

Doctoring Ink

SINGLE BLADE VS. CHAMBERED SYSTEMS

Bill Warner

Flexo presses utilize one of three methods to control the ink being delivered to the anilox roll.

The three methods, in order of increasing effectiveness, are fountain roll metering, single-blade systems and chambered systems. Most applications are better served with either a single blade or chambered doctor blade system. This article will provide a comparison of the single-blade and chambered doctor blade systems.

To begin:

- » Many years ago, the fountain roll method of ink metering was the only method of controlling the ink film being delivered to the anilox roll and the method is still used today for some basic flood coating and block letter applications
- » Single-blade systems are found on many narrow web presses and on some corrugated presses
- » Chambered blade systems are the norm on central impression (CI) presses, most wide web presses,

many corrugated presses and some narrow web presses

CHAMBERED SYSTEMS

Chambered doctor blade systems form an enclosed ink system by utilizing two doctor blades and two end seals, all running against the anilox roll to contain ink inside the chamber body. One of the blades is metering the ink from the anilox roll and is presented to the anilox in a reverse angle orientation. The other blade is commonly referred to as the containment blade, since its only function is to contain ink inside of the chamber and is not intended to meter it. The containment blade is presented to the anilox roll in a forward—sometimes referred to as a trailing—blade angle.

Here is a way to better understand the difference between a reverse angle doctor blade and a forward angle doctor blade. A reverse angle blade is commonly compared to an ice or paint scraper, where the blade scrapes the ink from the surface of the anilox. Conversely, the forward angle blade is often compared to a windshield wiper, where the blade drags or wipes the ink from the surface of the anilox.

Since the chamber is an enclosed ink system, solvent evaporation and resulting

viscosity changes due to evaporation are minimized. The enclosed system also helps to reduce ink contamination from environmental sources. This is particularly helpful in corrugated presses, where paper dust and debris are common.

Chambered blade systems are used on high-speed and CI presses. These presses can run faster and remain cleaner, since the potential for ink slinging is greatly reduced with a chambered system. The ability of the chambered system to accommodate anilox rotation in either direction is the reason why it is exclusively used on CI presses.

Setting up a chamber involves installing two doctor blades and two end seals. If a different blade is used for doctor and containment, the operator must be aware of how the chamber is installed on press to ensure the blades are placed in the correct location. This is particularly important on CI presses, where the doctor and containment blade locations are reversed, depending on which side of the CI drum the chamber is used.

Chamber to anilox roll alignment is more critical, since both blades must be aligned perfectly to the anilox roll to achieve the best results with low applied pressure. Misalignment in any of the three axes will lead to the need for extra applied blade pressure and potential print defects or variation. End seals must be carefully chosen to ensure the correct geometry is being used along with the best material for the application. Incorrect end seal geometry or material can create a poor fit to the anilox roll and doctor blade, leading to

Forward and Reverse Angle Blades

Forward or Trailing Angle



Flexo containment blades drag the ink off the anilox roll.

Reverse Angle



Flexo metering blades scrape the ink off the anilox roll.

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chamber leakage and, you guessed it, additional required applied pressure.

Given the number of components involved with a chambered system, operator training and attention to details are more critical for successful operation. Chambered blade systems are more costly to replace than single-blade options and the cost of consumables is higher, due to two blades being required per chamber and the addition of the end seals.

If the chamber is not set on the anilox roll correctly, it can result in incomplete metering. That will lead to ink film remaining on the surface of the anilox and variable ink delivery to the plate. In addition, any ink film remaining on the anilox surface will then potentially be “back doctored” off the anilox by the containment blade.

Back doctoring is easily identified by drips and stalactite-type formations below the chamber when the containment blade is on the bottom, or ink building up or flowing off the top blade when the containment blade is on the top.

SINGLE BLADE

As previously mentioned, single-blade systems are found on many narrow web presses and some corrugated presses. The differences between a narrow web and corrugated press blade system are numerous, even though they are both single-blade systems.

Let's start by looking at a narrow web press system:

- » The narrow web single-blade system utilizes one doctor blade that is installed in a blade holder that presents the doctor blade to the anilox roll in a reverse angle orientation
- » It requires a pan under the anilox roll that is filled with enough volume of ink to wet the anilox roll and fill its cells while rotating

- » The doctor blade then removes the ink from the surface of the anilox and excess ink returns to the ink pan
- » Other than the doctor blade, blade holder and ink pan, there are no other components used in a single-blade system. Therefore, setup and maintenance of these systems are relatively simple

A single-blade system will provide precise ink metering, so that the anilox roll can deliver a predictable and repeatable quantity of ink to the plate and ultimately the substrate. The single-blade system is an open concept, requiring a volume of ink to remain in the ink pan throughout the pressrun. Ink can freefall back into the pan after being metered from the anilox roll.

Furthermore, the ink is constantly exposed to atmospheric conditions, which will lead to solvent evaporation and potential for viscosity and temperature change. At the end of the job, ink remaining in the pan can be reclaimed for later use, but significant quantities are generally lost during cleanup operations. Ink loss on narrow web presses is less significant than wide web presses, since much more is required to fill the pan on a wide web press. Higher press speeds will be prone to ink slinging with a single-blade system.

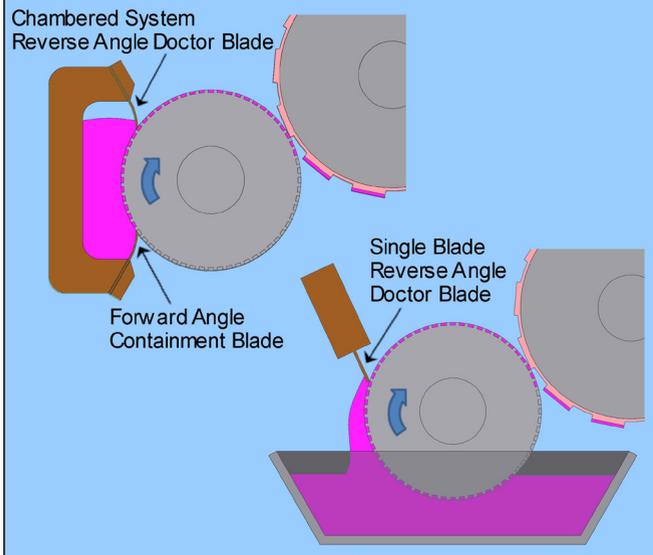
Corrugated press single-blade systems are generally like a chambered blade system in appearance with only one reverse angle doctor blade being used on the bottom of the system's body:

- » Instead of a pan being used to wet the anilox roll (as with narrow web systems), the system is designed with a cavity large enough to hold sufficient ink to wet the anilox roll before the ink is allowed to flow out the ends of the chamber body and back to the sump
- » End dams are used to restrict the flow of ink out of the ends of the body, instead of the end seals used in chambered systems
- » Since corrugated presses are very wide, the elimination of the containment blade and end seals is significant from both the time needed to set up the system and costs of consumables

BLADE SELECTION

Many chamber manufacturers specify—and pressmen will use—the same blade on both sides of the chamber, without regard to whether using steel, composite or plastic blades. When this is done, the potential for installing the blades in the wrong location is obviously eliminated, as well as the need to inventory multiple blade types. However, since the containment blade does not need to meter the ink—and you really do not want it to—using a different blade for the containment position can increase overall

Flexo Doctor Blade Systems



chamber performance, reduce anilox roll wear, minimize back doctoring and reduce the cost of consumables.

For many applications, a thin plastic blade in the containment position will perform well. Depending on the chamber design, a plastic containment blade that is 0.0625-in. to 0.125-in. wider than the doctor blade will force the contact angle to be flatter and increase potential for anilox surface ink to pass by the containment blade to minimize back doctoring. Some chambers are designed to provide a flatter containment blade angle, so the plastic containment blade does not need to be wider than the doctor blade.

Plastic blades do not work for some containment blade applications, due to either aggressive solvent contamination, heat or pressurized auto-wash systems. If this is the case, using a steel blade thinner than the doctor blade with a rounded edge shape is a viable alternative to plastic.

Choosing the correct doctor blade for the application is crucial for achieving optimum print results as well as controlling blade costs. There are numerous options for doctor blades, and I would suggest working with your blade supplier to determine the best for you. Most chambers are designed to accommodate blade thicknesses of 0.030-in. or less, with the exception being corrugated presses that can often use plastic blade thicknesses between 0.060-in. and 0.090-in.

You will need to determine your chamber blade thickness limitations before investigating alternative blade materials or thicknesses. Keep in mind that the same blade does not have to be used on each print station of the press.

Just about any blade can be used in a single-blade system limited only by the blade thickness the holder will accommodate. Some holder designs are based on using steel blades, so this will restrict

some plastic or composite blade options. Conversely, corrugated press holders are often designed for thick plastic blades, so that using a thin plastic or steel blade may not be an option. Blade choice will depend on the application. Hence, it is suggested to work with your blade supplier to determine the best blade options for your application.

MAINTENANCE

Maintenance for any type of blade system is essentially the same, even though the chambered systems have many more components to consider. All components need to be in good mechanical condition, which means they need to be checked for damage and deformation while paying attention to the straightness of the blade clamping components.

Chamber bodies can bend or twist over time, which will make blade-to-anilox alignment very difficult at best. Check moving parts and bearings for wear and smooth motion. Cleanliness is very important, as any accumulated ink in the blade clamping areas will tend to alter the position of the doctor blade, or cause blade wrinkles, when they are installed. Clean, repair or replace any components found to be compromised.

Alignment of the system—specifically the doctor blade to the anilox roll—needs to be checked and adjusted when warranted. Some blade systems have controls that allow the operator to adjust basic alignment whenever a new setup is made; others have adjustment mechanisms intended to be used only for maintenance-type operations.

All blade systems should have regularly scheduled preventative maintenance alignment checks included with other press maintenance tasks. ■

ABOUT THE AUTHOR: *Bill Warner is the vice president of Allison Systems Corp. Throughout his 30+ 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 mechanical engineering degree from Drexel University. For more information, visit www.allisonblades.com or contact Bill directly at bwarners@allisonblades.com.*

