US Ink® A Division of Sun Chemical Corporation

How is News Ink Quality Controlled?

Volume XX

The Quality Control of news inks consists of several tests that must be satisfied in order for a batch of ink to be approved. The following tests are performed on each batch of ink that is produced:

1. **Grind**
2. **Viscosity**
3. **Tack**
4. **Strength/Shade**
5. **Water Pick Up**

Quality control tests are designed for testing the critical properties of an ink important in high speed printing.

Grind

The Agrind@, as ink makers typically refer to is the fineness of the pigment dispersion. What is really looked at is the amount of oversized particles. It is important that the fineness of grind be monitored because an improper grind can adversely affect print quality, performance, and could cause plate wear on press. This test is a pass/fail type test and can be performed via several different methods.

Figure 1

The most common procedure utilizes a NPIRI (National Printing Ink Research Institute) grind gauge (Figure 1). This is a precision milled instrument that contains two channels varying from 1 mil to zero depth. The test ink is placed at the deep end on the channel and a machined scraper pulls the ink along the length of the channel. If oversized particles exist in the sample, then these particles will show as scratches when the size of the particle exceeds the depth of the channel. Ink makers will typically set specifications at the point where four scratches and then ten scratches show on the gauge.

Another commonly used method is a residue test. In this type of test the ink is diluted in a low viscosity solvent so that the mix is very fluid in nature. The mixture is then passed through a 325 mesh (44.5 micron) screen (Figure 2). The screen is then dried and any residual matter is weighed on an analytical balance. Maximum amounts of residue are set for this type of procedure.

Figure 2

Viscosity

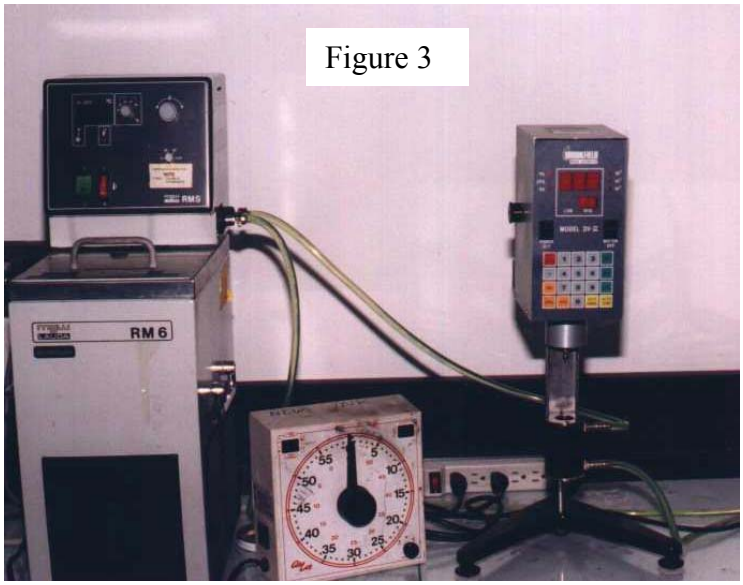

Figure 3

Viscosity is a very complex property of ink and it is critical that similar **methods and equipment** are utilized in comparing ink viscosity. Viscosity is the scientific term for resistance to flow. For a more in-depth look at the study of viscosity, see the technical bulletin Volume VII. The most common instrument used in the news ink industry to measure viscosity, is a Brookfield viscometer with a small sample chamber (Figure 3). This is a rotational type viscometer. The test sample is weighed into a chamber. The chamber is placed in the instrument temperature controlled jacket. After the sample is allowed to come to an equilibrium temperature, the viscosity readings are taken at several different rotational speeds. Specifications are set for a certain rotational speed for each product.

Tack

Tack is another ink property, which, in laymen's terms is a measurement of the force required to split an ink film between two rollers. In more scientific terminology, it is a relative measurement of the internal cohesion of an ink film, which is responsible for its resistance to splitting between two rapidly separating surfaces. Tack is a critical property used to control the ink's tendency to pull lint from the newsprint.

Figure 4

Tack is measured on an Inkometer (Figure 4). This instrument has a series of three rollers; two rubber rollers and a brass drive roller. A standard volume of ink is placed on the instrument and the resistance to separation between the brass and a rubber roller is measured versus time. Tack is typically reported at the one-minute interval.

Strength / Shade


Figure 5

During the printing process the strength of an ink determines what ink film thickness is required to achieve a desired print density. Strength is dependent on the grade, content, and dispersion of a pigment. Since the pigment is the most expensive ingredient in the ink, it is critical to maintain a consistent strength. The strength of an ink is determined by a reduction of the ink in an opaque white base (a Ableach@). This test is performed versus a standard ink of known strength level. The bleach with the opaque white base is done so that the difference in the strength/shade vs. the standard can more easily be seen by the naked eye. The use of color spectrophotometers can be used to quantify the bleach results and to measure shade differences. A color spectrophotometer (Figure 5) is an instrument that measures reflectance within the visible spectrum of a sample.

Figure 6 shows the different spectral response for several of the AD-LITHO® process colors. As you can see in this example, each color has its own individual Afingerprint@ spectral curve. The NAA applies both shade and strength requirements for the AD-LITHO and AdPro[7] colors on the color spectrophotometer.

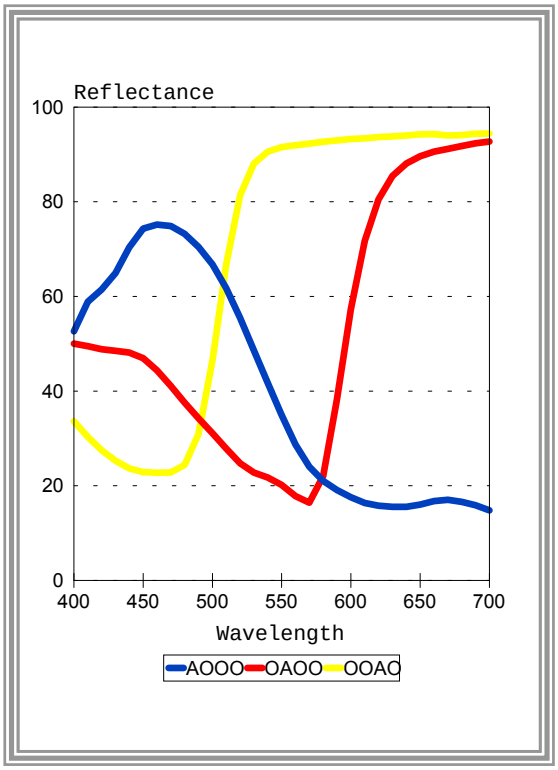

Figure 6

Water Pick Up

There are two commonly used methods for characterizing water emulsification of an ink. These tests are critical for determining the consistency of an ink to emulsify fountain solution. The first utilizes a Duke Emulsification tester (Figure 7). In this method the ink is placed into a mixing chamber and a fixed amount of fountain solution is added and mixed for a period of time. After the mixing time the excess water (fountain solution) is decanted off and measured. The difference between the amount decanted and the original quantity of fountain solution is what has emulsified into the ink. These steps can be repeated several different times to get an emulsification curve Figure 8. Values for the range of emulsified water are placed at a given time interval for quality control.

Figure 7

As one can see from Figure 8 different fountain solutions will also affect the water pick up of an ink.

Another method for the QC of water pick up utilizes the Kershaw emulsification tester. This instrument is different from the Duke in several ways. The Duke is a low shear mixer (mixer speed 90 rpm's) while the Kershaw is a higher shear mixer (1200 rpm's). The Kershaw uses a constant speed mixer. The fountain solution is pumped into the mixing vessel with a volumetric pump. As the fountain solution is introduced, the viscosity of the ink/fountain solution mixture increases. Higher viscosity produces resistance to mixing which is electronically measured and recorded as a torque increase. This torque increase is monitored until there is a sharp decrease. This decrease in torque is caused by free water in the mixture and is called the emulsion capacity of an ink. Again values for the emulsion capacity can be placed on an ink.

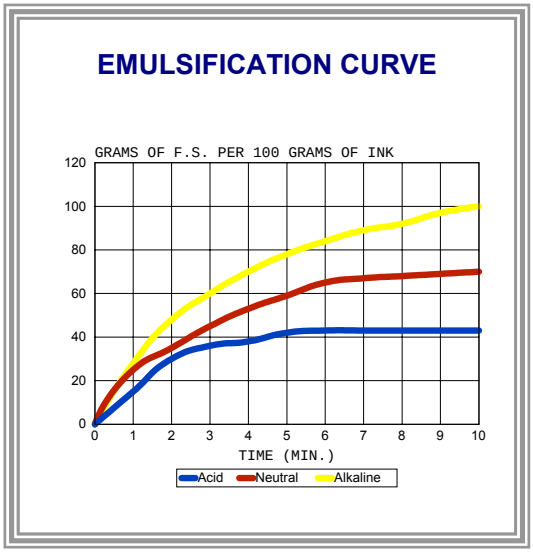

Figure 8

All of the above tests have documented procedures (which conform to ISO 9000 requirements) for both calibration and performance that a quality control laboratory would follow. This insures that we follow a consistent method so that reproducible results can be obtained.

Figure 9