Blade Audits & Their Impact

Match Performance to Potential

By Bill Warner

Unlike the dreaded income tax audit performed by the government, the blade audit is a desirable and informative process that flexographic printers may actually want to request. A blade audit can help improve printing quality, lower doctor blade usage and cut costs associated with printed waste and press down time.

For those who haven't heard of a blade audit, otherwise known as a blade analysis, it is a process of studying one or more worn doctor blades to gather data regarding how they were used. Your blade vendor can usually provide this service for you.

This article will describe the blade analysis process, what the investigation uncovers, and how to apply the audit results to your process to ensure high quality, consistent results.

BLADE ANAYSIS

The analysis process is usually initiated by some concern with the blade performance or a print issue that is attributed to the doctor blade. After contacting your blade vendor, you can request—and the supplier might even suggest—a blade analysis be performed to help diagnose the issue you are having. Of course, a blade analysis can also be requested if you are not experiencing any difficulty, but simply want to know more about the setup parameters of the blade.

We will begin by asking for some data regarding your application, so that we have as much information as possible to help put the pieces of the puzzle together as the analysis progresses. The worn blades, preferably matched doctor and containment blades if running a chambered inker, are sent to the blade vendor and your work is done until the blade analysis is completed. In general, Allison Systems analyzes the blades in three places unless there are special circumstances that will dictate that more or different sample sections be analyzed.

ASPECTS OF AUDIT

- Blade dimensions are measured
- Wear is documented
- Samples are cut for viewing under microscope
- Angle and blade footprint are acquired
- Data is compiled in report format
- Recommendations are offered to help improve doctoring efficiency

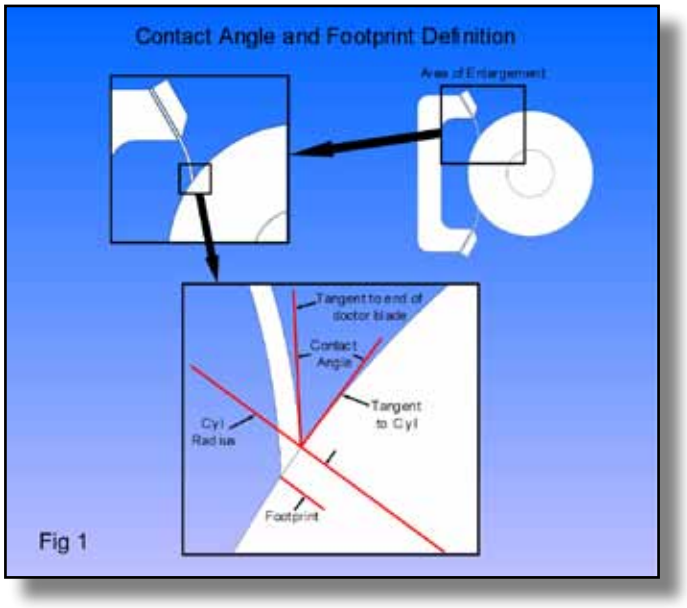

Figure 1: The angle that is measured is defined as the contact angle and the "footprint" is the measurement of the amount of doctor blade material that is in contact with the anilox roll.

The three sections are located near either end and in the center of the blade. The analysis begins by logging the blades into the system, measuring the blade's overall dimensions, and measuring the amount of wear on the blades at each of the sample sections. After the blades are measured, samples are cut from the working edge of the blade in the sections that are to be analyzed. These samples are prepared for viewing in the digital microscope by polishing the cross sectional edge of the sample.

A sample is then mounted in the microscope, so that the angle worn on the blade by the anilox roll can be measured as well as the blade "footprint." The angle that is measured is defined as the contact angle and the "footprint" is the measurement of the amount of doctor blade material that is in contact with the anilox roll **(Figure 1)**. Sometimes, when we look at a sample in the microscope, we will see more than one wear angle. Two or more angles worn in the blade is the result of changing the position of the doctor blade during the

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run by adjusting the chamber's or blade holder's position setting or loading pressure.

After all of the measurements are taken and indicated on the digital display, the image is saved to a file that will later be compiled in the report. This process is then repeated for each sample. When all of the samples have been measured in the microscope, the data is compiled in a report that will contain commentary about the results of the analysis.

Comments will explain what was measured, what it means, and any recommendations to help improve the doctoring efficiency.

ANALYSIS & FINDINGS

So, what does the analysis uncover? Many times the analysis reveals that the doctor blade was being run at a contact angle that is too flat **(Figure 2)** by generally accepted standards. What is too flat? Accepted contact angles for flexographic printing will fall into the range of 25 to 42 degrees with a desirable angle being near 30 degrees **(Figure 3)**. Less than 25 degrees is considered to be to flat for a flexo doctor blade. Flat angles will not provide proper doctoring or clean up of the anilox roll and will leave some surface ink on the anilox causing a shiny surface appearance. An operator may see the shiny anilox roll and apply more force to the system to try to clean up the roll (remember the multiple angles mentioned earlier). This will work initially as the contact angle changes, but success will be short lived. Too much force applied to the doctor blade, will quickly wear in a big footprint, potentially causing dot gain and inconsistent print.

A flat blade angle could also trap dried ink particles, blade material, or other debris potentially causing the infamous anilox roll score lines. Conversely, a contact angle greater than 42 degrees is considered to be too sharp. An angle that is too sharp can cause the blade to chatter, resulting in lines across the web or other print defects and vibration.

To illustrate the effects of flat contact angles, look at the two blade samples shown in **Figure 2** and **Figure 3**. Notice that the flat contact angle blade shown in **Figure 2** has very little wear (0.001-in.), but a very large footprint (0.027-in.). In contrast, the good contact angle blade shown in **Figure 3** has 24 times more blade wear (0.024-in.), but a footprint that is less than half the size (0.010-in.) of the flat contact angle blade. The flat angle blade had to be changed prematurely due to poor print quality. If you look closely, you can still see some rounding on the top of the blade from the initial blade tip because the flat angle is wearing "up" from the bottom of the blade. The good angle blade is wearing "back" from the edge of the blade, as it is designed to do and provided good blade life with consistent print quality.

Containment blades found in chambered doctor blade systems are the exception to the above angles. Containment blades should generally run flatter than the doctor blade. The range of angles for the containment blade is generally accepted to be between 20 and 25 degrees. The containment blade is run flatter and is typically a flexible plastic or thinner metal blade to prevent debris trapping and back doctoring.

Ideally, debris should pass easily under the containment blade and then be absorbed in the ink to ultimately be captured by a filter/magnet in the ink circulation system. If your chamber is not set up to run the containment blade flatter than the doctor blade, some chamber designs will allow you to use a slightly wider containment blade, which will automatically flatten out the contact angle. Most chamber designs will permit a containment blade that is 1/16-in. to 1/8-in. wider than the doctor blade.

Other than contact angles, a blade analysis will reveal any misalignment issues **(Figure 4)** that are present in the setup. Proper blade to anilox alignment is very important when using a chambered inker setup. Both blades should contact the anilox roll at the same time and evenly across the face of the anilox roll. If there is any misalignment in any axis, extra pressure will need to be applied to get the blades to seat properly and provide a

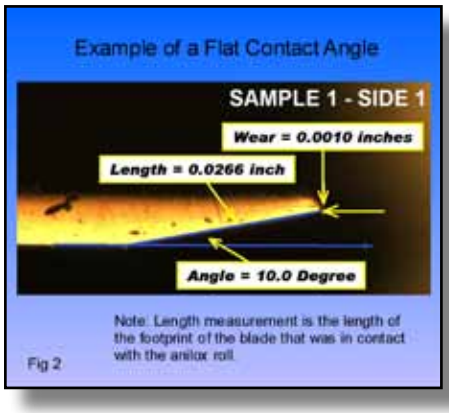

Figure 2: Many times, analysis reveals that the doctor blade was being run at a contact angle that is too flat.--less than 25 degrees. Flat angles will not provide proper doctoring or clean up of the anilox roll and will leave some surface ink on the anilox causing a shiny surface appearance.

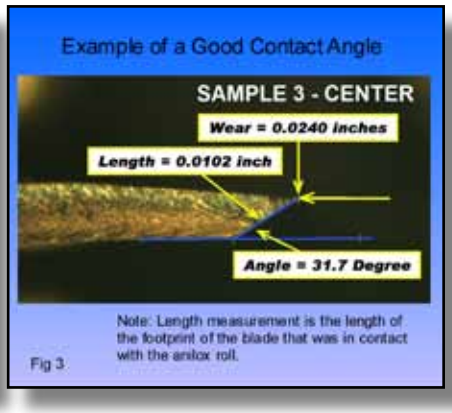

Figure 3: Accepted contact angles for flexographic printing will fall into the range of 25 to 42 degrees, with a desirable angle being near 30 degrees.

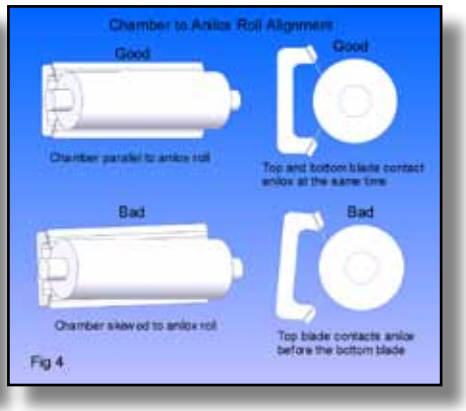

Figure 4: Proper blade to anilox alignment is very important when using a chambered inker setup. Both blades should contact the anilox roll at the same time and evenly across the face of the anilox roll. If there is any misalignment in any axis, extra pressure will need to be applied to get the blades to seat properly and provide a good wipe.

good wipe. Again, extra force generally results in flat contact angles and big footprints. It is a vicious flat angle, big footprint, and more force cycle that can be controlled once you are aware of it.

APPLYING RECOMMENDATIONS

After the report shows up in your inbox, what do you do with all of the information? Your work begins by applying the recommendations from the report to your process. The report may have recommendations, such as you need to raise your contact angles, check your chamber alignment, check your equipment for wear or damage, or maybe try a different blade.

Contact angles can generally be improved by applying less blade loading pressure. Try running with the least amount of pressure that you can and still obtain a clean wipe. If you can't lower your pressure, investigate what is preventing you from operating at a lower pressure. Maybe a different end seal will seal up the chamber with less force, or you are pumping too much ink thru the chamber and over pressurizing it. Maybe a component of your chamber's actuating system needs maintenance work. Maybe it's just by habit, based on the, "We always run it like that," scenario.

If misalignment is also suggested, check the alignment of the chamber to the anilox roll. If you have difficulty improving your setup, ask for help from your blade vendor, end seal vendor, chamber manufacturer, or all of them. Sometimes, a team approach is the best path to improvement. After you have made changes to your setup, send another set of worn blades to be analyzed, so that you can document the effect the changes had on your setup. You will also then know if you need additional improvements.

The doctor blade analysis is a valuable tool to determine if your doctor blades are being used efficiently and, if not, what areas to look at for improvement. Sometimes a change to the setup is needed, a blade related component should be replaced, a different blade is the answer, or maybe everything is within normal parameters. Let us help you achieve the "normal" possibility, so that you can be assured that your doctor blades are performing to their maximum potential and possibly reduce your blade usage and costs associated with printed waste and press down time. ■

About the Author: *Bill Warner is currently vice president of Allison Systems Corp. He is responsible for all operating, manufacturing, and engineering functions. Throughout his 25-year career with Allison, he has been involved in the application of doctor blades and doctor blade related components for various printing processes. Specific areas of experience include doctor blade sales, tech support, training, and R&D as well as the design of custom retrofit doctor blade holders and systems. He has a BS degree in Mechanical Engineering from Drexel University. Bill can be reached at 856-461-9111 or wjwarner@allisonblades.com.*