 

# Bridging the Gap between Paper and Printing: A Perspective from the Paper Industry

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A movement to span the communication gap between papermakers and printers has begun. As printing technologies evolve and their demands get ever more specific, the need to narrow this gap becomes more critical. At present, there is not a robust flow of information between these two major industries. This lack creates needless waste and frustrated users. Unless and until some sort of communication channels can be established, these conditions will not change appreciably.

This presentation outlines the first steps in the establishment of a program to develop this communication. Although the technical and logistical elements are numerous and complex, there is so much room for improvement that something valuable is almost certain to arise from the work.

Printers need papermakers. They need them to make paper. They need them to understand the printer's requirements and specifications for jobs in this era of extreme specificity. They also need them to understand their problems and how they need to be addressed.

**Papermakers Need Printers**

They need them as customers. They need them to specify what qualities the paper needs. They also need to learn about the printer's customers. Papermakers cannot act as if they exist in a vacuum, because papermaking is a process, not an end-point. Both sides need to learn to speak each other's language. The development of a common vocabulary of technical understanding is the critical first step. Making this first step requires a close examination of those elements of the papermaking process that affect printers. Formation is a good place to start.

## Definition of Paper Formation

Paper formation is defined as **point-to-point variation in basis weight**. In addition to basis weight distribution, formation also determines various physical characteristics, such as surface topology, shear strength, coatability, etc. It is certain that the fiber structure of a sheet is a major determinant of many other factors.

In spite of its intuitive importance to the process, no formal quantification of formation exists. Lacking an official definition of measurement, there is in its place only a variety of methods to measure it. My company has been developing formation inspection techniques for the last twenty years.

The baseline standard for measurement of formation in the paper industry is a person looking at a sheet with a light behind it, and then assigning a value judgement to it. Although imperfect, no one expects this methodology to change any time soon. Any instrument-based system must respect this condition.

Regardless of the method used to examine formation, its primary components are basis weight uniformity, floc and void structure, and fiber orientation. Each of these will exert a different effect on the sheet and its behavior.

The uniformity of the fiber's distribution will impact the sheet's surface topology, coatability, and various strengths. It is intuitive that a sheet with more uniform distribution of fiber is a better sheet. This notion is not easily proven, and I will not attempt to do it here. It is, after all, possible to get good printing on bad paper, and vice versa.

Floc and void structure is the expression of the fiber's uniformity. Uneven floc and void structure can result in uneven coating, which leads directly to poor printing. Floc and void sizes, both absolute and relative, must be constantly monitored.

Fiber orientation results from the difference in speed of the pulp and the moving wire on the Fourdrinier bed. It is expressed geometrically by a machine direction/cross direction (MD/CD) ratio. Fiber orientation is affected by adjusting the ratio between these two speeds (among other items). Orientation is a major factor in a sheet's tendency to kink and curl when printed.

Orientation can be measured in the lab in several ways (sonic, optical, tensile), but at that point the sheet of paper is finished. The goal is an on-line measurement system that can control the MD/CD ratio to a specification determined by the eventual use of the paper. Imagine a sheet that did not warp **at all** when going through a laser printer...

Print quality depends on many factors. Among them are mottle, gloss, speckle, and ink hold-out. Each of these has some reliance on formation, chemical composition, treatment, and ambient conditions. The key is to develop ways to assign responsibility for a given condition to a particular cause.

How much does printing depend on formation? That is what we attempting to answer, and then to measure and

quantify. Correlations between production conditions and results must be carefully monitored.

The ultimate goal of this work is to develop a means of communication between papermakers and printers. In that elusive perfect world, a printer could alert a papermaker about a certain customer's needs, and the papermaker could optimize his production to suit that particular need.

Although the goals stated here may seem audacious, even unreasonable, there is no reason to doubt that considerable progress can be made. The vast improvements in measurement and communication technologies provide a base. Once the two industries get together and commit to finding solutions, progress is inevitable.

## Biography

Paul Kallmes leads development projects at M/K Systems, a manufacturer of quality control and laboratory test instrumentation for paper and related industries. He has extensive experience in the application of formation analysis software and hardware to new application, such as printability.