

## What do these terms means?

### Acid free

Often, acid free paper is a required part of material quality, required for archive cartons, or required by the customer.

### A short review

Since around 1850, pulp grinders have been used on an industrial scale to allow paper to be produced from the valuable resource of wood. Since around 1879, there are approximately 340 pulp grinding facilities in Germany alone.

Groundwood pulp paper has proven to be problematic due to the residues of different acidic substances found in ground pulp mass. In industrial production, defibrated mechanical wood pulp (lignocellulose) must always be treated. During the chemical pulping process, acidic substances occur when the sulfite method is used. Other pulping methods use chlorine compounds and acetic acids. These complex mechanisms lead to yellowing and to a considerable reduction in levels of tensile strengths (tear resistance), wet strength and bending resistance at the final product stage. This becomes noticeable in paper "breakability". This reduced paper stability is a result of the catalytic splitting of cellulose molecules due to the presence of acids that occur in the form of progressive chain reductions.

The main reason behind yellowing of groundwood pulp paper is the occurrence of lignin and related decomposition products (mainly aromatic compounds).

Some people equate groundwood pulp paper with *acidic paper* – which is technically incorrect. Acidic paper is a result of the production process and of certain chemical additives found in paste application. Groundwood pulp paper tends to yellow strongly and quickly lose its elasticity. Unfortunately, cheap groundwood pulp and paste application (discovered in 1806) using saponified resins were used on mass scales. After 1846, following the discovery of groundwood pulp technology by Friedrich Gottlob Keller, and then throughout the first half of the 20th century, cheap groundwood pulp and paste application (gluing) had particularly harmful internal effects on paper testimonies such as books, graphic illustrations and maps.

Restoration is complicated: due to the high rate of cellulose decay, restoration is only possible through mass de-acidification and retroactive stabilization methods (such as the paper splitting method).

We can see that groundwood pulp paper was not only a factor in the cost-effective production of paper, but was also a great source of damage to written records during the 19th and 20th centuries.

### **In the last 30 years**

Since the 1980s, highly valuable publications and graphic illustrations have been largely printed using age-resistant, or “acid-free“ paper. This means the paper is free of chemical additives, free of free acidic substances and avoids free chlorides. Age-resistant paper is subject to DIN ISO 9706 standards.

In addition to stability values (which are more relevant for paper processing than for aging characteristics) DIN-ISO 9706 and German industry standards for age-resistant paper cover the following aspects which are decisive in determining age resistance:

- Producing paper in a neutral or alkaline area,
- Complete avoidance of potassium alum and other substances,
- The use of a mild alkaline buffer (calcium carbonate) as a filler (only in this production mode) ,
- Avoidance of lignified fibers (lignin)

### **How are archive cartons affected?**

Archive boxes are also subject to high standards. Whether a carton will truly help or damage its content critically depends on the materials used for carton construction. When the phenomenon of acid migration became known, manufacturers and users of archive cartons had to re-think their approach: Cartons that contained acids (which until then included all chipwood archive boxes available on the market) were damaging because acids in the carton materials migrated onto the papers stored within them. Even papers which were not endangered before and which contained no acid-forming substances themselves could become acidic.

As a result, demands were made that archive cartons should be acid free. Soon quality was improved by including an alkaline reserve in the cardboard. This could neutralize acid components that were already present in archived materials, or that were added from the environment. Yet it was also possible to use materials containing acid-forming components (e.g. recycled paper) since the acids contained therein become neutralized for some time. Finally, the new developments led to even higher quality requirements. The carton materials selected not only avoided the use of acidic substances, but avoided any components that could lead to acid formation.

Paper materials that meet these requirements may be designated as age-resistant. To attain this high quality standard, no material containing wood pulp can be used in making paper (e.g. the same pulp-free standards as when producing acid-free paper). As well, recycled paper cannot be used either, because its exact composition is unknown, and we can always assume that some wood pulp and acid containing materials are included.

Fact: Both DIN ISO 9706 and DIN ISO 16245 standards contain clear specifications that guarantee acid-free products, so you can be certain of your purchasing decisions.