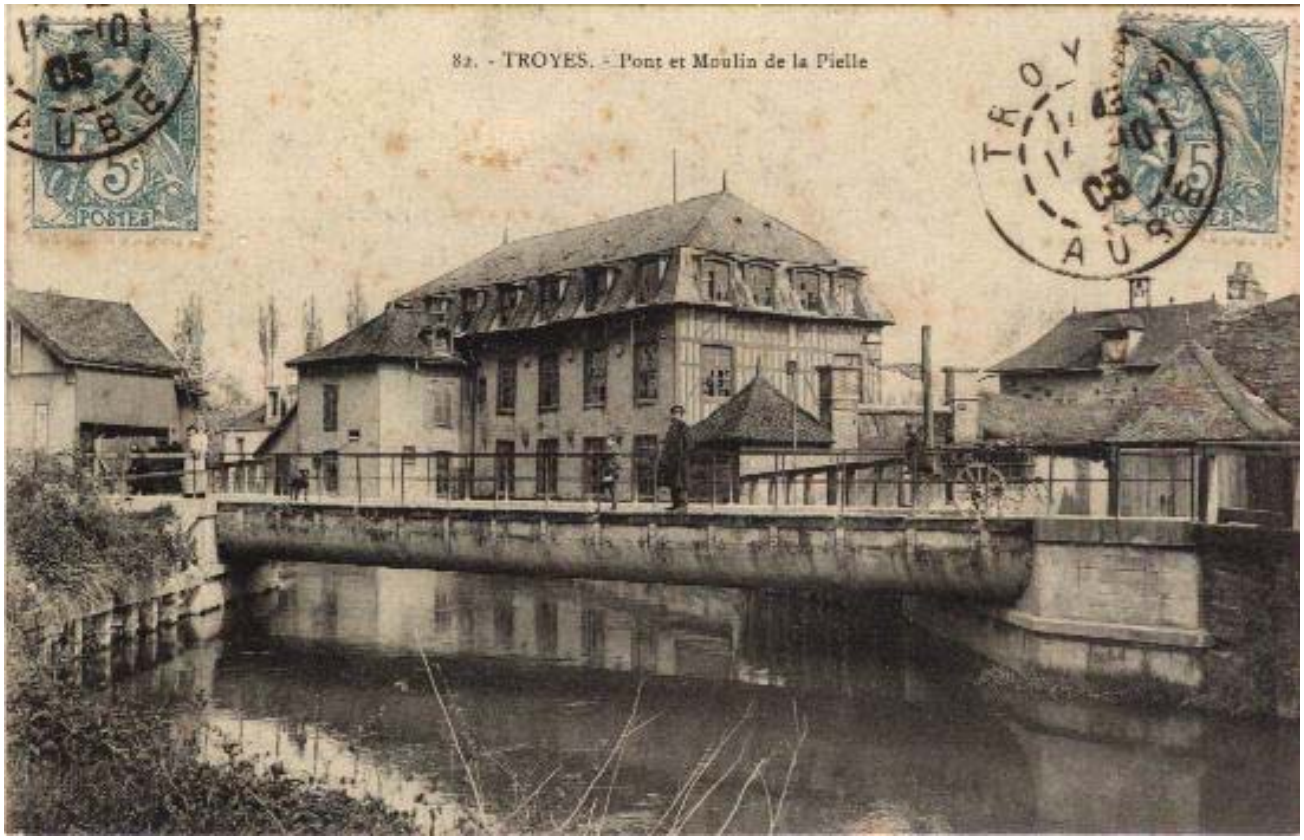
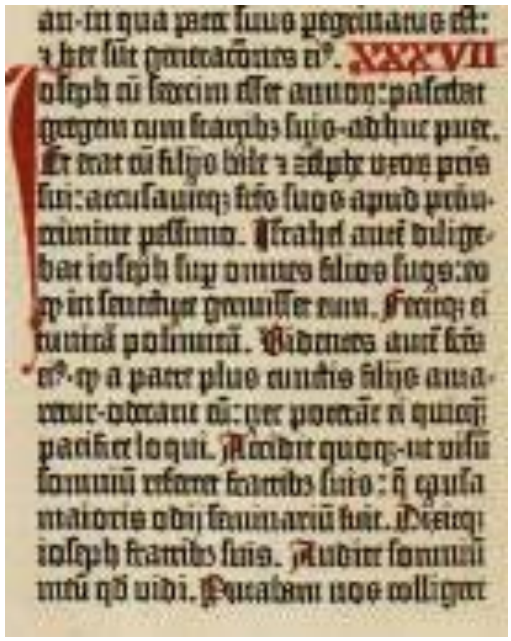
1338: le Moulin de la Pielle

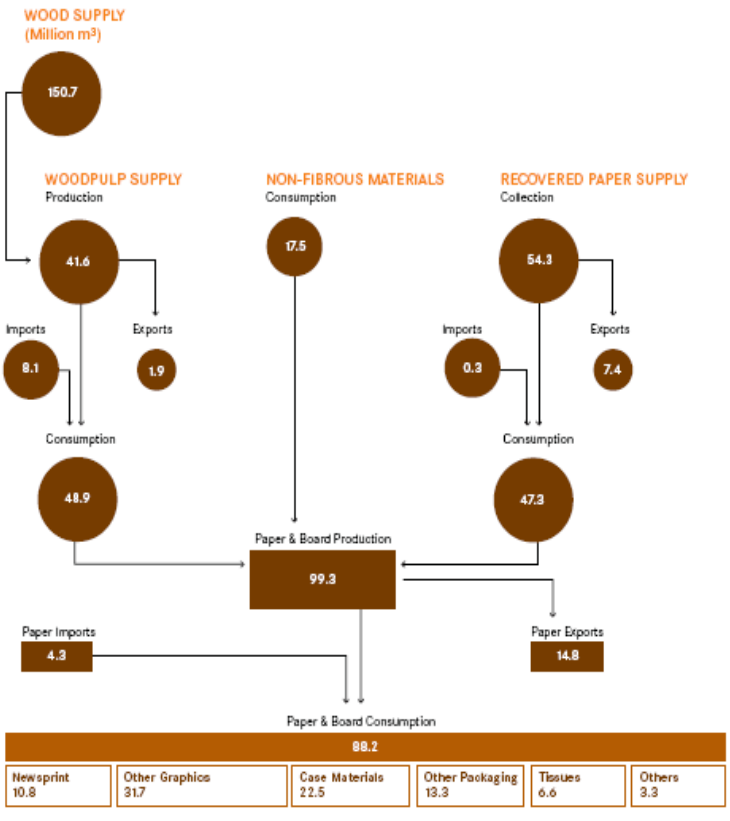


Gutemberg's bible: 1455



Pulp and Paper Industry in CEPI Countries in 2005

Figures in Million Tonnes

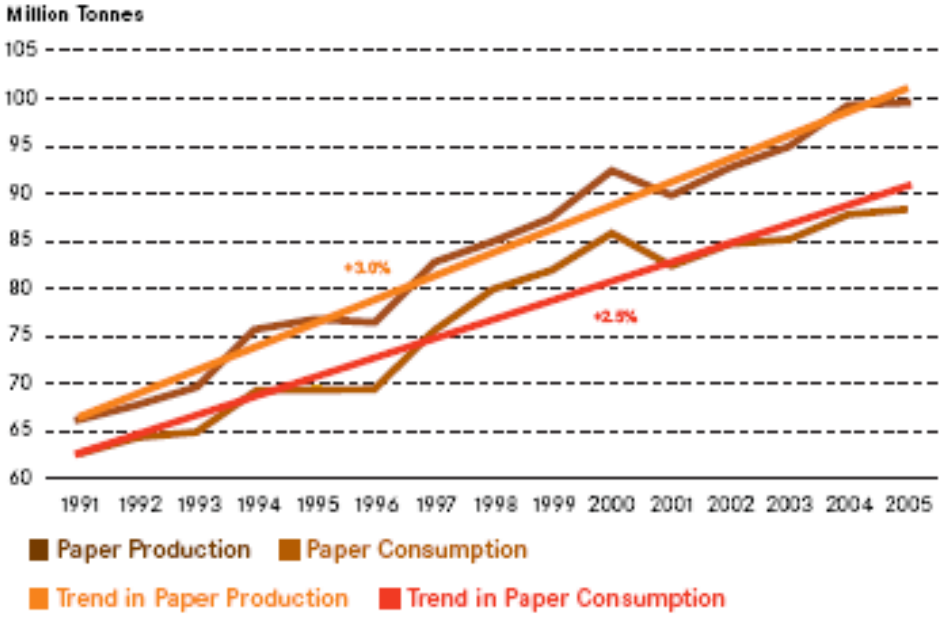


Note: Paper Consumption = Domestic Deliveries + Imports from Other CEPI Countries + Imports from Countries outside CEPI

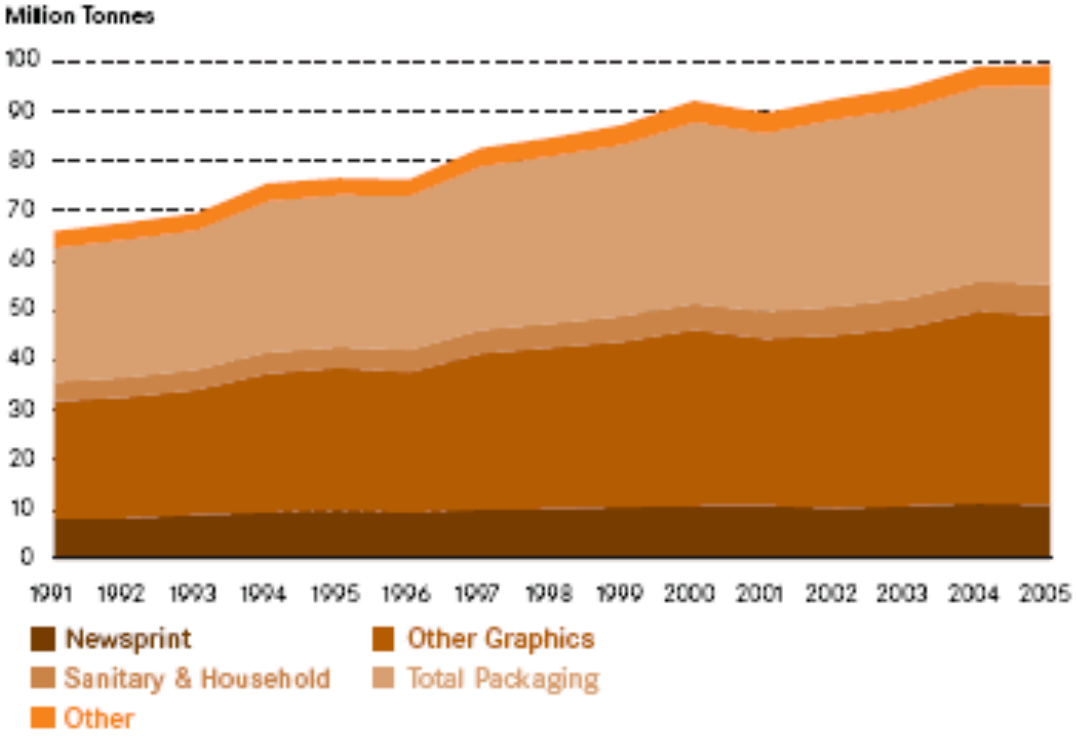
Pulp Production and Consumption in CEPI Countries 2004 - 2005

'000 Tonnes	PRODUCTION 2004	2005	% Change 2005/2004	CONSUMPTION 2004	2005	% Change 2005/2004
Mechanical & Semi Chemical Pulp	14 545	14 050	-3.4	15 000	14 634	-2.4
Sulphite Pulp	2 335	2 308	-1.2	2 139	2 195	2.6
Sulphate Pulp	25 139	24 570	-2.3	31 011	31 009	0.0
CHEMICAL PULP	27 474	26 878	-2.2	33 150	33 204	0.2
WOODPULP FOR PAPERMAKING	42 019	40 928	-2.6	48 150	47 838	-0.6
Other Pulp	658	649	-1.4	1 091	1 078	-1.2
TOTAL PULP	42 677	41 577	-2.6	49 241	48 916	-0.7

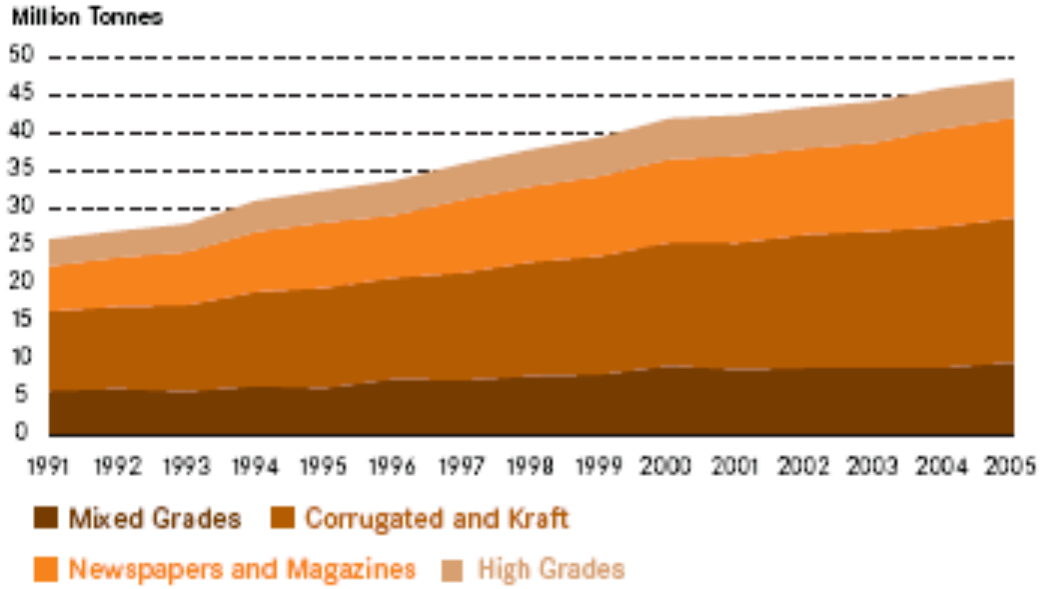
Paper Production and Consumption in CEPI Countries 1991- 2005



Paper Production by Grade in CEPI Countries 1991 - 2005



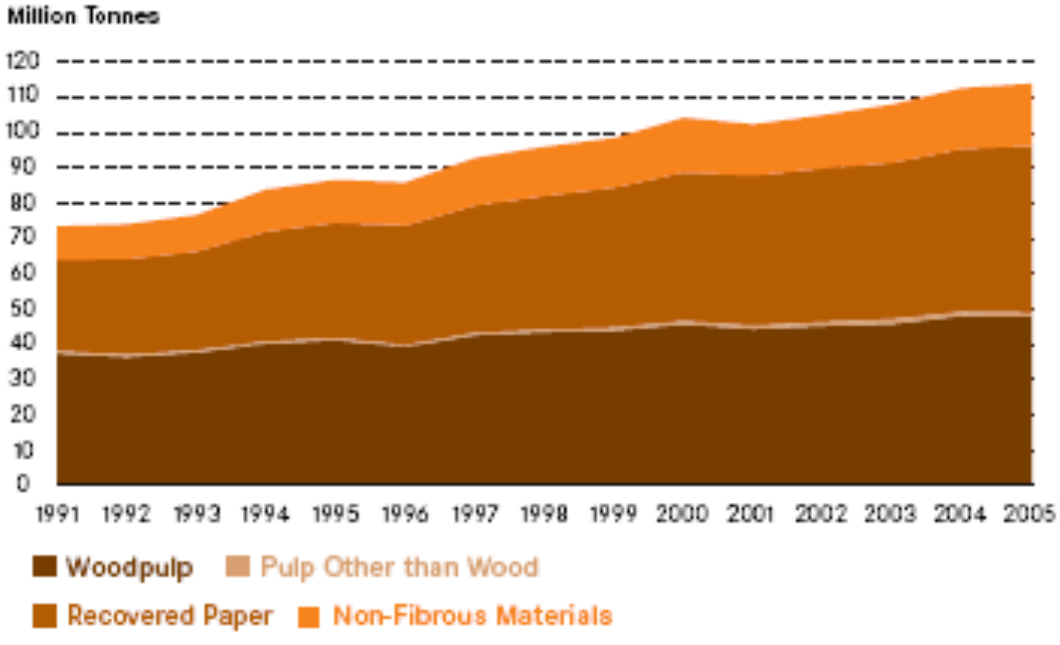
Recovered Paper Utilisation by Recovered Paper Grade in CEPI Countries 1991 - 2005



Raw Materials Use in Papermaking in CEPI Countries 2003 - 2005

'000 Tonnes	2003	2004	2005	% Change 2005/2004
Woodpulp	45 809	48 150	47 838	-0.6
Pulp Other than Wood	1 294	1 091	1 078	-1.2
Recovered Paper	44 356	46 144	47 335	2.6
Non-Fibrous Materials	16 405	17 117	17 517	2.3
Total Raw Materials	**107 864**	**112 502**	**113 768**	**1.1**

Raw Materials Consumption in CEPI Countries 1991 - 2005



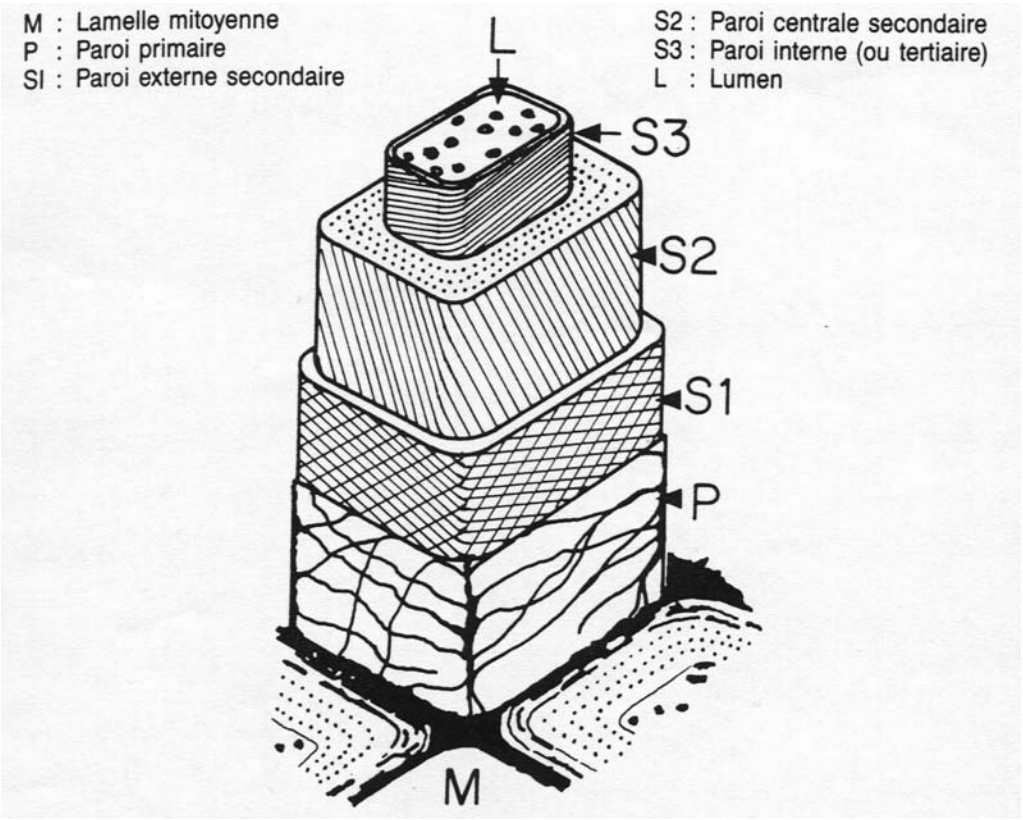
Paper Production and Consumption in CEPI Countries 2004 - 2005

'000 Tonnes	PRODUCTION 2004	2005	% Change 2005/2004	CONSUMPTION 2004	2005	% Change 2005/2004
Newsprint	11 266	10 972	-2.6	10 688	10 828	1.3
Uncoated Mechanical	6 796	6 679	-1.7	5 288	5 209	-1.5
Coated Mechanical	10 335	10 438	1.0	6 986	7 184	2.8
Uncoated Woodfree	10 925	10 692	-2.1	10 283	10 220	-0.6
Coated Woodfree	10 454	10 249	-2.0	9 067	9 074	0.1
Other Graphic Papers	38 510	38 058	-1.2	31 624	31 687	0.2
TOTAL GRAPHIC	49 776	49 030	-1.5	42 312	42 515	0.5
HOUSEHOLD & SANITARY	6 054	6 288	3.9	6 494	6 596	1.6
Case Materials	22 853	23 721	3.8	21 948	22 516	2.6
Carton Boards	8 071	8 018	-0.7	7 042	6 935	-1.5
Wrappings	3 752	3 718	-0.9	3 160	3 178	0.6
Other Paper for Packaging	4 333	4 275	-1.3	3 205	3 224	0.6
TOTAL PACKAGING	39 009	39 732	1.9	35 355	35 853	1.4
OTHERS	4 221	4 294	1.7	3 341	3 249	-2.8
TOTAL PAPER & BOARD	99 060	99 344	0.3	87 502	88 213	0.8

Hemp ‘s components

	Whole plant	Bast	Softwood	Hardwood
Holocellulose,%	80 -83	81 - 86	75 - 85	60 - 70
Alpha-cellulose,%	50 -55	65 - 67	58 - 61	45 - 55
Lignin,%	17 - 20	8 - 10	23 - 26	20 - 25
Ash,%	2 -4	3 - 5	0,3 - 0,4	0,2 - 0,1
Solvent extract,%	2 - 3	1 - 2	0,1 - 0,5	2 - 13
Water soluble extract,%	5 - 8	9 - 11	2 - 3	3 - 13

Fibre’s Structure

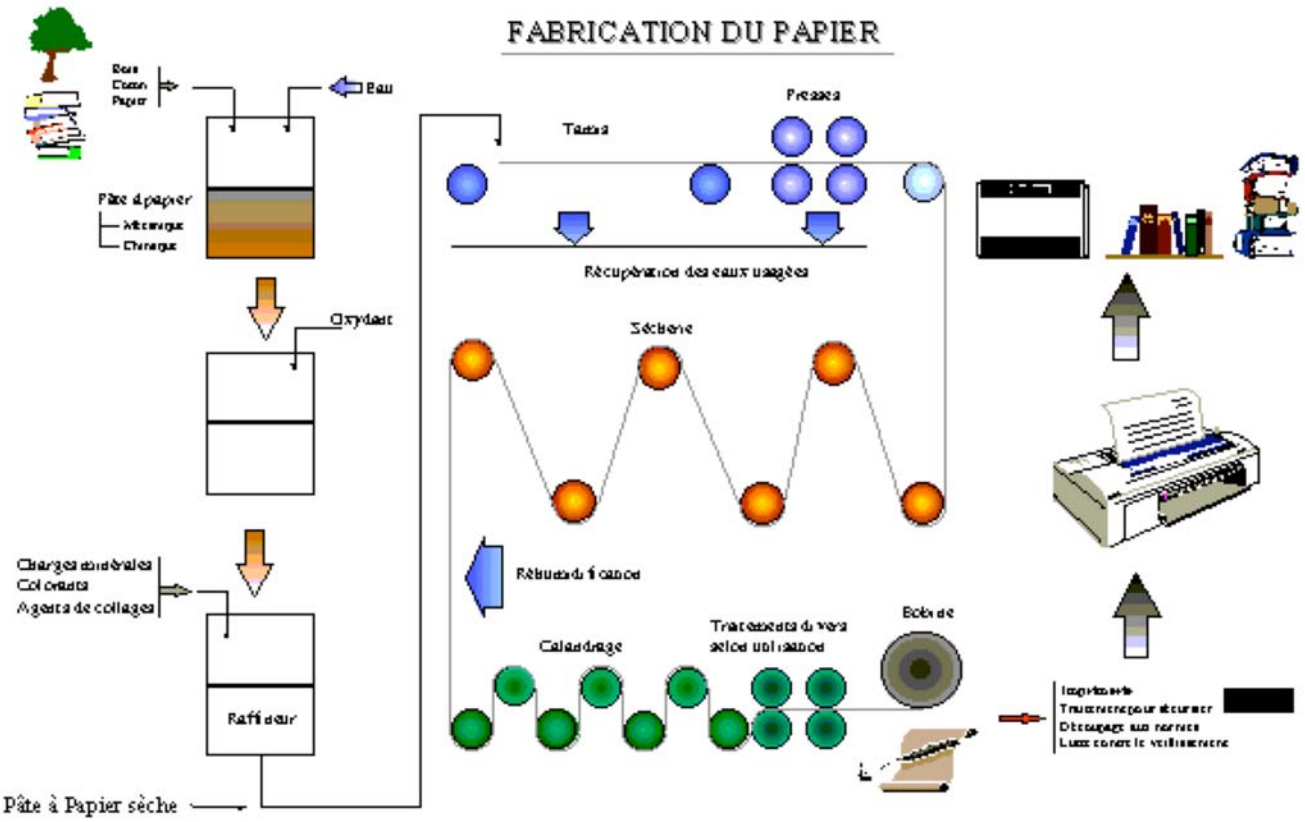


Fibre's Structure

- M : Middle lamella is mainly composed of lignin (70%) and hemicelluloses.
- P : Primary wall is very thin (0.1 to 0.5 mm) and composed of lignin (50%), pectines and hemicelluloses.
- S : Secondary walls are mainly cellulose containing and the thickness of the walls are:
  -S1= 0.1 to 0.2 mm,
  -S2= 0.5 to 8 mm,
  -S3= 0.07 to 0.1mm.

Kraft process=cooking

- Process :
  - 15 to 18% NaOH and 4 to 6% Na2S (dry raw material weight)
  - Temperature of 170 – 175 °C is maintained during 1 to 3 hours.
  - Cooking chemistry : Action of sodium hydroxide on lignin
  - At 140°C, in alkaline conditions, the OH groups are partially ionised.
  - The lignin is then divided up into small soluble units of phenolic type.


FABRICATION DU PAPIER
Bois
Chiffon
Papier
Eau
Pâte à papier
Blanchiment
Charges
Oxydant
Charges minérales
Colorants
Agents de collages
Raffineur
Pâte à Papier sèche
Presses
Tissus
Récupération des eaux usagées
Sécheur
Rétention et floculation
Calandrage
Traitements de surface
Bobinoir
Impression
Traitement pour résumer
Découpage aux normes
Lutte contre le vieillissement

Manufacture of thin and special papers

The manufacture of fine papers is, in Europe, the first use of hemp's fibre by paper industry:

Estimated: > 20 000 tons/year

Flax(short fibers): > 30 000 tons

Manufacture of fine and special papers

- The destination of these papers is :
  - cigarette paper, paper money, tea bags, papers dielectric, cosmetic papers, etc
- The output paper of fibres of hemp is about 60 - 65%

  (Either 20 points moreover than the coniferous trees and 10 points moreover than the leafy trees -Source CTP).

Cigarette paper manufacturing

- **Characteristics of a cigarette paper :**
- **Porosity**, leading to the manufacturing of 20 to 25 g/m² paper.
- **Wet strength resistance and tear index**, (the thinnest the paper, the weakest the strength).
  - The hemp fibre resistance and the fibre length are properly adapted for this application.
- **Opacity.** It is essential for cigarette paper to avoid transparency giving the brown hue of the tobacco inside.
  Due to the thin thickness of the paper, a high mineral filler charge (up to 30%) has to be blended with the fibres to give enough opacity of the paper.
  The filler (generally calcium carbonate) will affect the mechanical properties of the paper but will have a positive effect on the porosity.
- **Brightness**
- PROCESS: mainly Kraft process.

RECYCLED PAPER

•In Europe, the recovery and the re-use of old papers reached such a level that the quality of reclaimed fibre starts to decrease.

•This situation involves the recourse to a greater use of virgin fibre of reinforcement in the shape of paste of coniferous tree.

•Rebuilding of the pulp plants of Rosendal and Stendal(Germany), with the process kraft.

RECYCLED PAPER

- It is generally admited that it needs 5 to 10% fibres of reinforcement (long fibres) to give again force with paper to be recycled.

- As the paper output of hemp is 60 - 65%, = 20 points moreover than softwood, the use of hemp is technically more interesting because it saves matter and costs of treatment

Recycling paper with all hemp's straw: France

• Instead of using fibre alone -30% of the plant-, papermakers crush all the straw of hemp -100% of the plant-.

• According to this process, they add 15 to 20% of hemp to volume to be recycled.

- •Technical interest is obvious.
- •Economic interest.

Process tested by a french papermaker in North of France.

Paper recycling with all hemp's straw: USA

- Researches by The Foundation Herty - Savannah (Georgia) on the use of fibres of industrial hemp in the manufacture of paper.
- Results obtained : by introducing fibre of hemp into paper to be recycled at the rate of 33% the produced paperboard can be recycled 8 to 9 times.
- Without this addition the paperboard can be recycled only from 3 to 4 times.


Thank you
Merci
Spassiba
Grazie mille
Danke schöen