

Lessons in Labeling: The Paper Face Sheet

In our previous two issues of the Artcraft News, we wrote about the release liner and the pressure sensitive adhesive. The final part of the pressure sensitive label construction is the face sheet. We will cover this topic by addressing paper face sheets in this issue of Artcraft News and film face sheets in our next issue.

Paper Manufacturing Process

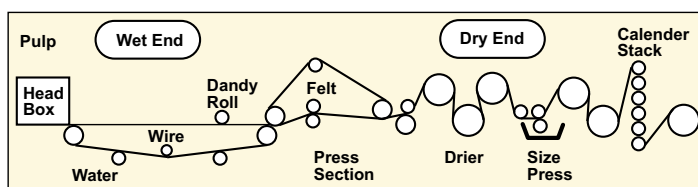
Understanding the paper manufacturing process is important in understanding paper pressure sensitive products. The various grades and physical properties will determine the ultimate performance of the paper label. The paper making process is divided into three main segments, each having an effect on the final appearance or physical properties of the paper. The segments are: Pulping, Process, Paper Formation, and Finishing Operations.

The first stage in the paper making process is the making of pulp from wood. Most wood products consist of cellulose fibers cemented together with a substance called lignin. The main goal of the pulping process is to separate the wood into individual fibers called pulp. Additives and fillers are blended with the pulp and water to improve some basic paper characteristics. Internal sizes are additives designed to control the excessive and rapid penetration of water or inks through the sheet. Fillers are intended to increase the opacity and improve the printing qualities of the sheet. The pulping process can be accomplished in one of two ways: Mechanical Pulping or Chemical Pulping.

Mechanical wood pulp is also known as ground wood because the pulp is created by grinding logs into very small particles. This type of wood is not typically used in the pressure-sensitive industry because the grinding operation destroys the strength of the paper. Also the lignin that was used to hold the fibers together has not been removed and will begin to yellow and deteriorate over time. Pressure-sensitive materials that do use ground wood include tamper resistant papers because of their low tear strength.

Chemical wood pulp is a process by which the lignin that holds the fibers together is chemically dissolved leaving the fibers behind to form the pulp. This type of pulping operation results in a stronger paper fiber which will not yellow or deteriorate with age. Most pressure-sensitive paper stocks are made from chemical wood pulp.

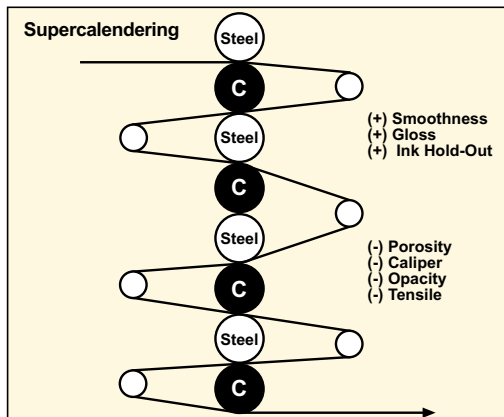
Figure 1.



The second stage in the paper making process is the paper formation. The pulp blend is mixed with water creating a pulp/water mixture, which is 99% water. This mixture enters the paper machine through the head box, which meters the mixture onto a continuously moving wire belt. The water will drain from the mixture through this wire belt. The movement of the wire belt past the opening in the head box causes the paper fibers to line up in the direction that the web is moving. This affect causes what is known as grain direction of the sheet. The cross direction (CD) of a sheet is the direction across the web or grain. The machine direction (MD) is the direction of the web through the paper machine or parallel to the grain. Paper is weaker and more flexible in the machine direction than the cross direction. This is why a paper label will wrap a cylinder with less “flagging” when the grain of the paper goes up and down the cylinder rather than around it. When a label must be applied with the grain going around the cylinder due to automatic applications, an adhesive strong enough to withstand the tendency to “flag” should be used.

Calendering is the final operation of the paper making operation. The calendering operation compresses the paper between a series of steel rolls or cotton rolls. As the calendering increases, the sheet becomes smoother and glossier. At this point in the operation, the caliper of the sheet will be determined.

Figure 2.

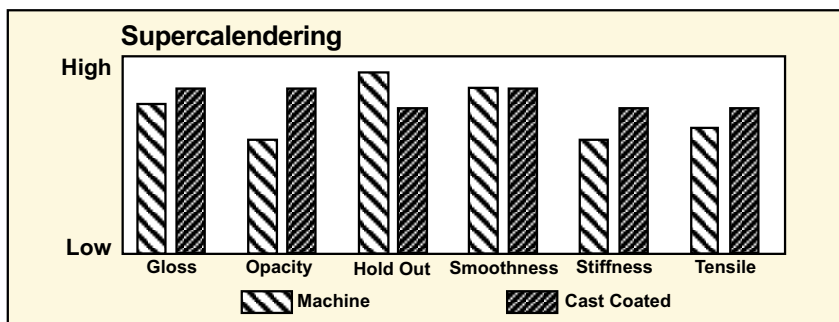


Finishing is a term used to describe a variety of operations that are performed to the paper “off machine” or in a separate procedure from the manufacture of the base paper. Finishing procedures include: Supercalendering, Surface Coatings, Cast Coatings, Embossing and Slitting.

Supercalendering is the off machine version of machine calendering. The operation consists of passing the web of paper between a series of cotton and steel rollers which are under high pressure. The process compresses the paper fibers and changes the properties of the sheet. The supercalendering operation can be used to process both uncoated and coated papers. Supercalendering will increase the smoothness, the gloss, and the ink hold out of the sheet. Supercalendering will decrease the tensile strength, opacity, and caliper of the sheet.

Coatings can also be applied “off machine” to improve the print qualities of the paper. Cast Coating is used to increase the gloss of the sheet without calendering it. The cast coated gloss paper is created by coating a web and drying the coating in contact with a highly polished drum called a casting drum. As the coating dries, the sheet takes on the same appearance as the drum creating a smooth glossy surface. A term sometimes used to describe a cast coated paper is Kromekoat which is a trade name for Champion Papers cast coated paper. A cast coated paper differs in many ways from other types of gloss papers that have been calendered. The opacity, strength, and stiffness of cast coated papers are higher than supercalendered papers.

Figure 3.



Papers label stock is often chosen for an application because of their relatively low material cost when compared to film labels. It is important to choose the correct paper for the best performance for an application (see fig. 4).

Figure 4.

