

# Северский Промышленный Колледж (СПК)

## Презентация на тему: The invention of paper

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# History of invention

Cai Lun Paper established in 105 AD Before Cai Lun paper in China, made of hemp, and even earlier - of silk, which is made from silkworm cocoons defective. Cai Lun rastolok mulberry fiber, wood ash, rags and hemp. All this he mixed with water and put the resulting mass to form (wooden frame and sieve made of bamboo). After drying in the sun it is this mass smoothed with stones. The result is a solid sheet of paper.

After the invention of Cai Lun papermaking process began to improve rapidly. Steel added to increase strength the starch, glue, coloring agents, and natural. D.

At the beginning of the century VII papermaking process becomes known in Korea and Japan. And even after 150 years of war gets over to the Arabs.

In VI-VIII centuries, paper production was carried out in Central Asia, Korea, Japan and other Asian countries. In the XI-XII centuries the paper appeared in Europe, where he soon replaced animal parchment. With the XV-XVI centuries, due to the introduction of printing, paper production is growing rapidly. The paper was produced very primitive - manual grinding weight wooden mallets in a mortar it forms a mesh bottom.

Of great importance for the development of the production of paper was the invention in the second half of the XVII century grinding machine - roll. At the end of the XVIII century rolls has allowed to make a large number of pulp, but handmade (scooping) retards the growth of paper production. In 1799 NL Robert (France) invented papermaking machine, mechanized tide paper by application of endlessly moving grid. In England, the brothers G. and C. Fourdrinier buying patent Robert, continued to work on the mechanization of low tide and in 1806 patented a paper machine. By the middle of the XIX century, paper machine into a complex machine that runs continuously and largely automatically. In XX century the production of paper becomes a major branch of industry with highly mechanized continuous-flow process diagram powerful thermoelectric power stations and complex chemical workshops for the production of fiber intermediates.



# Appointment

- A. For writing and printing (books, magazines, newspapers, notebooks)
- B. The finishing materials (wallpapers)
- C. Ornamental material (origami, applique)
- D. The packaging material (candy wrappers, bags, boxes)
- E. Cleaning materials (towels, napkins, handkerchiefs, toilet paper)
- F. The fibrous filter material (filter paper)
- G. The insulator in the production of capacitors
- H. Manufacture money
- I. The substrate for the application of chemicals (photographic paper, test paper, sandpaper)



# Production technology

To prepare the necessary paper plant substances that have long enough fiber, which, mixing with water, give a homogeneous, plastic, paper pulp. Semi-finished products for the production of the paper include:

- wood pulp or cellulose;
- cellulose annual plants ( hemp, rice, and others);
- hemicellulose;
- waste paper;
- Rag half-stuff;
- Special types of paper: asbestos, wool and other textile fibers.

Paper consists of the following processes:

- preparing pulp (grinding and mixing the components, sizing, filling and coloring of the pulp);
- production of paper pulp in the paper machine (dilution with water and clean the mass of dirt, tide, pressing and drying, as well as the primary finishing);
- finishing (cutting);
- sorting and packing.

When grinding the fibers give the necessary thickness and physical properties. Grinding is done in devices periodic and continuous action (roll, conical and disc mills, refiners and others). To make the paper suitable for writing and give it hydrophobic properties, the pulp is introduced rosin glue, paraffin emulsion, alumina and other adhesion promoting substance (so-called sizing); to enhance the connection between the fibers and increase the mechanical strength and hardness is added starch, animal glue; to increase the strength of paper in the wet state - urea formaldehyde and melamine-formaldehyde resins. To improve whiteness, smoothness, softness and opacity, as well as improve the printability of paper injected mineral fillers (kaolin, chalk, talc); to give color and enhance the whiteness - aniline (less mineral) dyes. Some papers, such as absorbent and insulating, produced without sizing and filling. Paper from hemp supply and rice paper whiter paper from wood pulp, so often do not require additional chemical bleaching fibers.

Finished pulp concentration of 2.5-3.5% by the pump is fed from the preparatory department of the mixing in the pool, where it comes from on the paper machine. Pre mixture is diluted with recycled water (up to a concentration of 0.1-0.7%) and passed through sewage treatment equipment (sandboxes, vortex and centrifugal cleaners).

The most common is the so-called dining room (with a flat mesh) paper machine. It consists of a grid, press and dryer section and reel. The furnish a continuous stream flows onto a moving mesh closed in the ring of the machine where there is a low tide, dewatering and compaction of the paper web. Further dehydration and sealing webs produced in the press section, formed by several roller press, between which rolls the paper web is transported throughout the whole process cloth serving as an elastic gasket. The final removal of water takes place in the drying section, where the paper web is alternately in contact with its surfaces heated by steam drying cylinders arranged in a checkerboard pattern in two tiers. Obtain a smooth surface of the paper because it is pressed against the upper and lower cylinders felts. The resulting paper web is wound onto rolls in the reel, which is a forced rotating cylinder, which is pressed against the platen with wound on his paper.

Then the paper can be processed in a supercalender, which is a battery of vertical metal shafts 5-8. When moving



# Interested facts

- A. According to the known empirical law, plain paper used in most offices (that is, an ordinary writing paper, medium weight and size), it can be folded in half more than seven times not.
- B. Every year, every American receives an average of about 10 kg of mail advertising market, which generally amounts to almost four million tonnes. If spam has become such a distributed exclusively over the Internet, the 150 thousand trees a year would be saved.
- C. Recycling paper not only saves the life of trees, but also saves other material resources and energy - 240 liters of petrol; 4000 kW / h of electricity, 260 thousand liters of water, 3 cubic meters of land.
- D. Greenhouse gases are one of the leading causes of global warming. Calculations have shown that they have been able to reduce emissions by 1.6 million tons, if the car in the United States was less than 280,000. In this regard, should bring some interesting facts about the paper: if the United States reduced its consumption of only 10% have been able to achieve the same effect.
- E. Recycling not only requires half the electricity, but it also has 2/3 fewer harmful emissions.
- F. Over the past two decades, the consumption of paper in the world increased 2.5 times - from 92 to 208 million tons annually. Even electronic documentation was not able to reverse this trend.



