WHY SHOULD YOU CONTROL VISCOSITY?

There are two good reasons to pay close attention to viscosity control...competition and reduced costs.

Printing buyers—your customers—are growing more demanding. When flexo was grocery bags and shipping cartons, buyers' expectations were not very high. With constant improvement in quality, the flexo printer has assumed new responsibility to the printing buyer, and we can expect these buyers to increasingly insist that flexo meet the visual results produced by the best of the other printing processes. They are increasingly concerned about the *overall end product. If the result is* satisfactory, they probably won't care if it's printed by flexo or one of the competitive processes.

We all know flexo has been *the* competition these past few years, taking an increasing share of market. But you can also be sure that the other printing processes are not sitting idly by.

In addition to outside processes, there is increasing competition within the flexo industry. One has only to look at the annual FTA Award winners to have this driven home. If you're going to participate in flexo's continued growth, then you'd better be able to compete not only with the other processes, but with other quality flexo houses.

Why Quality

Why all this emphasis on quality? Why are printing buyers becoming more demanding?

Today's consumer is faced with many choices as to how and where to spend his or her money. Competition between brands is fierce. This has created a much more selective shopper, a more sophisticated buyer. Because much of today's buying is done at self-service stores, more attractive and informative packaging is required to attract the shopper's attention. This means the task of communicating brand identity and creating consumer appeal on a shelf crowded with competing items is left to the packaging.

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The net result...your printing customer wants to be sure that his package stands out. Clean impression, proper color, good register. The quality of that one item, label, wrapper or package you printed can mean the difference between whether that product is sold or sits on the shelf.

Viscosity is Keystone

Quality in the flexographic printing process is dependent upon a number of variables. Any time you control these variables, you stand a greater chance to improve the quality of the finished product. While you must pay attention to all the variables to assure true quality, one of the most important variables is viscosity. A variation in viscosity is of tremendous concern because it causes significant changes in ink properties. Viscosity affects color, printability, fade resistance, ink resistance and drying. While we generally think of ink when we speak of viscosity, *it's equally important when running* coatings, varnishes and adhesives.

Viscosity is the keystone of print quality. You can spend lots of dollars and lots of time assuring yourself of topnotch art and film work, proper plates, mounting, register, and print on the best press available, but if someone is not paying proper attention to viscosity

throughout the press run then consistent quality for delivery of the product to your customer is at best a roll of the dice. And customer satisfaction is the name of this competitive game, because if you can't supply the quality required, you can bet your anilox someone else will.

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To sum up the quality aspect; if you are going to have uniform color from the start of a run to the finish, you've got to have uniform viscosity. As viscosity increases, color changes, sometimes drastically.

If you are going to have clean impressions, good trapping and the absence of fill-ins, you've got to have *uniform viscosity.*

If you are running or contemplating running process color you have to pay close attention to viscosity control. Process work is even more critical because a change in the viscosity of just one color not only affects that color, but can affect the tone or shade of the other colors in the laydown sequence.

Control Cuts Costs

The next area where viscosity control can contribute greatly is in reduction of costs. I am sure you have heard and read this time and again, but it's well worth repeating—viscosity is by far the most important factor in ink mileage. With the tremendous increase in the cost of inks and solvents, ink mileage takes on real significance. To get the best ink mileage, and therefore the optimum cost, ink should be run at the lowest possible viscosity that will maintain the predetermined color strength and coverage.

While it's easy to see when an ink film is too light, it is next to impossible in most cases to know when an ink film is too thick, wasting costly ink. It has been demonstrated that an increase of only one second in the lower ranges can cause ink consumption to increase 25 to 50 percent. By maintaining color intensity at what appears visually to be an acceptable level, you could be using much more ink than is really necessary to achieve that color strength. Once color strength and coverage are achieved, any additional ink laydown is wasted. Beside the waste associated with the high cost of unnecessary ink, this additional coverage will also result in the use of extra energy for drying.

Less Material Waste

Another significant cost reduction can come from less waste of material. If you pay attention to viscosity throughout the press run, quality should improve with less chance for rejection of any parts of the job. At today's higher press speeds and costs, this can represent significant savings, since rejected materials have already absorbed almost all cost associated with that job in addition to the high cost of the materials themselves.

Maintaining Viscosity

Now that we have established some good reasons why you should

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maintain a uniform viscosity, how do you do it?

By hand? Or with an automatic viscosity controller? Either way, it will be up to the pressman to determine the optimum viscosity necessary to provide the desired color for the item to be printed. The Zahn or other cup or automatic controller will then make sure viscosity is maintained.

Striving to print throughout the run at this optimum ink film thickness is necessary because eyeballing color strength and coverage on press is tricky at best. One method for setting the optimum viscosity is to set impression and register while bringing the press to production speed. Inks can now be reduced, beginning with the first down, to just lighter than the desired color value. Slowly add fresh ink to the reservoir until just the desired color value is achieved. This is the point where a final viscosity reading can be taken and recorded and, if used, automatic controllers set.

Manual Control

Controlling viscosity by hand involves the least initial expense, but to be done correctly requires the greatest attention by the pressman. He will need a #2 Zahn or other cup and stopwatch. While this can be a fairly accurate method of measuring viscosity, it still depends on human judgement.

In order to maintain uniformity, solvent should be replaced regularly as it evaporates and in small doses. If controlling viscosity by hand, the closer together in time the readings are taken, the better the chance to maintain uniform viscosity. From a practical standpoint, this may be next to impossible. There are just too many other demands on the pressman's time. However, if the goal is uniformity, and you are going to do it by hand, then irregular frequency of viscosity readings will be self-defeating.

If your pressmen are using hand methods and viscosity increases, it will be necessary to thin the ink back to the proper viscosity manually. This should be a carefully measured procedure, but circumstances don't always allow this. Often by the time the reading is taken, viscosity will have increased several seconds. Now the operator has to try to bring it back in line all at once.

I am sure that everyone has seen this happen. Someone is manually adding solvent to an ink pail to reduce the viscosity; too much solvent is added, and the color suddenly starts to wash out. More ink is then added until the color comes back.

While all this taking place, you've got a whipsaw effect that turns quality erratic. In addition, consumption of high-cost solvents may have increased beyond real need. And finally, has that optimum laydown been exceeded?

With manual methods, you are

dependent upon the pressman being able to find time at frequent enough intervals to measure the running viscosity, and then to be able to judge how much solvent to add to return the ink to its correct viscosity. In actual practice, when using hand readings with a Zahn cup, too often you are playing catch-up instead of maintaining uniformity.

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Changing Technology

Technology is also changing. If you are printing with, or plan to use, solvent-base high-solids inks, viscosity control is extremely critical. Experience is showing that it is difficult to hold viscosity with high-solids inks.

Compounding the problem is the fact that changes are faster and greater with high-solids inks. A slight change can easily affect printability in the areas of fill-in, offsetting and blocking. Any increase in ink consumption is also very costly due to the high initial cost of these inks. If you are going to print with high-solids materials, you had better have a strict viscosity control program.

Water Is Different

With an apparent increase in the use of water-base materials, the need for viscosity control arises. When switching from solvent to water on the same job, most likely the running viscosity of the water material will be higher. As an example, if you are running a solvent white at 17 to 18 #2 Zahn cup, your water white might be run at 22 to 25 seconds.

Water, of course, does not evaporate at anything like the rate of solvent, but it does evaporate (you will also find a small amount of alcohol or other solvents in most water inks). While it may take longer for a change to take place with water-base materials, the effect on printability can and will cause problems. This will become more apparent as water-base ink increasingly finds application on non-absorbent substrates. When printing on these non-absorbent substrates, you will have to pay as much attention to your water-base inks as you now have to with your solvent inks.

In addition, with water inks you also have to be concerned about getting *too much* water into your ink, as it will affect drying and setting times.

CONTROL

Automatic Controller

If you accept the fact that viscosity control is important then what's really needed in the pressroom is something to eliminate the guesswork. Something that detects and corrects any variation of viscosity, on a continual basis, without attention from the press operator.

An automatic viscosity controller is just that. Once the operator has set his unit to maintain a specific viscosity, the device will continually monitor running viscosity. As soon as a change takes place, a small amount of solvent will be added to correct the variance.

There are two important points here. Because the viscosity is being monitored continually, it does not have a chance to vary more than slightly before correction begins. Secondly, because the change is slight, print quality isn't affected and only a minimum amount of solvent will be used. The result is improved quality and cost saving, and with the viscosity control being done automatically, that's one less variable the pressman has to worry about.

Because of the recognized potential for savings and quality improvement, there has been a definite increase in the use of automatic viscosity controls.

Controls Save Ink

As further justification for automatic control, it has been stated that in tests carefully conducted by dividing long run jobs into two equal parts and controlling ink viscosity manually on one part versus automatically on the second part, consistent savings of at least 25 percent in ink consumption with the automatic controls have resulted.

Because of the recognized potential for savings and quality improvement, there has been a definite increase in the use of automatic viscosity controls. This trend is increasing. It's becoming an economic necessity.

What the Pressman Can Do

There are also a number of things the pressman can do to help maintain viscosity, whether making hand readings or using automatic controls.

1) Circulate ink through the system for about five minutes before attempting to make any final adjustments to the press. This is necessary because some inks are thixotropic and do not achieve a true viscosity until they have been circulated.
2) Keep the ink pail or container full. Avoid adding large quantities of ink at one time. Be sure to thoroughly mix any new ink before adding it to the ink container. Keeping the ink container full will help reduce foaming with water-base inks.
3) The fresh ink should be as close to the running viscosity as possible, but never less than the running viscosity. Too thin an ink can cause a sudden wash-out of color. If it's a little thicker, the viscosity controller will go to work to bring the mixture in line.
4) Once the ink has been circulated sufficiently, begin press adjustments and registration. When production speed is reached, carefully reduce ink viscosity until color is just lighter than desired. Now, gradually add a little fresh ink (after thorough mixing) to the container until the desired color is reached. You now have optimum viscosity. Take a manual reading and note for future reference. If automatic viscosity controls are used, they can now be set.
5) If using doctor blades, have an adequate supply of ink at all times to prevent damage to the anilox. As viscosity increases, the ink flow will be reduced, so keep that viscosity constant.
6) A full unrestricted drain opening in the fountain pan is absolutely necessary for trouble-free flowback of the ink from the pan to the container, since there is no pressure to force the liquid out. Drain fittings with adjustable height are available and can maintain a preset level in the fountain. Keeping the pan constantly draining will assure only fresh ink is being used.
7) The ideal setup for a fountain is to bring the ink in at one end with the drain at the opposite end. This provides the best flow-through circulation within the fountain to avoid any stagnation.
8) Any ink viscosity controller, and for that matter any press, will benefit from filtration. A good ink filter will assure removal of contamination before it has a chance to reach the fountain or further.
9) When taking viscosity readings by hand or with an automatic controller try to sample the ink as close to the fountain as possible. If possible, sample in the container or in the hoses going to the fountain. The least desirable is on the return before it has become mixed with the ink in the container.

If you want to remain competitive and print a quality product, you will find automatic viscosity control a great benefit.

Regardless of the type or size of a press you operate, whether you print with water-or solvent-base inks, you will be able to benefit from using automatic viscosity controllers. If you want to remain competitive and print a quality product, you will find automatic viscosity control a great benefit. And with rising costs, automatic viscosity control is becoming an economic necessity. ■