Hello all. A long hot busy summer has finally come to an end here in Texas. By the time this newsletter is published we will have had a very brief patch of fall weather and be heading into another winter forecasted to be as bad as last year’s. I can smell the snow and ice already.

Some of you may know of my interest in projectile (modern and archaic) and edged weaponry. Everyone should have a hobby. A fair amount of my youth was spent in attaining some meager skill with some of these tools and the knowledge has served me well on occasion. So you can imagine why I would be a fan of the recent cable program pitting experts with various types of weapons against each other in a contest to determine who the best all around user of these implements is. All the reality show minutia aside, the exhibition of talent was impressive to say the least. No matter what the particular person’s talent was, they were usually able to accomplish the goals set in the competition.

Given this was just another situation where solutions could be arrived at using a variety of tools, skill sets, and expertise, it was not much of a stretch for me to draw parallels between these competing practitioners and the many people in our industry who are using old and new methods and technology to manage their color needs. Let’s face it; the job in both cases is to hit the identified target; and in a colorist’s case while also understanding all the complexities of plastics color matching.

Sometimes the technology used is like a tomahawk being thrown on a late night program (the older among us will know exactly what “late night” scene I am referring to); in others it is like the speed and precision illustrated in all the videos showing a missile strike in the war zone. Bottom line is that the job gets done by putting the right tools in the hands of the right person with the right skills to use them. Their talents should be nurtured and built upon with an understanding that experience builds confidence, and problems encountered and solved build knowledge and flexibility in using the tools of trade properly.

The membership of the Color & Appearance Division reflects this great diversity of method and knowledge, and many of our practitioners are frequent contributors to CAD programs. This is why CAD is the right place to go for information about “Coloring the World of Plastics”. We do not cater exclusively to any specific technology or approach to plastics coloration; we try to deliver content that serves all comers to the trough. This is a major part of our mission and I personally
believe that we deliver on it. The other part of that mission is creating opportunities for the exchange of information; and in fulfilling both CAD has recently completed yet another highly successful RETEC®. The Nashville venue was great and the number of attendees was up in comparison to the last few years. More importantly, there was an upbeat and optimistic attitude among the attendees that has been absent in prior years. I had not felt energy like this at a RETEC® in a while and it gives hope that our industry is emerging from the recent Dark Age. Congratulations to the RETEC® 2010 Committee for a job well done. Please check out their wrap up report contained within.

The board members that plan and execute programs like RETEC®, create and manage the content for the website and newsletter; and conduct all the myriad tasks necessary to keep the division running smoothly are elected volunteers. Their dedication is why the division is always a contender for (and winner of) the many Society awards given to the outstanding performers among the SPE affiliates. We are currently gearing up for our annual CAD Board of Directors election and are always looking for division members who would like to contribute. You will be seeing a lot of information regarding the election in the next few months; starting with this issue of CAD News. Our Chair-Elect - Scott Heitzman - will be running the election this year. Please contact him if you are interested in running for a position on the board. We would love to have you.

By January we all will be looking for warmer climes, so the CAD Board of Directors Winter meeting will be held in New Orleans late in the month; hopefully with better result than the last time we tried to have a meeting there. We will also have a full slate of committee meetings to work on our plans for 2011 and beyond. Remember that attendance is open to all members of the division. Please contact me if you are interested in attending.

In closing I want to wish all of you a safe, happy, and Colorful Holiday Season. And to all you color matchers out there I’ll use a quote from my favorite character on the ultimate (ultimate because it is the only reality show where you can get eaten) in cable reality shows - "Shooooot!"

Always remember that you can't sing the blues when your world is full of color.

Earl W. Balthazar, III
CAD Chairperson 2010

The Council meetings at ANTEC™ were held on May 16, 2010 in Orlando, FL. Two meetings were held, the morning meeting being the completion of the 2009/2010 Council year and the afternoon meeting was the first meeting of the 2010/2011 year. This summary covers both meetings. The change in leadership of SPE takes place at the ANTEC™ Council meetings, so they are an opportunity to recognize the leadership completing their terms and look forward to the new leadership.

2009 was a difficult year for the organization. Membership was down due to the economic downturn and as a result, revenue was also down. The organization implemented a number of cost containment activities, including the sale of the building in CT, a head count reduction and changes to governance. The impact of these changes will continue into 2010/2011.

There is recognition that currently, membership is the strongest contributor to revenue growth and therefore there is a need to drive membership growth. During the first quarter of 2010, there has been some membership growth. However, the aging of the membership will be a threat to the viability of the organization as members retire. There are active programs to drive membership and the cost/benefit of each program is being evaluated.

Incoming President Ken Braney reviewed the 2010/2011 Operating Plan, which identifies three strategic objectives for the organization:

**Membership**
Initiation of new groups outside of traditional markets, particularly globally

**Revenue**
Growth of non-dues revenue sources, i.e. Corporate Affiliate Program

**Member Involvement**
Revitalization of the organization to reflect group activity through small groups.

Sandra Davis
CAD Councilor
SPE is a global non-profit organization promoting communication among professionals in the polymer and plastics industry. SPE has over 20,000 members worldwide.

ACE - The Additives & Color Europe Division - stimulates and disseminates knowledge of the modification and the coloration of polymers.

The Conference will be of interest to producers, researchers, suppliers, and users of pigments, dyes, flame retardants, impact modifiers, mineral and nano additives, stabilizers, plasticizers, antiblocks, etc.

AIMS OF THE 2011 ACE CONFERENCE

The conference is open to any original presentation, but preference will be given to papers that analyze the reciprocal effects between colors or additives and the polymer matrix. Finely tuned studies, works in new domains, and reports based on new concepts or new perspectives are also warmly encouraged for submission.

An important aspect of the conference are the networking possibilities. The conference dinner will take place on Wednesday 16 March and is included in the conference fee.

Conference Secretariat
SOCIETY OF PLASTICS ENGINEERS
Additives & Color Europe Division
Eric Sasselaan 51, BE-2020 Antwerpen, Belgium
Tel: +32 3 541 7755 - Fax: +32 3 541 8425
spe.ace@skynet.be - www.speeurope.org
On-Line Plastics and Coloring of Plastics at Terra Community College

Terra Community College’s Coloring of Plastics Program now offers three Internet-based courses available from any computer connected to the Internet anywhere in the world.

These affordable courses will be in a completely distance format—no on campus time involved. They are designed for students who find it difficult to attend regularly scheduled classes on campus due to distance or time constraints.

Advantages include:

- Complete Terra’s basic Coloring of Plastics Technology Certificate Program with these three classes.
- Receive a solid foundation for understanding how to color plastics.
- Perfect for processors who must understand color to produce plastic parts to customer specifications.
- Designed to provide valuable color knowledge to QC technicians, operators, production engineers, or anyone else who needs to work with the coloring of plastic parts.
- Longer programs of study up to two year Associates Degrees are available.

Distance Learning Courses Offered

Section VL  **PET 1100 Introduction to Plastics** (3 Credits)
Fees: $400 Ohio students/$600 out-of-state
Books: approximately $200
Offered Fall 2011: (August 22–December 16)
Offered Spring 2011: (January 10–May 5)

Section VL  **PET 1240 Introduction to Color**  (3 Credits)
Fees: $400 Ohio students/$600 out-of-state
Books: approximately $200
Offered Fall 2011: (August 22–December 16)
Offered Spring 2011: (January 10–May 5)

**Section VL  PET 2320 Colorants for Plastics**  (4 Credits)
Fees: $500 Ohio students/$790 out-of-state
Books: approximately $150
Offered Spring 2011: (January 10–May 5)

Why is Terra the Right Choice?

Terra Community College is a two-year accredited, state-supported, commuter college. Its mission is to provide students with the opportunity for quality learning experiences that are both accessible and affordable.

Many options are offered for those who desire to take one course or a full curriculum leading to an Associate Degree. Students who wish to continue their education may transfer credits to a four-year college or university.

Terra maintains a strong commitment to provide state-of-the-art equipment, facilities, library, and instructors that give the students a quality technical education and a competitive edge in the job market.

In addition to the quality courses that are offered, Terra is the only technical college in the U.S. that offers the Coloring of Plastics program. TCC Plastics courses are designed to be flexible to work around the schedules of working adults.
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TECHNICAL SERVICES include color matching, extraction and analysis on competitive products, FDA migration studies along with any regulatory needs you may need.

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- FDA & aluminum lakes
- High performance pigments

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- Keyplast granites
- Revetsacol photochromic dyes
- Security tags and taggants

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Please visit the websites of the sponsors listed in this newsletter by clicking on web address included in their sponsorship space. Thank you!
RETEC® 2010 “COLORFUL NASHVILLE” RECAP

Brian West and Austin Reid

The 2010 RETEC® certainly lived up to its billing as the premier technical conference devoted to the subject of plastics coloration. Despite the flooding earlier in the year, Nashville was back in business in time for RETEC® and lived up to expectations providing our group with plenty of attractions to enjoy. The conference attendance of 387 is an indication of the strength of this year's program, which featured 16 presentations, including 2 plenary sessions. The plenary lectures by Kurt Beyerchen of Nissan and Vincent Billock of the National Research Council were thought-provoking and drew strong attendance to the technical sessions. Dr. Billock's talk was a departure from our typical topics, and was well-received by the audience.

When putting together this conference, we found that cost control, sustainability, and new materials are of great interest to our attendees. We have historically included a variety of focus topics in the technical program, which we have tried to tailor to the expected audience and to the regional participants. As an example, the technical program for our conference in Dearborn in 2008 was heavily weighted toward the automotive arena. This year we had a more eclectic mix due to the centralized location of the venue (Nashville). The program included talks on sustainability, new materials, processing concerns, biomaterials, and optical behavior, among others.

This year's conference introduced a new three-day format with the technical program running from Tuesday afternoon through Thursday morning. The well-attended opening reception, sponsored by EMD, was held Tuesday evening where the band Color Eye Blind rocked a full house. The awards luncheon was held Wednesday, sponsored by Dominion Color. A successful networking reception was held on Wednesday evening, sponsored by Nubiola. We enjoyed sponsored breakfasts both mornings. Wednesday was sponsored by Lansco, and Thursday was sponsored by BASF. The 5K Fun Walk, sponsored by Dominion Color, continued its tradition at the 2010 RETEC® early Thursday morning and generated a $1,200 donation to Habitat for Humanity.

This year's conference also offered a golf outing Monday afternoon, held jointly with the local Tennessee Valley Section, and the Color of Plastics Tutorial in two sessions, Monday afternoon and Tuesday morning. The exhibit area featured 60 spaces during this year's conference. The exhibit area was laid out well with enough space to hold coffee breaks, the welcome reception and networking reception in that area. Feedback from exhibitors and from attendees was very positive.

Although final figures are not yet available, we expect the net return to the Division from the Conference will amount to approximately $60,000. A very successful undertaking, and our thanks to all of the committee members and to our sixteen sponsors whose collaborative efforts made this possible.

CALL FOR PAPERS

Papers should be oriented towards the topic of ‘Giving the Customers the Colors They Want’.

Topics can include:
- New Products / New Technologies
- Market Research / Market Analysis
- Solving Customer Problems
- Identifying/ reviewing customer needs/wants
- Color Trends
- Testing & Quality Control

Location: Westin Hotel, Lombard, IL
Conference Dates: September 26, 27, 2011
Abstracts Due: March 14, 2011
Papers Due: May 16, 2011

Contact Technical Chairs for more details:

JACK LADSON jack.ladson@verizon.net
215.369.5005

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Objective:
This article briefly explains how to use statistical tools to evaluate the reproducibility of color testing. Several pigment chemistries combined with several test methods were evaluated in hopes of establishing a test that both the statistician and color technician would endorse.

I. Introduction
This study was stimulated by the market’s demand for tighter color specifications. We needed to quantify and possibly improve our test method reproducibility before we could realistically attempt to improve our process capability and tighten specifications.

Pigments and pigment dispersions have been and continue to be evaluated for color using a wide variety of methods. Over the years Oil Ink Tests, Latex Paint Tests, Liquid Ink Tests and PVC, Rubber, and Polyethylene Two-Roll Mill Tests have been used as Quality Control methods. We didn’t have extensive reproducibility data for these methods, but we felt that all of them could be improved using statistical tools.

We started reaching our goal of a quick, easy and reproducible test method for quality control of pigments for plastics by surveying our plastics color concentrate customers. The survey found a wide variety of tests being used. We selected the most prevalent methods and measured their reproducibility. With these methods selected, we chose a range of pigments to represent typical high volume pigments used in color concentrates.

II. Statistical Tools Required for Understanding Test Variation
The most common statistic used for measuring any variation is the standard deviation. Think of it as a type of index about variation - the higher the index, the more variation. Because we use samples to generate data and then calculate a standard deviation, this statistic is an estimate of the true variation index.
When we calculate a standard deviation from a set of data, all the sources of variation in the generation of the data are included in this estimate. By controlling the sources of variation, we can determine a standard deviation for a particular test method. For instance, if five different technicians using two different moisture balances generated percent moisture data over the course of 10 days using the same sample, then our standard deviation for this moisture test method would include technician and equipment differences. These combined differences make up what is generally called test reproducibility. On the other hand, if only one technician measures the same sample using a single balance over a short time, then the standard deviation does not include any technician and equipment differences. This variation is called the repeatability or the precision of the test method.

For abbreviation purposes, let's define $S_{\text{test}}$ as the standard deviation due to a test method. $S_{\text{test}}$ should always be qualified to identify whether this estimate is for reproducibility, repeatability, or any other set of variation components.

The easiest and most straightforward way to calculate $S_{\text{test}}$ when you have multiple data for the same sample is to generate a standard deviation on the set of repeat tests. Typically, one uses a statistical software package or the standard deviation function in a spreadsheet to generate this value.

Testing of color pigment adds some additional nuances for consideration. For instance, to perform any type of plastics application test that measures shade and strength differences between sample and standard, one must disperse the pigment into a medium and then create a display for presentation to a spectrophotometer. Experience and special studies have proven sample preparation to be the largest source of test variation and very difficult to practically control; however, this variation can be reduced by having the standard and sample prepared side by side by the same technician, using the same equipment and testing raw materials. Each single result is then a difference generated by the same technician, equipment, and raw material. This focuses our interest in test repeatability as opposed to test reproducibility. Also, we must not forget that all pigment testing is destructive in that the exact same set of pigment particles cannot be put through an application test method twice. Once the pigment has been dispersed in some medium it has been permanently changed. Thus, all repeat testing includes some “near neighbor” differences which relate to the homogeneity of the sample itself. Lastly, we have to be careful not to assume all test methods have the same precision for all pigments, especially with their differences in ease of dispersion.

Once $S_{\text{test}}$ has been calculated, how do we judge if the test is valid? How do we know when $S_{\text{test}}$ is good enough? There have been a variety of statistics used to help make this judgment. One is Percent Nominal, which is $S_{\text{test}}$ as a percent of the average result. It is calculated as follows:

$$\text{% Nominal} = \frac{S_{\text{test}}}{\text{Average}} \times 100$$

The smaller the percentage, the better the test. The problem with this method is that the amount of test variation is not always a function of the size of the results obtained.

In Figure 1., $S_{\text{test}}$ is 16.7 for Pigments A and B, with average values of 400 and 200 respectively.

Pigment A % Nominal = $\frac{16.7}{400} \times 100 = 4.2%$

Pigment B % Nominal = $\frac{16.7}{200} \times 100 = 8.4%$

The test variation appears to be better for Pigment A just because it has a higher average.
Another method is to analyze $S_{\text{test}}$ as a percentage of the total variation, $S_{\text{total}}$. Since $S_{\text{total}}$ represents all sources of variation - raw materials, process, test method, etc. - this comparison makes good intuitive sense. Again, the smaller the percentage, the more sensitive the test is to real differences in the product. On the surface this seems like the best approach, however, it is not statistically sound. The science of statistics teaches one to compare variances (the square of the standard deviation) rather than standard deviations. One needs to think of comparing the area under the test distribution curve to the area under the total distribution curve rather than the lineal distance of the two standard deviations.

Consider comparing a room in a house to the total house. If one compares only the width of a room to the width of the entire house they may not get a valid comparison, but when one compares the square area of the room to the square area of the entire house they get a more valid ratio. This leads us to another statistic named Percent Contribution. It is calculated as follows:

$$\text{Figure 2:} \quad \% \text{Contribution} = \frac{S_{\text{test}}^2}{S_{\text{total}}^2} \times 100$$

This statistic describes the percentage of the total variation which is taken up by the variation in the test. The smaller the % Contribution, the more sensitive the test is to real differences in product samples. To be specific about the desired levels of this statistic, the following rule of thumb has been adopted:

- % Contribution > 30%  Unacceptable  Too much test variation.
- % Contribution < 30%  Acceptable  30% test variation
- % Contribution < 10%  Ideal  10% test variation

**Note:** The reciprocal of the % Contribution is an F-test statistic and the 30% limit equates to a significant F of 3.33. This value is close to the critical F-value at 95% confidence with 8 degrees of freedom for both variances.

What can we do if we don’t know $S_{\text{total}}$, and how do specifications fit into this statistical analysis? Since our specification range represents at least +/- 3 total standard deviations, then the specification range divided by 6 (+/-3 creates a total of 6) must equal a single standard deviation which the spec allows, called $S_{\text{allow}}$ as shown in Figure 2.

When we substitute $S_{\text{allow}}$ for $S_{\text{total}}$ in the % Contribution calculation we get a slightly different interpretation. Percent Contribution now describes the percentage of the total specification allowable variation which is taken up by the variation in the test. We now have a complete relationship between our desired % Contribution, $S_{\text{test}}$, and the specifications.
Goals of Test Variation

Given the following specification targets, we can calculate the required $S(\text{test})$s needed to achieve the 30% Contribution:

<table>
<thead>
<tr>
<th>Property</th>
<th>Desired Specification</th>
<th>Required $S(\text{test})$ for 30% Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cielab $D_l^*$</td>
<td>+/- 0.75</td>
<td>0.137</td>
</tr>
<tr>
<td>Cielab $D_a^*$</td>
<td>+/- 0.75</td>
<td>0.137</td>
</tr>
<tr>
<td>Cielab $D_b^*$</td>
<td>+/- 0.75</td>
<td>0.137</td>
</tr>
<tr>
<td>Cielab $DE^*$</td>
<td>1.3 max</td>
<td>0.119</td>
</tr>
<tr>
<td>Strength</td>
<td>+/- 3%</td>
<td>0.548</td>
</tr>
</tbody>
</table>

Table 1:

III. Case Study - Tests to Evaluate and Pigment for Use in Evaluation.

Considering the above requirements, we decided that four test methods would be evaluated: Polyethylene Compound Test, Mix & Mold Test, Precompound and Mold Test, and Concentrate-Extrude and Mold Test.

Polyethylene Compound Test

The Polyethylene Compound is a two-roll mill test. It, or some similar method, is currently used by several pigment manufacturers. Pigment is blended into pulverized and pelletized low density polyethylene. The compound is added to a heated two-roll mill and is cut and slashed by hand for 5 minutes. Swatches are cut out of the polyethylene skins and are pressed out side by side on a Carver press.

The Polyethylene Compound Test is a time-tested industry standard. It is labor intensive due to the constant cutting and slashing. Material and equipment costs are relatively low.

Mix & Mold Test

The Mix & Mold is an injection molding test. A premix is made using a shaker or an Osterizer. The premix is used to charge the molding machine and display chips are molded.

The Mix & Mold test was the most frequently used incoming quality control method for the color concentrate manufacturers. The Mix & Mold is much less labor intensive. Equipment costs are slightly higher. Multiple displays can be made with this procedure.

Precompound and Mold Test

The Precompound is a premix that is extruded and injection molded. The premix is a small amount of pulverized polyethylene that is mixed with pigment and osterized. This small master batch is then letdown in the remaining polyethylene and extruded at the end use levels. The compound is then injection molded.

The Precompound test is a three phase process, requiring three pieces of equipment. Thus, equipment expense is higher. Although not labor intensive, the Precompound test is time-consuming due to the multiple steps. Process is very similar to “Real World” conditions and should correlate well with production.
Concentrate and Mold Test

The Concentrate is a high level of pigment mixed with pulverized polyethylene. This pre-blend is then extruded on a twin-screw. The concentrate is letdown at end use levels and compounded on a single screw extruder. The compound is then injection molded to make displays.

The Concentrate test has a very high level of dispersion that simulates pigment development typical of that in an end-use application. The four phase process is very time consuming and equipment and material costs are high.

Knowing that pigments differ chemically and in dispersion, strength, particle size, color, etc., we felt it important to use a variety of pigments with different colors and chemistries. Five of our plastic grade pigments were selected for this study: phthalocyanine blue and green, staples of the organic pigment industry; an azo-based diarylide yellow because they are so prone to contamination problems; an azo-based calcium 2B as it’s a “Work Horse” pigment that covers red; and a quinacridone violet because it tends to be difficult to disperse versus other organic pigments and to add a violet shade. The specific codes with pigment type are listed in the chart below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Index Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phthalocyanine Green</td>
<td>Pigment Green 7</td>
</tr>
<tr>
<td>Phthalocyanine Blue</td>
<td>Pigment Blue 15:3</td>
</tr>
<tr>
<td>Calcium Red 2B</td>
<td>Pigment Red 48:2</td>
</tr>
<tr>
<td>Diarylide Yellow (OT)</td>
<td>Pigment Yellow 14</td>
</tr>
<tr>
<td>Quinacridone Violet</td>
<td>Pigment Violet 19</td>
</tr>
</tbody>
</table>

IV. Study Scheme

Before time and effort were spent on the test methods that utilized the molding machine, some preliminary work was required to check the reproducibility of the molding machine itself. A homogenous concentrate was created for a blue pigment sample. The pigment sample, zinc stearate, and TiO2 were osterized three times for 30 second intervals. This pre-mix was then added to a bag of PE resin powder and vigorously shaken. After two extrusion passes, 300 chips were continuously molded. Using the first chip as standard, 299 comparisons were made. Note the very first chips were discarded for purge considerations. Results are as follows:

<table>
<thead>
<tr>
<th>Color Property</th>
<th>S(test) Blue - 299 Chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cielab DL*</td>
<td>0.016</td>
</tr>
<tr>
<td>Cielab Da*</td>
<td>0.012</td>
</tr>
<tr>
<td>Cielab Db*</td>
<td>0.012</td>
</tr>
<tr>
<td>Cielab DE*</td>
<td>0.016</td>
</tr>
</tbody>
</table>

Table 2:

It was obvious from the data presented in Table 2 that the molding machine chips were very repeatable and they would contribute only a small amount of the total S(test) for the entire test method.
The next step was to design the data scheme needed to obtain a good estimate of $S(test)$ for each of the four test methods. Since we already had prior estimates of $S(test)$ for the Polyethylene Compound Test involving a variety of products, only five comparisons of a sample to a fresh standard, each test being performed on a different day, were completed for each product. For each of the other three tests, we produced a set of chips (the number of chips was predicated by the size of the samples created) on six different days. On each day, the first chip was accepted as standard and the remaining chips were measured against it. The Mix and Mold test method created 14 chips (13 comparisons) per day for six days giving 78 data points to analyze. Both the Precompound and Concentrate test method created 25 chips (24 comparisons) per day for six days giving 144 data points.

V. Results and Conclusions

The following table summarizes the study.

<table>
<thead>
<tr>
<th>Pigment</th>
<th>Test Method</th>
<th>DL* S(test)</th>
<th>Da* S(test)</th>
<th>Db* S(test)</th>
<th>DE* S(test)</th>
<th>Strength S(test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green 7</td>
<td>PE Compound</td>
<td>0.036</td>
<td>0.127</td>
<td>0.048</td>
<td>0.077</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Mix &amp; Mold</td>
<td>0.046</td>
<td>0.049</td>
<td>0.016</td>
<td>0.032</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>Precompound</td>
<td>0.018</td>
<td>0.040</td>
<td>0.013</td>
<td>0.030</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Concentrate</td>
<td>0.024</td>
<td>0.022</td>
<td>0.010</td>
<td>0.018</td>
<td>0.23</td>
</tr>
<tr>
<td>Blue 15:3</td>
<td>PE Compound</td>
<td>0.085</td>
<td>0.027</td>
<td>0.065</td>
<td>0.099</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>Mix &amp; Mold</td>
<td>0.043</td>
<td>0.028</td>
<td>0.035</td>
<td>0.027</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Precompound</td>
<td>0.017</td>
<td>0.018</td>
<td>0.035</td>
<td>0.021</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Concentrate</td>
<td>0.036</td>
<td>0.020</td>
<td>0.029</td>
<td>0.031</td>
<td>0.34</td>
</tr>
<tr>
<td>Red 48:2</td>
<td>PE Compound</td>
<td>0.123</td>
<td>0.307</td>
<td>0.178</td>
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<td>0.026</td>
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Table 3:

S(test) was calculated using the Classical Method.
Table 3 above summarizes the data but the Cielab De* S(test) and Strength S(test) bar charts (Charts 1 and 2) really help us quickly see several interesting occurrences.

First, the Polyethylene Compound Test has the highest S(test)s across all the products tested. The Diarylide Yellow has higher S(test)s in Delta E*, but in Strength, it was just like the other colors. This may be due to yellow being the lightest color and thus more susceptible to cross contamination. The Quinacridone Violet was just the opposite. The Delta E* S(test)s are consistent across the tests but the Strength S(test)s are higher. This is thought to be due to Quinacridone Violet being a harder pigment: its dispersion differences have a larger impact. Blue and Green have low test standard deviations across the various tests.

Another observation was that the Mix & Mold test performed well. With the lower levels of dispersion, we expected results similar to that of the Polyethylene Compound Test. We also expected to see lower S(test)s from the Precompound and Concentrate Tests as compared to the Mix & Mold Test, but this wasn’t the case. This was the most significant finding of the study, and it has permanently changed our testing direction. We could have the advantages of a more automated test without the need for expensive and time-consuming steps.

In conclusion, the Mix & Mold Test has a much lower S(test) than the Polyethylene Compound Test. It meets the selected criteria, a minimum goal of having less than 30% test contribution of variability for strength. In fact, it is less than 10% contribution on the color components. The Mix & Mold Test is the solid choice for routine quality control testing (testing versus a know standard).

It’s obvious this study was just a step in the right direction. Many of us have improved on our application test methods for both internal and customer use. The key to “real” improvement is using statistics. Our work continues. This was just a step in the right direction in search of the “perfect test.”

This study was made possible by the combined efforts of several groups within Sun Chemical Pigments Division. We wish to extend special thanks to the Plastics Group Technical Service Representative Dee Eichenlaub his contributions.
The Color & Appearance Division Endowment Scholarship Winner or the 2011 - 2012 School Year

The Color & Appearance Division of the Society of Plastics Engineers is proud to announce the winner of its Endowment Scholarship for the 2010 - 2011 Academic year: Robert “Bobby” Mims. The Endowment Scholarship is offered by the CAD to students who have demonstrated or expressed an interest in the coloring of plastics industry. The students must be majoring in or taking courses that would be beneficial to a career in this industry. This would include, but is not limited to, plastics engineering, polymer science, coloring of plastics, chemistry, physics, chemical engineering, mechanical engineering, industrial design and industrial engineering. All applicants must be in good standing with their colleges. Financial need is considered for most scholarships.

Born and raised in rural South Carolina, Robert “Bobby” Mims graduated from Berkeley High School in 1996. After graduating high school, Bobby worked for Corning Inc. where he held various positions in manufacturing. In 2004 Bobby joined Sun Chemical Corporation as a Chemical Operator in the R&D Pilot Plant. In 2006 he was promoted to Technician Specialist in the Colors Technology New Product Development Group and later to Chemist, where he is currently working on High Performance Pigments Research. He holds a patent in PV55 Crystal Form and several internal invention disclosures. Bobby is currently attending Trident Technical College in the pursuit of a degree in Chemistry. Bobby attended the CAD RETEC* in Nashville where he was recognized during the awards luncheon.

For interested students who will be attending college during the 2011-2012 academic year, please see the adjacent page, or follow the link: specad.org/index.php?navid=66 to the CAD website for more detailed information, including an application.

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Color Mischief Coloring the World of Plastics

The Tale of the Lab Manager and His Two Pairs of Safety Shoes.

We are aware (at least most of us) that the color of viewing illuminant affects our ability to correctly determine if two materials are a color match. Perhaps you don’t know that the level of illumination can also affect whether you can “see” color correctly. Have you ever dressed in dim bedroom light then discovered when you went to a room with bright light, and discovered that you put on a blue sock and a black sock? This happens because of the sensitivity of cone versus rod receptors in our eyes.

Once upon a time there was a color match lab manager [name withheld to protect the individual] who had two pairs of safety shoes of the same loafer style; one pair was black and the other was brown. Leaving for work in a rush one dark and dreary day, this color expert quickly exchanged his slippers for work shoes in the mud room. At work, it wasn’t long before all the lab technicians picked up on the rather embarrassing mistake. You can be sure they were all very diplomatic and discrete in pointing out to their manager the error that was made.

Some of you “Old Timers” may remember the famed radio host Paul Harvey. Paul’s famous line was “and now the rest of the story”. So! As Paul Harvey used to say, “and now, the rest of the story!":

You see, all these caring technicians eager to avoid embarrassing their boss arrived at work the next day each wearing mismatched shoes. Loafer and Oxford, Oxford and Tennis shoe, etc.

Look for Color Mischief features in the next issue of the CAD NEWSLETTER
SOCIETY OF PLASTICS ENGINEERS ENDOWMENT SCHOLARSHIP PROGRAM FOR THE 2011 - 2012 SCHOOL YEAR

All scholarships will be paid directly to the recipients’ schools. The Color & Appearance Division Endowment Scholarship Program will not award scholarships to applicants who are not qualified and reserves the right to not award a scholarship in a given year if it so chooses.

The Endowment Scholarship Program offered by the Color & Appearance Division of the Society of Plastics Engineers awards up to five scholarships each year to students who have demonstrated or expressed an interest in the coloring of plastics industry. The students must be majoring in or taking courses that would be beneficial to a career in this industry. This would include, but is not limited to, plastics engineering, polymer science, coloring of plastics, chemistry, physics, chemical engineering, mechanical engineering, industrial design and industrial engineering. All applicants must be in good standing with their colleges. Financial need is considered for most scholarships.

Undergraduate and graduate scholarships range up to $4,000 annually. Scholarships are awarded for one year only, but applicants may apply for a re-award for each year they are enrolled in school.

Scholarship Eligibility
1. Applicants for these scholarships must be full-time undergraduate students in either a four-year college or a two-year technical program or enrolled in a graduate program.
2. All applicants must be graduates of public or private high schools.

Scholarship Criteria
1. Applicants must have a demonstrated or expressed interest in the coloring of plastics industry.
2. Applicants must be majoring in or taking courses that would be beneficial to a career in the coloring of plastics industry.
3. An applicant must be in good academic standing with his or her school.
4. Preference is given to student members of SPE and also to students who have a parent(s) as a member of the Color & Appearance Division of the SPE.
4. Financial need of an applicant will be considered for most scholarships.

Application Procedure
To be considered for a scholarship from the Color & Appearance Division Endowment Scholarship Program, applicants must complete an application available at WWW.SPECAD.org and return it to the address specified on the application by June 15, 2011. All applications submitted must include:
1. A completed application form.
2. Three recommendation letters: two from a teacher or school official and one from an employer or non-relative.
3. A high school and/ or college transcript for the last two years.
4. An essay by the student (500 words or less) telling why the applicant is applying for the scholarship, the applicant’s qualifications, and the applicant’s educational and career goals in the coloring of plastics industry.
The Color and Appearance Division of SPE strives to educate, train, inform and to provide professional interaction opportunities to the global community involved in visual performance and aesthetics of plastics.
INVITATION TO ATTEND OUR CAD BOARD MEETINGS

The Color and Appearance Division regularly holds Board of Director (BOD) meetings at the ANTEC™ and the CAD RETEC®. In addition, a Summer BOD meeting is typically held about 6 weeks prior to the next CAD RETEC®. The Summer meeting is scheduled in various locations. A Winter BOD meeting is held in January. The Winter meeting is typically held at a site of a future RETEC®. Any SPE CAD members who wish to attend are welcome at these meetings. If interested in attending the next Board meeting, please contact the Division Chairperson for more information.

THE COLOR AND APPEARANCE DIVISION

The Color and Appearance Division (CAD) is committed to the publishing of at least three newsletters a year (four, if there is sufficient material to justify the extra issue). To that end, we would like you to think about the financial side of sponsorship of the newsletter. For the small donation of $300 per year, we offer a business card sized (2 x 3.5 inches) mention in our newsletter, which goes out to the nearly 1,500 members of the CAD as well as other SPE division members. These are people active in every aspect of plastic coloring and additive technology. Larger sized spots are available at a commensurate increase in rate.

YOURS IN COLOR AND APPEARANCE,

If you are interested in helping to sponsor the SPE/CAD Newsletter please contact:

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Great papers, Excellent exhibits, Fantastic Networking Opportunities; The Color and Appearance RETEC® is the best conference in the industry to network and reach out to all those dealing with the coloring of plastics and to learn about all the new (and old) plastics coloration technologies.

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