Q&A Session for Overview of Dye Classes and Methods of Coloration Webinar

Session number: 735780237
Date: Thursday, September 30, 2010

Q: Nelson, why does cotton have a negative charge in water?
This comes from the hydroxyl (-OH) groups on the fiber structure.

Q: Where do azo dyes fit in?
Probably 75-80% of all dye chemistries (structures) are azoic. What has been a little confusing to some is the German MAK list of hazardous aromatic amines which can result from the cleavage of certain azo dyes. There are about 20-21 specific chemistries of concern. Most of these dyes have been eliminated from the marketplace.

Q: Explain systems rate of dyeing
When talking about rate-of-dyeing, we are referencing the rate at which the dye exhausts onto the fiber (or fabric) and different temperatures as related to the dyeing procedure. Many suppliers have this information which may be used for relative comparisons of one dye versus another. However, dyebath additives (i.e. levelers, retarders, electrolytes, etc.) may influence the rate of exhaustion. Also, in some cases such as disperse dyes, the dyes themselves can influence each other. Because of these variables, if one is experiencing a problem with a particular shade, the individual should perform a rate-of-dyeing on the dyes used (with all the chemicals) and determine the critical strike temperature (or range) and just how their procedure matches to the exhaust profile.

Q: If all parameters are known. How long does it typically take on average to match a color? What is reasonable?
This can be quite variable with the skill of the technician and relative to the number of stored primaries for computer matching, and the dyeability difference between the computer primary data and the substrate to be dyed. Probably an average of 4 adjustments would be appropriate.

Q: How does one manage the color change during the finishing process?
The color change in finishing can occur from both the chemicals and the temperature. We can be sure that some changes will occur and most dye houses/finishing departments have samples representing “after of dye” and “after finishing.” One key is controlling for consistency of change. The other, if there is a severe, uncontrollable change, to look at dye selection and/or a change in finishing conditions (heat and chemicals). Sometimes, a change in finishing conditions (heat and chemicals) may not be possible due to the end-use requirements. If that’s the case, then looking at those possible changes in the temperature or concentration of chemicals to still meet the same end-use requirements, but minimize shade change, would be in order..

Q: What is the role of ionic linkages in pigment-fibre bonding?
I think the physical entrapment is the primary bonding mechanism. There may be some ionic bonding occurring depending on the type of binder and dispersing mechanism of the pigment used.

Q: Which material fibres and associated dyeing process have the largest and the smallest color gamuts (in terms of Chromaticity)
This would be really hard to pin down, in my opinion. The various dye classes can cover the bright to the dull in most all hues. However, color fastness requirements can reduce the color gamut significantly.

Q: How does one manage the color change during the finishing process?
See earlier comments on finishing.

Q: How would a dyer prioritize the following: Shade, Runnability, Fastness performance?
I think all three should have an equal status. When developing a shade, one considers fastness requirements for the dye selection. Most dye houses have "weeded out" the poor performing dyes (regarding runnability). Sometimes the runnability is not determined until production; particularly with a new style of fabric or yarn. Then we start looking backwards to rate-of-dyeing, migration, and other factors to either make-it-work or reformulate.

Q: How does one manage the color change during the finishing process?
See earlier comments on finishing.

Q: Nelson, does finishing typically improve or hurt colorfastness properties after dyeing?
This can vary with the dyes and fibers. Disperse dyes and polyester may be the biggest hurdle regarding finishing as the heat and chemicals can desorb the disperse dye leading to reduced wetfastness properties. Strongly acidic conditions and heat can "acid hydrolyze" reactive dyes to lead to reduced fastness. Generally, ionic dyes/fibers such as acrylic, nylon, cat-dye polyester are less sensitive to finishing and reduced colorfastness.

Q: How does one improve the hydrophilicity of dark colored cellulosics treated with color fixing agents?
I do not have the answer for this. The fixatives often used for direct and fiber reactives are cationic and complex with the anionic dyes. If the fixatives are polymeric, they form a film. One thing to watch for is the influence of softeners – many can give hydrophobic properties. Be sure to use a hydrophilic softener and some may incorporate a wetter/rewetter.

Q: What do the think of the future developments of dyeing methods? CPB? or Continuous?
Cold Pad batch still has the economic and environmental advantages. However, the speed and time are limiting factors. The newer jet machines offer quicker dyeing cycles. Also, there can be the concern about predictability and repeatability of cold pad batch dyeing – while there are quick tests (microwave) to confirm the shade, its not good to wait 6 to 12 hours to decide one needs to make an add.

Continuous dyeing is geared for large volume, long runs, for wovens. Still the best way.

Q: Nelson, what is the current liquor ratio comparison between yarn dyeing and jet dyeing or other piece dyeing processes?
I would say most yarn and jet dyeing operations operate within an 8 to 12 liquor ratio. There are some exceptions to lower liquor ratios and designed equipment….and that's good.

Q: Will you talk in the future about dyeing by heat sublimation transfer printing processes
I think Jack Daniels (AATCC Executive Director) and Peggy Pickett have their "wheels turning in their head" on many future webinar topics.

Q: Is rate of dyeing important in heat transfer printing
Here we switch from rate-of-dyeing to fixation rate. With heat transfer, there is not the typical slowing raising temperature over time to affect fixation. It's almost instant. Most dye suppliers will have thermosol/thermofixation curves for the dyes at a specific temperature. Thus, one would want to ensure that the combination of dyes have similar fixation rates.

Q: Please comment on the natural dyes. Thanks
Natural dyes have their niche in the environmental/sustainable markets. Specific for natural fibers, these dyes often require metals to mordant or complex the dye to the fiber and one doesn't necessarily have a high level of fastness properties. I believe there have been numerous articles on natural dyes, and we could never replace the current market of synthetic dyes for shade range, color fastness, and suitable fibers, simply from the volume of dyes required. But, it is a niche.

Q: Will AATCC be covering indigo dyeing in the vat dyes webinar?
Refer to earlier question about future webinar topics.