The anilox roll serves as the heart of the flexo press, just as the aorta serves our hearts. Both have the important function of distribution. If the aorta fails to do its job, the results are terminal. Likewise, when an anilox is corrupted in its ability to deliver ink film to the plate, the print job will, no doubt, die on press. We, as individuals, certainly have a responsibility to protect our heart through what we put into our bodies and proper monitoring. Printers, by the same logic, are responsible for monitoring and maintaining their anilox rolls and can make the difference between success and failure.

An anilox roll works as a precise ink-delivering instrument that was meant to supply a specific ink thickness to the printing plate to maintain a specific color that is measured in density, L*a*b* or L*C*h* values. Let’s take a look at a critical component of the anilox: volume.

**Volume:**
- The volume of the anilox, expressed in BCM, often times will make or break any printed job if not monitored and controlled.
- Volume is express in Billion Cubic Microns/Square inch.
- 1 inch is equivalent to 25,400 microns.

Referring to the illustration below, A would have a slightly higher volume than B. Although the illustrations are extremely large to gain a visual aspect, there would only be a variation of 2 microns in the depth of the cells if, for example, we were comparing 4.3 bcm anilox versus a 4.0 bcm anilox. This is a precise and microscopic
measurement considering the micron is one-millionth of a meter.

The obvious question becomes, “What does this look like when the ink hits the substrate, and is this 8 percent difference in volume enough to have a negative visual impact?” The examples above are two proofs showing an 8 percent variation on volume. You are the judge—is this acceptable variation in your day-to-day operation?

I am confident that the variation will fall outside the range that is expected by your customers, whether you are using visual analysis or a measurement device to compare.

Color acceptance has become more complex the past few years as brand and flagship corporate colors have become very specific. Printers must give color matching more emphasis because these colors act as product identification to consumers.

Seven years ago, while managing a pressroom, I had a target of less than 2 for a delta E total difference. Last week, a customer called me and said they were being required to hold a tolerance of less than 1 delta E for their spot colors. Printer and print customer expectations in the quality of packaging products are changing quickly and it is not enough to make an adjustment in tolerance without looking at the ramifications of how to meet the new objective. This call was similar to many others I have had in the past—“Uh-oh, we need to tighten our tolerances”—which is a reactive and inefficient approach.

Before your customers require a tighter color tolerance, take a proactive stance and adapt a system for your monitoring and maintaining the anilox rolls. Although many other variables can affect color, let us look at the anilox because it is a crucial factor in color control.

Maintaining a Clean Anilox Inventory
Anilox rolls are a precise ink-delivery vehicle, but the precision is lost quickly if the aniloxes are not clean and maintained. The following guidelines for anilox cleaners, cleaning, and storage will help you achieve proper preparation:

**Anilox Cleaners:**
- Use anilox cleaners that actually work to remove the ink or inks without damaging the anilox.
- Test cleaners to make sure you have the best cleaner available for your ink system.
- Keep enough cleaners available.

**Cleaning:**
- Specify cleaning procedures to efficiently and effectively clean aniloxes.
- Have employees contribute the best methods.
- Make sure the procedures are followed.
- Set up the cleaning area for efficiency and safety.

- Make sure to include roll rinsing and drying as part of the procedure.

**Storage**
- Make sure the rolls have roll cover protection.
- Have proper storage to keep rolls separate and identified with tags.
- Make sure the storage system does not damage the aniloxes.

Since we know the color tolerance expectations of customers, it implies a press priority to have aniloxes maintained. Following the steps above will get you well on your way to keeping aniloxes ready for use.

**What will we use to measure, and how do we know the aniloxes are clean?**

Now that we are all maintaining our anilox inventory through good cleaning practices, we will need to develop a system for accurately measuring volume. There is an ongoing debate on the virtues of any particular system among anilox roll manufacturers. Those varying opinions have no place here. I would rather focus on looking at the available technologies, consulting with your anilox manufacturer, and developing a system that best fits your organization’s goals. There are three common ways that printers typically measure anilox rolls.

**Gravure Scope**
A gravure scope is an affordable means of measuring anilox rolls. This method requires magnification lenses and a micrometer for depth measurement. In order to calculate the volume, you will need to know three pieces of information—opening, depth, and line screen of your anilox roll.

The measurement for opening can be taken by measuring the repeat of the cells. The depth measurement is taken by focusing on the tops of the cells, zeroing out the micrometer, and then using the fine
adjustment to focus on the bottom (as seen below).

Once the measurements have been taken you can utilize the formula above to calculate the anilox volume.

The depth measurement component can be subjective based on an individual’s perception of top and bottom focus, but with practice it is very reliable. This equipment can be used for visual inspection for how clean the roll is and gauging wear.

\[
((\pi \times (\text{Opening}^2)) \times (\text{Depth}/8) \times (\text{Line Screen}^2) \times 1.15)
\]

1,000,000,000

**Interferometry**

This is a Digital Microscopic method using a series of reflective light waves on a sub-micron level, capturing cross sections of the engravings composing a 3-D image of the cell resulting in a true volumetric measurement. These measuring units have a high level of accuracy as long as they are calibrated and maintained properly. These systems have various levels of software to support functionality.

This method of volume reading is not influenced by the operator, assuming it has been calibrated to a known standard. Prices have come down the last few years on these systems.

**Liquid Volume**

This method of measuring volume utilizes a known quantity of liquid; for this example we will say 10 microliters. This precise amount of liquid is then applied to the engraved roll surface with a device known as a “tractor,” which evenly transfers the liquid into the cells. Using a piece of uncoated paper to lay over the distribution of the liquid on the anilox, an outline of the area will transfer. A planimeter is used to measure the area. For example spread 10 microliters \((10\mu l = 10\text{bcem of displaced capacity})\) of liquid over the engraved cells. Assume the area covered by the \(10\mu l\) measured 2 square inches. Dividing the area into the amount of liquid volume used yields 5bcem per square inch of cell volume. If you couple this system with a handheld magnification device, you will have gained the ability to measure volume as well as visually inspect the cells. This system is the most cost-effective means due to its relatively low cost versus the options above.

For your press to perform consistently and productively, it requires reliable components—specifically, aniloxes as the heart of the system. Poor care of the anilox inventory and an inability to determine the condition of the aniloxes results in system failure. Adopting a regular cleaning procedure as well as documenting roll condition and volume will add back otherwise lost dollars to the bottom line. Production cost can be retrieved in lower waste, press time, and anilox reconditions. There are also other tangible benefits such as gauging the wear of rolls so that budgets can reflect when you may need to replace a roll. Frequent measurements will help determine a predictable loss of volume and the affect it will have on color.

You should strongly consider adopting a procedure for cleaning, documenting, inspecting, and measuring their anilox inventory periodically. Work with your supplier on what methods will fit best into your operation.
About the Author

Mike Huey has been employed by Harper GraphicSolutions, a Division of Harper Corporation of America, for the last six years. His current role is to support and advise customers throughout the United States as Technical Graphics Manager, Western Division. Mike has been employed within the flexographic industry for 17 years, holding positions from Pressman to Conversion Manager for a flexible packaging company.

Some of Mike’s accomplishments are: Certified by the National Council for Skills Standards as a expert flexographer, published technical articles, and spoke at the FTA annual forum in 2005 and 2006, as well as other workshops and trade events.

ANSI/CGATS TR 011-2002
An ANSI Technical Report Prepared by Committee for Graphic Arts Technologies Standards (CGATS)

Graphic Technology —
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