

Paper Conditioning & Characteristics



Sappi Printer Technical Service

877 SappiHelp (727 7443)

Paper and Environment

Hygroscopic in nature, paper is constantly changing to reach equilibrium with its environment. Like a sponge, it absorbs or loses moisture relative to the extremes of exposure and the surrounding atmosphere. The hygroscopic properties of paper vary from grade to grade, but dimensional stability and superior press performance is best assured when paper is fully acclimated and stabilized to a properly controlled and climatized pressroom.

Ideal climate control is 45% ($\pm 5\%$) relative humidity at 72° ($\pm 5^\circ$) F. for North America and 52% ($\pm 5\%$) at 21° C. in Europe. Even if climate is not controlled in the pressroom, it should be monitored for both temperature and relative humidity to determine the length of time needed for paper to acclimate.

- All Sappi grades and products are shipped in moisture-resistant packaging to ensure dimensional stability and flatness. Since temperature extremes vary during transit and storage, paper should be allowed to acclimate to pressroom environment in original skid, roll, carton, or ream wraps and should not be opened until going to press.
- Acclimation time is relative to the temperature differential between pressroom and paper in conjunction with the volume of paper in question. The basic consideration for minimal differences is 24 to 36 hours.
- Properly conditioned paper runs with a broader operating window on press.
- After packaging is opened, the paper mill cannot be held responsible for problems due to moisture imbalance or other environmental conditions adversely affecting the paper in the printer's facility.

Characteristics of Sheetfed Paper

- Wavy edges usually result when paper is exposed to an increase in relative humidity. The edges absorb moisture and expand while the center of the sheet remains relatively unchanged. This condition can also result when cold paper is unwrapped in a warm pressroom. The surrounding air will quickly cool and, as condensation takes place, the unprotected paper can take on moisture. Cold paper also has less resistance to picking and delamination.
- Tight edges, where the edges lose moisture and contract, are caused when the relative humidity (Rh) of the pressroom is significantly lower than the Rh of the paper. This condition may also result when warm paper is unwrapped in a cold pressroom. The surrounding air will quickly warm and lower its relative humidity, causing the unprotected paper edges to lose moisture and tighten while the center of the sheet remains relatively unchanged.

Paper Conditioning & Characteristics (continued)



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- Since paper fibers exposed to moisture fluctuations expand and contract more in diameter than in length, grain direction will affect the way paper responds to its environment and how it performs on press. Paper will expand and contract more in the cross-grain direction when exposed to moisture changes. This is one of the reasons for short-grain instability on press when grain direction is the same as press direction and register fan-out is often experienced. Exacerbating this problem could be that short-grain paper is typically cut down from parent sheets at the printer and sometimes left exposed until the pressroom is ready to run. This exposure leaves the paper very susceptible to distortion which may negatively impact press performance.

Adversely exposed paper resulting in either an unstable wavy or tight-edge condition can cause slur, misregister, and/or wrinkles on press. A tight-edge condition may also cause blanket pre-slap during impression resulting in tail-edge slur or doubling. For either condition, it may be helpful to cut-out the blanket packing on the outer non-image edges to allow the sheet some relief during impression squeeze.

High relative humidity and excessive moisture can retard ink drying, and low relative humidity and reduced moisture can cause static build and cracking at the fold.

Characteristics of Web Paper

- Since web rolls are tightly wound and subjected to only one continuous pass under controlled tension, relative humidity is not as critical as the affects of temperature in the web pressroom. This is assuming that rolls are not prematurely unwrapped or stored unwrapped.
- Rolls should remain wrapped until they have properly acclimated to pressroom temperature. Only the end headers should be removed when the roll is ready for shafting. The outer wrap around the roll should remain intact until staging for press paste.
- Similar to sheets, prematurely unwrapped cold roll stock exposed to warm pressroom air will pick up moisture through condensation, which may result in soft, baggy edges or unstable paper on the outside windings. Cold paper also has less resistance to picking and delamination.
- Moisture content is a very important consideration for web rolls, particularly heavier basis weight text and cover grades. Since web paper is manufactured to lower moisture than sheets, it is more susceptible to moisture pick-up if the outer wraps of the roll are adversely exposed to high relative humidity. Some web grades are manufactured with higher surface porosity as compared to sheets, which further increases this vulnerability.

Baggy or swollen ends can result in dot slur, tension control problems, inconsistent web alignment and misregister. High moisture pickup in the outer wraps of the roll may cause blistering after roll paste.

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Storage and Handling

- Avoid storing paper in areas that are subject to extreme temperature changes such as heated objects, vents or cold walls. Paper should never be stored in direct contact with concrete, where it may be exposed to moisture or damp conditions.
- Rolls should always be stored on their ends, not on their sides. Prolonged storage on their sides can cause them to become out-of-round or otherwise damage the outer windings and edges.
- Avoid excessive clamp pressure which may smash cores or misshapen and damage rolls. Recommended clamp pressure is between 2100–2300 psi (145–150 bar).
- Minimizing paper's exposure to high or low humidity is particularly important when multiple press passes, per side, demand a consistently stable sheet.
- Check stock for temperature acclimation with pressroom. Relative humidity testing is recommended when tight register and multiple-pass performance is critical. Testing can be done with a high-quality paper sword or probe stabbed between sheets within the load, measuring both temperature and relative humidity as compared to ambient pressroom climate.
- Unwrap paper only as needed to avoid adverse exposure, especially if there is a chance the job may not run as planned.
- Monitor and control load temperatures when using IR drying or UV curing. Maintain load temperatures below 95° F. (35° C.).
- Unused paper should be wrapped in plastic or sealed in original cartons. Printed loads should be covered between passes on press. Avoid cutting paper any sooner than necessary before going to press and protect paper with moisture-proof wrapping immediately after cutting.
- Tight-edged paper can, at times, be reconditioned by exposure to higher levels of humidity through use of a humidifier in a confined area, or if possible, re-trim affected edges to relieve stress.
- To avoid wavy edged paper when pressroom relative humidity is too high, turn pressroom heat up to a maximum of 85° F. (29° C.). The relative humidity will decrease as the temperature rises.
- For wavy edged sheets, try conditioning the paper through the press on impression (without moisture) and pre-warm with the IR dryer or the strip heaters above the feedboard.