US Ink® A Division of Sun Chemical Corporation

Estimating Ink Mileage

Volume XXVI

Ink mileage is usually defined as the number of copies produced with a pound of ink, or more commonly quoted in the newspaper industry as the pounds of ink required to print a ton of newsprint. Estimating ink mileage has always been a difficult task. This is because there are several interesting factors that control the amount of ink required to achieve the final ink density. The factors that most influence the ink requirements are as follow:

Strength of the ink
Newsprint
Print Density Control
Ink and Water Balance
Print coverage

Strength of the ink

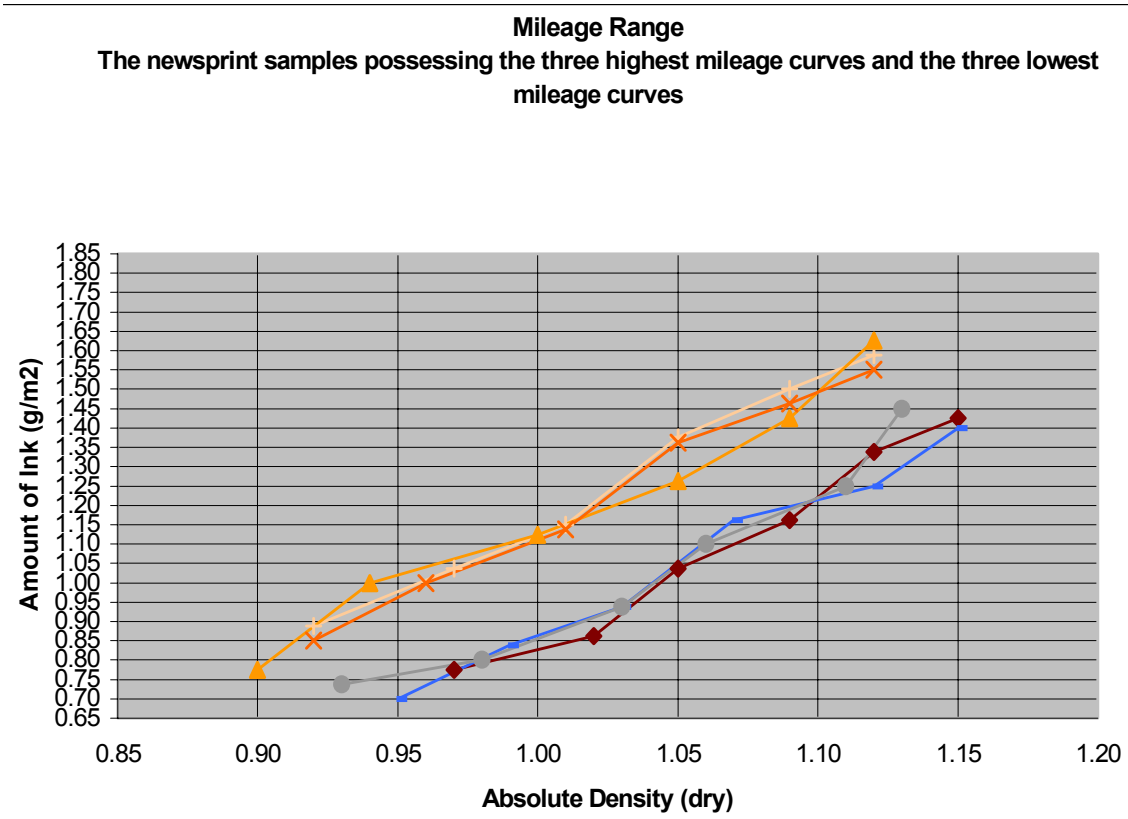
Ink manufacturers look at the strength of an ink or level of pigmentation. The strength is a critical factor in determining the ink film weight requirements or thickness on the final print. For the newspaper market there are industry specifications for a set of inks called AD-LITHO®. The NAA establishes these specifications for a set of process inks that have standardized shade and strength requirements. Some printers have found it valuable to go outside of these guidelines and use a set of stronger inks. If the ink manufacturer maintains the shade of the AD-LITHO inks but increases the level of pigmentation, then these inks are classified as AD-LITHO Plus. The key factor here is the level of pigment in the final ink formulation which determines how much ink is required to achieve density. The pigment is the ingredient in the ink that either absorbs or reflects light. When ink is printed on paper, what we are trying to do is to change the light reflection off of the paper so that the reader perceives color. The pigment type has certain characteristics to achieve this. We cannot change this property, but we can put more pigment into an ink so that the ink film thickness required to achieve density can be decreased.

Newsprint

The substrate that the newspaper is printed on can also be a major factor in determining ink mileage. Many people would think that this would not be a major factor. To understand this better, we have to look at the surface characteristics of the newsprint and how the ink is applied to this surface.

Newsprint is made of fibers that are pressed together to form the paper. The surface is not smooth, and depending on the uniformity, will change the level of ink required to achieve the final print density. A newspaper is printed by the coldset process, which means the ink dries by absorption into the sheet. So, the level of ink required can change with the newsprint's physical characteristics, (smoothness, absorption, etc.).

To illustrate this difference better, we evaluated 35 different newsprints and measured the volume of ink required to achieve density. This was done in the laboratory using a Prüfbau printability tester. This instrument allows us to accurately measure the weight of ink transferred to the newsprint at the time of printing. The following graph shows the highs and lows of the different newsprints tested. The graph plots ink density vs. ink weight requirements.

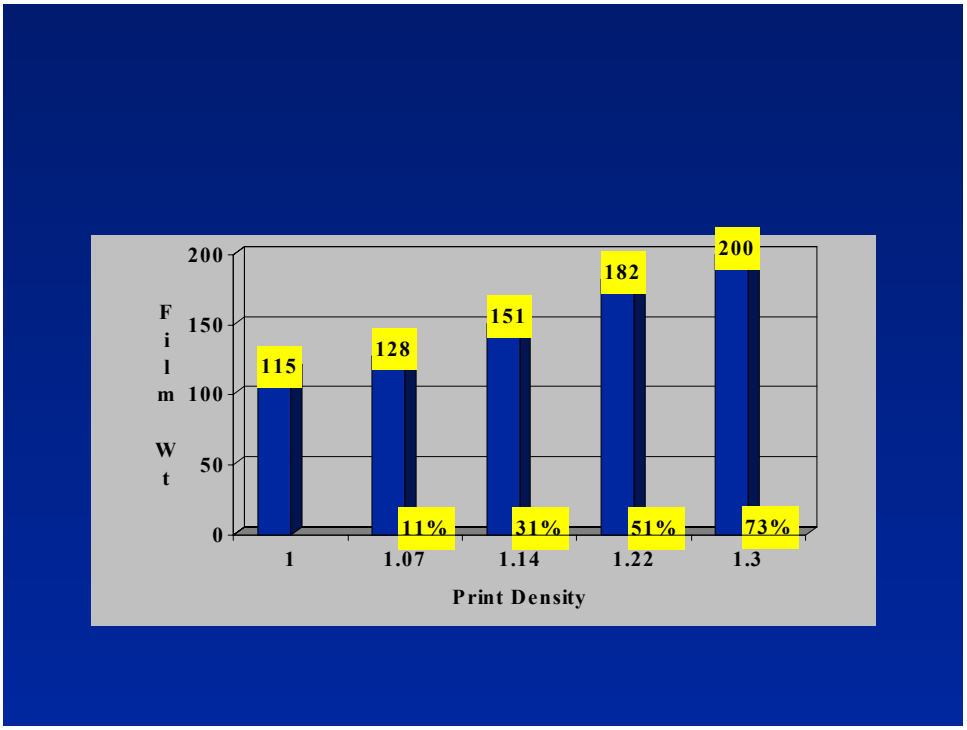


Our study showed that the weight of ink required to achieve SNAP density could vary by as much as 30%.

Print Density Control

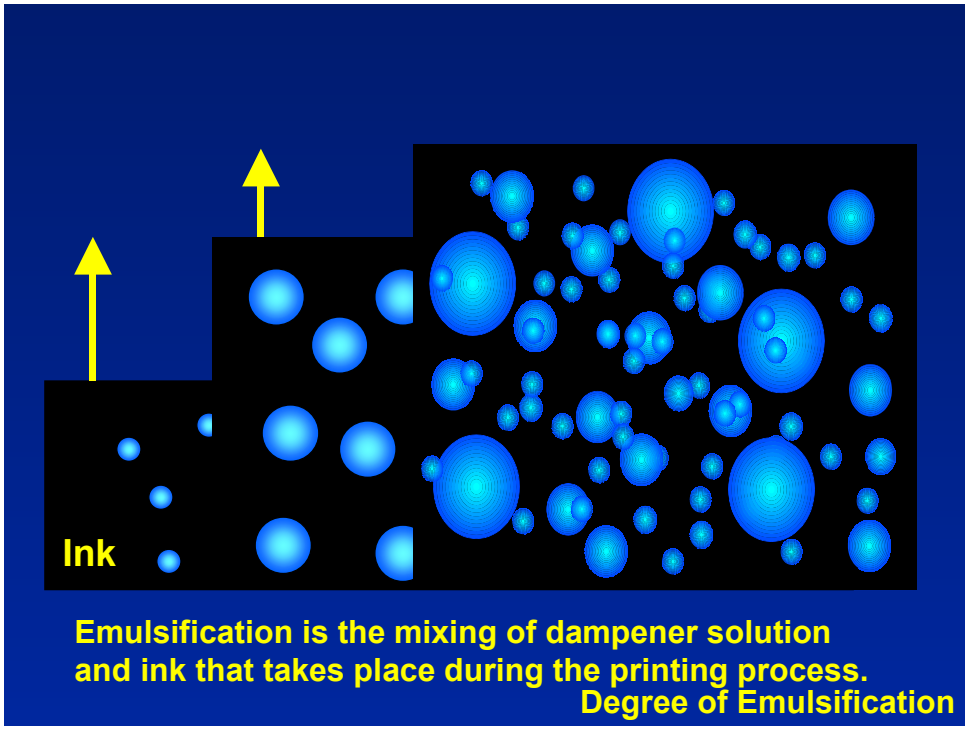
Print Density is measured with a Densitometer. The Densitometer is an instrument that measures the amount of light reflected off of the surface. As explained earlier, the pigment level in the ink determines how it will absorb or reflect light. In order to do this on press the operator cannot change the level of pigmentation; they can only increase or decrease the film thickness of ink to achieve a density change.

The density function of a Densitometer is based on what is referred to as a logarithmic function. The level of ink required to achieve this also follows this same logarithmic response. This means that as the density is increased, it will require progressively larger amounts of ink to affect a change in density. For example, an increase in print density of 20% (from 1.0 to 1.2) requires an ink film weight increase of 58%. This film weight percentage increase is over double the percentage of the print density change. The ink requirement changes in density are illustrated in the following chart. (See Technical Bulletin IV How Does a Densitometer Work for more information on this section).



Ink and Water Balance

The setting of the proper ink and water balance has always been a key part of the process of Lithography. Ink and water balance can be reviewed in Volume X of the Technical Bulletins, but it is key to remember that as the levels of ink and water are increased on press, ink mileage can be inadvertently affected. The following figure illustrates the increase of the ink film as increased fountain solution is applied.



Print Coverage

The final factor to be discussed is probably the most critical factor in determining ink mileage. This is the coverage of area printed on a sheet of newsprint. The coverage will be determined by the ad designer or page layout person. Color ink coverage can be dramatically changed in the design or layout of the page. The following figure illustrates these differences:

	12% Coverage			20% Coverage			25% Coverage			30% Coverage			45% Coverage		
	C	M	Y	C	M	Y	C	M	Y	C	M	Y	C	M	Y
AdLitho	3.0	3.4	3.5	5.0	5.6	5.9	6.2	7.0	7.4	7.4	8.4	8.8	11.2	12.7	13.2
Spectra	2.2	2.0	2.5	3.7	3.4	4.1	4.7	4.2	5.1	5.6	5.1	6.2	8.4	7.6	9.3
Spectra Max	1.8	1.5	1.7	3.0	2.5	2.8	3.7	3.2	3.5	4.5	3.8	4.2	6.7	5.7	6.4

Estimated Pounds of Ink Per Ton of Newsprint

Note: Calculations are based on a 50 inch web, US Tons for Newsprint, and 30% of the pages of the Newspaper are printed in color, i.e. 20 color pages in a 64 page product.

Conclusions

As we have shown, the exact determination of ink mileage can be a difficult task. The best way would be to determine an average mileage factor for a particular ink over a long period of time, so that some of these variations could be averaged out.