

Paper Industry

Paper in general

The ancestor of the pulp paper making process that is used today is considered to be developed by a Chinese man named Tsai-Lun during the early 2nd Century.

Paper and similar products like cardboard are made from cellulose fiber that comes from various sources (wood, rags, grasses). The cellulose fiber is extracted with either chemical, mechanical plumping or a mix of both. After the wet fiber mix has undergone various treatments it is ready for pressing and drying.

Today's highly sophisticated printing, drawing or packing machines process this thin and sensitive material at an incredible speed. It is essential to adjust these high performance machines to the individual characteristics of the paper type. Deviation of the paper properties must be avoided at any cost.



A constant environment and a well-conditioned paper fiber is crucial to maintain efficient high speed production while producing a high quality product.

Humidity and temperature measurement and control are critical to maintaining the precise and constant environment.

Why the need to measure humidity?

Controlling humidity in the paper industry is essential for many factors. An incorrect level of %ERH or moisture content in the paper will have the following effects on product and process:

Static electricity

From time to time printers experience difficulties due to static electricity phenomena (paper sheets stick together etc.). This happens mostly when both paper and the ambient air are too dry.

Dimensional changes

Vegetable fibers are highly hygroscopic and therefore absorb and desorb humidity resulting in a swelling or shrinking of paper fibers. At approx. 50%ERH, a humidity change of $\pm 10\%$ RH results in a length change of typically 0.1 – 0.2% of the paper. Such a humidity variation

would give a 1 to 2mm variation on a 1 x 1m sheet of paper and therefore inaccurate printing results (poor positioning of paper).

Dust

Too dry paper generates dust that will lead to a layer of dust negatively affecting the printing quality.

Deformation

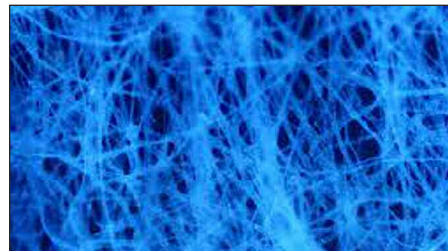
Deformation of the paper may occur if too much moisture is exchanged with the surrounding atmosphere through the edges of the stack or roll. An uneven distribution of moisture within the roll or stack will eventually lead to rippled paper.

Ink drying time

High values of %ERH and/or low temperature result in longer drying times after printing which will slow down the print production process.

Best humidity level

A humidity level between 50-60%ERH is suitable for working with paper in any production process. Ambient air around the paper production process should not vary more than $\pm 8-10\%$ RH from a level that will maintain this level of %ERH.



Paper under a microscope shows how the fibers intertwine. These fibers are about $10\mu\text{m}$ in diameter.

Facts & Figures

- China is the world's largest producer of paper and paper products manufacturing 25% of the world's paper which is equivalent to nearly 100 million tons. The next largest producers are United States, Japan, Germany and Canada.
- The world's annual paper consumption in 2011 was 399 million tons.
- Benjamin Franklin was the first paper merchant in America. He helped start 18 paper mills in Virginia and surrounding areas.
- Recycling is becoming more and more important in our modern society. Every day, U.S. paper makers recycle enough paper to fill a 15 mile long train of boxcars.
- Paper was invented in China around 105 C.E.