Viscosity Analysis Helps Pressroom Converters Reduce Downtime and Minimize Unplanned Maintenance

APPLICATION

Commercial printing converter process

CHALLENGE

The commercial printing industry is in the midst of significant changes—digitization and workflow automation are driving efficiency, increasing productivity, and driving profitability. However, there are some things that haven't changed. Staying competitive is still a driving force, and in order to succeed pressrooms need to reduce downtime, minimize unplanned maintenance, improve the speed of job changeovers, and reduce waste and rework.

How can you accomplish that? First, let's breakdown typical pressroom activities. The average pressroom only runs about 54% of the time. The remaining 46% is made up of activities like color matching, maintenance, customer trials, plates and ink, and preparing to operate.

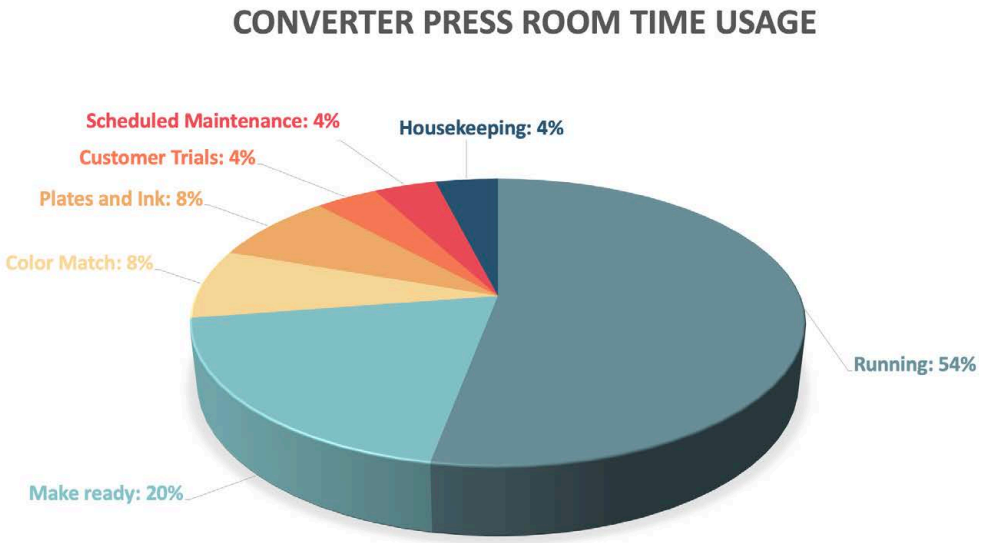

Figure 1: Actual operation only makes up 54% of the total converter press room time usage.

SOLUTION

Viscometers and viscometer control systems can influence the amount of time required to make the process ready and for color matching – which take up about 28% of typical operations – in three main areas: film consistency, temperature, and color consistency.

Film Consistency

Film consistency—and ultimately product quality—is directly impacted by the method of viscosity control. Over a period of 12 sequential weeks, we tracked a converter. All variables remained the same, except for the first six weeks, manual viscosity control was used, while the second six weeks, a Cambridge Viscosity viscometer was used.

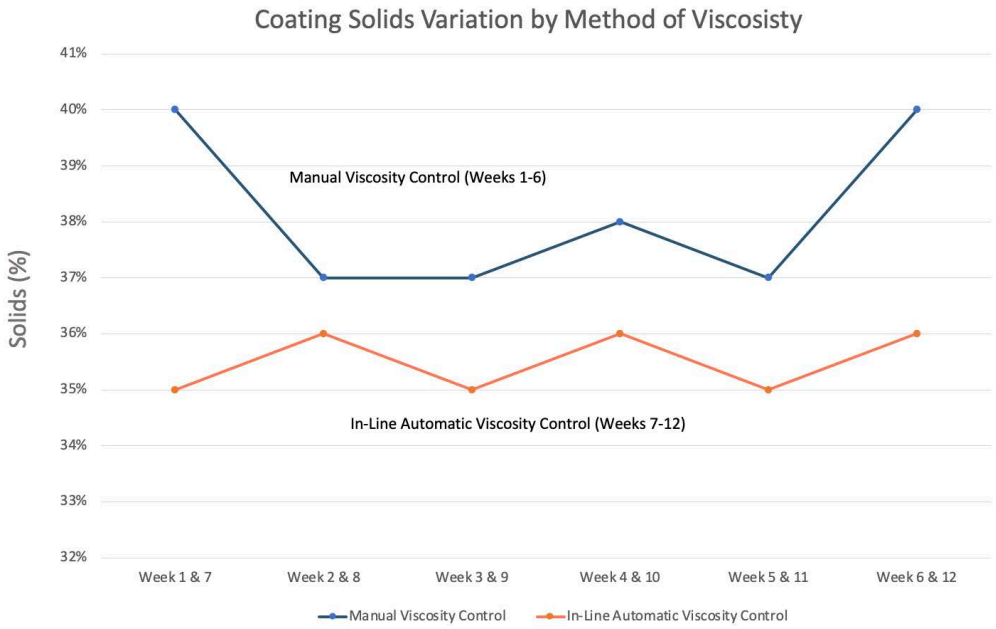

Figure 2: A test was run for 12 consecutive weeks, with weeks 1-6 tracking viscosity manually, and weeks 7-12 monitoring viscosity with a Cambridge Viscosity Viscometer. The CVI viscometer led a reduction in the amount of coating used by an average of 2.6%, and a range of 1%-5% improvement.

We found that when an operator controlled the viscosity manually, more material was applied. The press operator gave himself a margin for error by consistently running viscosity higher than necessary, as shown in Figure 2. The in-line automatic viscosity control reduced variability and reduced the use of excess coating. Ultimately, this converter saved $80,000 in coating costs per year in reduced raw material usage alone, plus product quality and consistency improved.

Compensating for Temperature

Temperature has a significant impact on the relationship between viscosity and the concentration of solids in inks and coatings.

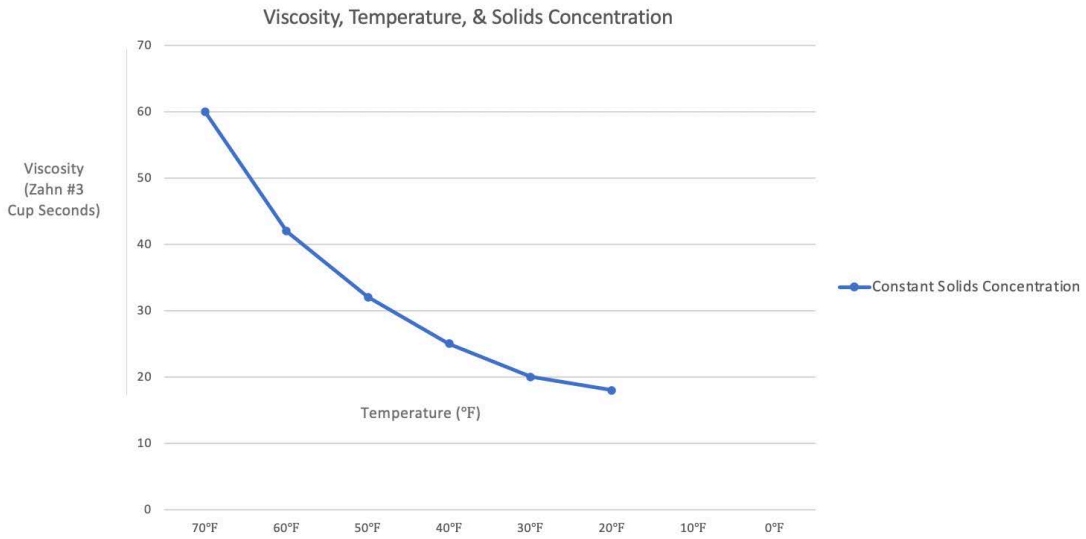

Figure 3: As temperature increases, viscosity decreases. Temperature-compensated viscosity measurements are the best way to adjust for temperature variations.

As shown in Figure 3, when the ambient temperature drops, the viscosity of the inks and coatings is also impacted. As the characteristic curve shape shows, when the ink or coating temperature varies due to changes in the press room temperature, the viscosity must be adjusted to maintain a constant percent of solids. When you are above the line, excess ink or coating material is being applied – which means money wasted. When you're below the line, the result is inadequate coating weights and substandard coating quality.

The color lab might be at 75°F, for instance. Based on that, they might tell the pressman to maintain a viscosity of 50 cup seconds on a #3 Zahn cup to maintain the targeted coat weight or color concentration. In the pressroom the press might also be at 75°F at start-up as well, or 50 seconds is fine. After 10 minutes of operation, however, the press might heat-up to 80°F, and after ½ hour might be 85° or 90°F. At these raised temperatures, the viscosity to keep the correct solids concentration drops to 37 or 32 cup seconds. If the viscosity set-point is not temperature-corrected, you are giving away money! This can be managed a couple of ways: managing absolute temperature throughout the press equipment, process fluids and pressroom; or incorporate temperature-compensation into the viscosity measurement.

Because full control of plant temperatures is frequently not feasible, a viscometer that features temperature-compensated viscosity (TCV) is the best way to adjust for variations in process temperatures.

Each coating has a characteristic temperature-viscosity curve. If the running temperature and viscosity of the coating are known, TCV allows the converter to easily tell whether solids are high, low or just right. TCV also indicates what corrections are needed. For this reason, many converters are choosing a method that directly incorporates TCV.

Cambridge Viscosity's VISCOpro 2100 viscometer offers temperature-compensated viscosity (TCV) measurement. Regardless of atmospheric fluctuations, the VP 2100 with TCV accurately reflects the percent of solids in the fluid to ensure that a proper and uniform film thickness is applied.

With in-line viscosity measurement that incorporates TCV, you can achieve tremendous cost savings by ensuring the coating machines continue to run at the most efficient levels, without interrupting the process to determine changes in viscosity due to temperature. The real-time, automatic measurement and control reduces labor requirements and laboratory time and reduces the amount of scrap waste. Plus, it helps to improve the overall uniformity and quality of the end product.

Color Consistency

Consistent, accurate color is important. A business's brand might be its most important asset, and getting the color right is absolutely imperative. There are many variables that can impact color, including color density, anilox volume, ink transfer, web substrate characteristics, doctor blade use, and characteristics, as well as ink viscosity. Inks and coatings consist of very small solids. A consistent color relies on maintaining a constant viscosity because thicker ink, which has more solids, delivers more color. Drying rates can also be impacted, as viscosity can impact solvent evaporation. As such, deviations in viscosity can have an impact on consistent print quality

CONCLUSION

Viscometers and viscometer control systems can influence the amount of time required to make the process ready and for color matching—which take up about 28% of typical operations. Cambridge Viscosity viscometers adjust for temperature variations to ensure a uniform coating thickness, minimize deviations in viscosisty to improve print quality, and reduce raw material usage to contain costs.