

The Ups and Downs of Ink pH

Since the introduction of water-based flexo inks for the corrugated and preprint packaging industries, maintaining and monitoring ink pH has been a constant problem. The biggest challenge has been getting press operators to even consider the inks, while doing the countless other activities that are required while running a job.

Recently, neutral pH and stable pH inks have come on the market that allow for greater ease-of-use and improved production efficiencies. Unfortunately, there is some confusion about the differences among these types of inks. This article is intended to provide clarity on this subject, while addressing the advantages and disadvantages of each ink type. Understanding these new ink options requires a general understanding of conventional water-based inks that are currently used for preprint and corrugated packaging.

Conventional Water-Based Inks

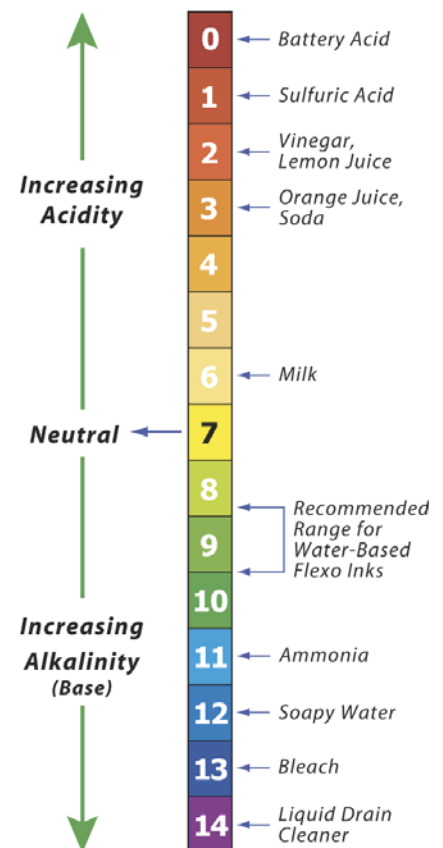
Conventional water-based inks are basically composed of solids and liquids. The ink solids consist of additives, resins and pigments. The pigments can be for color or filler. The liquids or volatiles typically consist of water, amines and solvents. The solids are suspended in the liquid state by keeping the pH above the level needed to keep the resins in solution, typically between 8.5-9.5. When the pH drops below this level, the ink thickens up, eventually turning into a gel or solid.

As ink circulates through the press and transfers to the substrate, the volatiles that keep the solids in a liquid state begin to evaporate. This is especially true of ammonia, which is a very common amine used in water-based inks. With amine evaporation, the ink pH begins to drop, causing the viscosity to increase. Since most press operators recognize the symptoms of high viscosity, they address the problem by adding water to the ink, when the real problem is low pH. Eventually, the pH can drop so low that the ink stops printing. Fortunately, ink manufacturers and resin suppliers have developed a solution to this problem – stable pH and neutral pH inks. Unfortunately, there is some confusion about the differences between these two types of ink.

Neutral pH Inks

Neutral pH inks contain essentially the same make-up as conventional water-based inks; however, they use different resins, which are soluble at a pH of near 7. It's these new resins that make it possible to produce inks that print well throughout a wider pH range (7.0–9.5). Neutral pH resins require less amines and remain soluble at a lower pH, allowing the ink to run cleaner than conventional water-based inks over a longer period of time, with much less attention. Press runs of up to 12 hours and corrugated packaging runs of 25,000 have been achieved with these inks, without stopping to clean the plates.

The pH Scale



Neutral pH inks have also been found to provide greater color consistency than conventional water-based inks. However, the greatest impact may well be on vacuum transfer presses, where increased airflow makes amine evaporation even more challenging. The reduced amine content of neutral pH inks drastically improves the press-side stability, allowing the ink to stay open longer on vacuum transfer presses and reducing the typical problems associated with conventional water-based inks.

At this point you are probably asking yourself, "Why isn't everyone using these new inks?" The answer is, cost. On a price-per-pound basis, these inks are more expensive because they're relatively new and are produced in smaller quantities than conventional water-based inks. As with most new products, the costs will probably decrease as demand increases. The price-per-pound differences are somewhat mitigated when reduced downtime and the virtual elimination of press-side chemicals are considered in the calculations. Even with these points factored in, the cost-per-pound won't always justify the need or cost of switching to neutral pH inks.

Another consideration is that neutral pH inks may not be compatible with other inks or additives being used in the plant. Plant personnel must have a complete understanding of this fact before these inks are used.

Overall, neutral pH inks provide advantages when greater print consistency, improved press efficiency, and higher print performance are desired (compared to conventional water-based inks). Plants with long production runs, that need to achieve greater operational efficiency, may also find that these inks meet their needs.

Stable pH Ink

So what about plants that do mostly short- to medium-length production runs? Stable pH inks bridge the gap between conventional water-based inks and neutral pH inks. These inks are generally produced either by mixing neutral pH resins with conventional water-based dispersions to create a hybrid ink, or by using conventional water-based inks, manufactured with a non-volatile amine (such as sodium hydroxide) to provide greater pH stability. (Note: Neutral pH inks are essentially a stable pH ink. This terminology is often confused in our industry.)

The advantages of stable pH inks are significantly reduced pH fluctuations, improved color consistency, and improved press efficiency due to reduced press downtime for plate wash-up. The benefits of greater pH and viscosity stability are similar to those of neutral pH inks, but the window of pH stability is shorter. This makes these inks better suited for today's relatively short-run press environment. Another advantage of stable pH inks is that they're more compatible with other inks and additives used in most plants, which makes for an easier transition from conventional water-based inks.

Unfortunately, both stable and neutral pH inks are more susceptible to water resistance problems. Although, this is a relatively significant issue for the corrugated industry, ink manufacturers have already begun working on ways to overcome this problem, so it's unlikely to be a long-term concern.

Determining the cost differences between stable pH and conventional water-based inks is difficult because each ink manufacturer uses different methods of addressing this issue. If your operation focuses solely on price-per-pound and doesn't consider increased operational efficiencies, neither of these inks are probably the right option for you. Still, consider how much a press charges per hour for production; then calculate downtime from opening and closing the press every half hour to wash plates. If you then factor the cost-per-hour for each color being printed, the cost-per-pound comparison begins to look more advantageous when compared to conventional water-based inks.

One last point is that there's some difference of opinion on the amount of neutral pH resin that should be mixed with conventional water-based dispersion systems to produce stable pH inks. This can affect the performance of the ink over the length of a press run. When more neutral pH resin is used, the ink remains stable longer, but it also costs more per pound. If your press runs typically take one to two hours, you don't

need to pay for an ink that remains stable for eight hours. So, as always, it's important that your ink supplier really understands your need to balance the cost/benefit relationship for each specific plant or regional operation.

Below, is a brief list of the advantages and disadvantages of neutral pH and stable pH inks:

Neutral and stable pH ink advantages:

- Reduced press down time for plate cleaning.
- PH/Viscosity stability – Less press side monitoring.
- Improved ink performance for vacuum transfer presses.
- Less foaming compared to conventional ink.
- Better color consistency.
- Reduced VOC levels.
- Potentially reduced anilox plugging.

Neutral and stable pH ink disadvantages:

- More expensive than conventional or pH stable inks.
- May not be compatible with other inks in plant (*Neutral pH inks only*).

If you would like more information on the pH stability of inks or other technical topics, contact your Smurfit-Stone Sales Manager or call us toll free at 1-877-785-7835, or e-mail us at paperwise@smurfit.com. You can also download and print other Paperwise articles from the Paperwise section of our Web site, www.sscboardsales.com.