Converting From Roll to Sleeve
Faster Makeready Times & Lower Cost of Operations are Attractions
By Paul Teachout

THE SKINNY ON SLEEVES

• Sleeve technology has grown to a global application that has brought the flexographic manufacturing process to another level.
• Converters are seeing tremendous gains in production, quality and product consistency.
• On average, sleeves will last three-to-four years before the inner layers, end rings, key ways or body either wear out or get damaged.
• Extreme care must be taken in the handling, material movement, storage and cleaning practices.

Over the past two decades there has been a major shift in the way we go to press. Led by the wide web press manufacturers, we have begun the shift from traditional metal, or alloy plate, and anilox rolls, to the more ergonomic and lightweight composite sleeves. This trend has been widely accepted throughout our industry and has also been adopted by many of the narrow web press OEM’s over the last decade. Either used as anilox, imaged in the round (ITR) or carrying flat imaged plates, sleeve technology has grown to a global application that has brought the flexographic manufacturing process to another level.

Sleeves can now offer a wider repeat range on one shaft and reduce the amount of print-related defects caused by mechanically induced vibration. In the narrow web market,
they are a major factor in the makeready process during short runs, as they offer a quick change solution that will remain competitive with the up and coming digital printing market. In either market, wide web or narrow web, sleeve technology has taken makeready times to an all-time low.

Designed more for the fully automated servo presses of today, sleeve systems are ideally suited for today’s Lean environments. They offer a tooleless and easy one-step exchange of the plate and anilox sleeves with no wasted movement. Ease of storage and material handling has also created a much safer and friendly working environment.

- We no longer need overhead cranes, jigs or straps to move our tooling inventory to permanent storage locations that tie up valuable real estate.
- Our inventory can now be safely stored and moved efficiently throughout the facility on specifically designed transfer carts.
- Sleeves are where we need them, when we need them.
- In general, sleeves are one third to one fifth of the weight of traditional rolls. For wide web, they can be as much as one tenth the weight of traditional options.

PRESS PERFORMANCE ENHANCED

The optimal stability and low weight of the sleeves is also a very attractive feature for the press manufacturers. The lightweight nature of the sleeve is what allows for the reduced size and energy required by the drives and motors thus making the press more sustainable. These factors will lead to reduced on-press issues related to roll balance and or mechanical concerns from mechanical drive systems. The automation system itself offers a whole new world of press operation and works hand-in-hand with sleeve technology.

Along with the use of sleeves, the presses are now equipped with an endless variable repeat system, due to the lack of a set gear pitch and common drive train. Each cylinder in the press is driven by its own servo motor, which allows all cylinders to be controlled independently. They can be automatically preset for register and print length, allowing no material waste to be generated during makeready. The auto register systems are aligned with pins on the sleeve mandrel to always know the location of the sleeve and its image. Computer systems of new presses can store each job for future recall. Now that most plate sleeves can be stored, mounted and ready to go, printers report great reductions in time and resources required to remount and demount plates. These features and benefits are why converters are achieving faster makeready times and a lower cost of operation.

MATERIALS & STABILITY

There are many types of sleeve materials available to fit all our needs. Thin sleeves can be used with modified traditional plate rolls or on direct drive mandrels. Both plate and anilox sleeves are a combination of composites and other materials constructed in layers. Different layers serve different functions. Some layers are for repeat building. Some are for an expansion layer. All layers need to be dimensionally stable. Many sleeve suppliers will offer different levels of sleeve construction. It is critical to know what will be most effective for our process.

There are many different types of fillers used for the repeat-building layer. Many of them react differently to humidity and atmospheric conditions. The thicker the filler material, the more susceptible it is to these environmental changes. These changes can directly affect the sleeves’ taper and stability. Higher grade fillers can provide extended dimensional stability and will be beneficial for critical reproductions of halftone and process oriented images.

Total Indicated Run out (TIR) or eccentricity of the sleeves is also of major importance. This is influenced by many variables that include the expansion material and filler material and if the sleeves are being properly stored. These materials will not remain indefinitely stable. The majority of plate
sleeve suppliers will offer an extended warranty on dimensional stability, taper and TIR concerns, as long as proper material movement and storage practices are being employed.

In the narrow and mid web arena, there is now an aluminum-cladded print sleeve available. This will greatly improve the dimensional stability of the sleeve, decrease the taper and TIR concerns related to atmospheric conditions and offer prolonged life expectancy of the sleeve—beyond the traditional three-year period. Just be sure that the added weight of the aluminum-cladded sleeve does not overcome the inertia mismatch of the servo motor designed for the press.

MOUNTING & FITTING

Most all sleeves are now pneumatically loaded on the press mandrels. Compressed air is used in the range of 60 to 90 PSI (6 bar) to compress the expansion layer of the inner diameter of the sleeve. This allows the sleeve to slide on the mandrel like an air hockey puck slides across the table. Once the air is turned off, the expansion layer returns to its original state, securing the sleeve to the press mandrel. The way this works is due to the designed interference fit of the inner diameter of the sleeve to the outer diameter of the press mandrel. Typically, the ID of the sleeve will be .001-in. smaller than the OD of the press mandrel. When compressed air is introduced it expands the inner layer, thus compressing the expansion layer allowing it to slide on.

As you can imagine, any contamination between the ID and OD will allow a sleeve to get stuck requiring it to be forced off. Housekeeping is the best practice for eliminating stuck sleeves and sleeve damage. The last thing you want to do is pry off a new composite sleeve with a metal pry bar. Carrier sleeves or bridge mandrels can also be used to reduce sleeve thickness, weight and also to reduce cost of larger repeats. All these types of sleeves can be suited to fit all plate material and backing combinations. Servo driven sleeves can also offer tighter on press tolerances as the effects from mechanical drive systems, gear backlash and worn bearings will no longer be a factor in print performance. These performance increases will be seen in both running speeds and color-to-color registration.

PRECISE REGISTER POSSIBLE

In the round direct imaging (ITR) on plate sleeves is gaining a lot of traction. This process allows for plate sleeves to be imaged digitally ITR. A continuous layer of photopolymer is applied to the sleeve with an integrated laser ablated mask (LAM) layer and then exposed and processed.

There are many great advantages to this technology. There will be no plate seam that can lift on smaller repeats thus eliminating any gap or plate bounce. With the elimination of flat plate imaging there is no need for a distortion factor to
be applied. This process can create a full set of sleeves that will have no tape or distortion variation and have the most precise register available. It will eliminate the human factor in plate mounting and greatly reduce the downtime related to the makeready process. The consistent nature of the photopolymer directly applied will lead to fewer variations in tonal ranges and overall improved print performance and quality.

**ANILOX SLEEVES**

One of the biggest impacts to our process improvement and Lean initiatives is the introduction of anilox sleeves. This has allowed our color management process to really grab hold. As converters all over the world continue to streamline their operations and standardize their inventories they are enjoying tremendous gains in production, quality and product consistency.

With anilox inventory standardization practices in place we will have fewer targets for the ink room to hit creating less downtime to match color on press. Many converters have reduced their inventories to only five different combinations of CPI/BCM. For example, a typical inventory could consist of:

- 200 8.0 for whites/coatings.
- 400 6.0 for heavy spot colors.
- 600 4.0 for spot colors and text.
- 800 3.0 for combination and vignettes.
- 1000 2.0 for process work.

Standardizing in this fashion will create a very uniformed inventory and will allow the ink room to proof inks to only five set volumes. When work is sent to the press, there will be specific rollers to use for each graphic requirement. Anilox sleeves can be very easily exchanged to meet that requirement. This will eliminate the need to match an ink to an anilox because we don’t have the right one, or we don’t want to take the time to change it. Your color...
management process will be more consistent and repeatable and you will have considerably less work off ink to contend with.

The correct anilox sleeve will be available to hit your color target and it will be easy to install. I have seen eight-color, wide web CI presses set up in 25 minutes and hit color 95 percent of the time, first time following these practices. Sleeve technology is a major factor in allowing the makeready times to be greatly reduced. Having the correct inventory on hand and ready to use is what allows it all to happen repeatedly.

**CARE & HANDLING**

There are many other advantages to sleeve technology as well. There will no longer be the need to maintain gears, bearings or shafts. This will reduce the need and cost to inventory spare parts and the time, real estate and resources to maintain them. Sleeves also allow for offline cleaning, this is a big advantage especially to the wide web market. Now there will be no excuse for not having an offline cleaning system to always insure rollers are clean and ready to use. But, as with any new technology, education will be the key to take full advantage of the opportunities it provides.

The lightweight nature of the sleeves means they will be handled more and most likely care free. These new composite materials are not as durable as the old metal rollers. We must dedicate ourselves to the education of our people to ensure they are given the proper training to take full advantage of the tools. Only then, will we get the most life expectancy and return on our investment.

On average, sleeves will last three-to-four years before the inner layers, end rings, key ways or body either wear out or get damaged. This allows us to forecast our inventory control and predict that we will need 20 percent to 25 percent of our sleeve budget each year for replacement or repair. It may sound like a lot, but the uptime created by the improved press performance more than justifies the cost.

**Training and education for this technology is widely available. Care and maintenance of the sleeves is what will allow us to get the most out of our investment. Educating our people is what will allow this to happen.** Extreme care must be taken in the handling, material movement, storage and cleaning practices of the sleeves. Handling considerations include having the proper transfer carts available for safe and efficient movement of the inventory.

Cleaning chemicals we use must also be taken into high consideration and reviewed to insure they are safe for the construction of the sleeves. Corrosive or caustic cleaners with very low or very high pH content can cause severe damage to the sleeve construction. For anilox sleeves, it is of extreme importance to keep this in mind, as these conditions could cause blistering of the ceramic surface requiring resurfacing. Improper chemicals can cause the inner layers to delaminate and the aluminum cladding to corrode. These are some of the most common causes of reduced anilox sleeve life. These concerns can all be properly addressed by training our operators on the construction of the sleeves and the use of the offline cleaning systems.

While sleeves are in storage it is always recommended that they be wrapped or covered with a protective cover. This will protect plates from ozone and anilox from environmental plugging or surface damage. Proper utilization of padding is also highly recommended to protect the sleeves from any type of impact damage anywhere in the process.

Vertical storage, for me, is the best way to store a sleeve as it applies no pressure to the ID or OD of the sleeve. But this is not always possible. If horizontal storage is required, it is always best to have the largest diameter peg possible to disperse the weight of the sleeve over a larger area. Following this practice will prevent the expansion layer from being fatigued or the sleeve egg-shaping due to weight and causing TIR concerns on press.

So, as you can see there are endless opportunities for process improvement as we continue to convert from roll to sleeves. Education will play a major factor in how successful we are in doing so. I am sure if we listed all the pros and cons of sleeves and metal journal rollers, the performance characteristics would
be very comparable. But the biggest difference you will see is in the makeready times and the safety concerns. And for me, if I can work safer and more efficiently and be more profitable doing it, I will take that route every time.

About the Author: Paul Teachout has been in the packaging industry for more than 25 years. Starting out in offset, he moved to flexo press manufacturing with Webtron/Aquaflex in 1986. He remained with the company through its evolution to Aquaflex. Teachout has held numerous key positions including printing management, application specialists, sales support, engineering support, marketing and product development manager. As of March 2008, he became southeast technical graphics advisor for Harper Corporation of America. He is also active on industry committees and is a contributor to numerous technical articles.

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