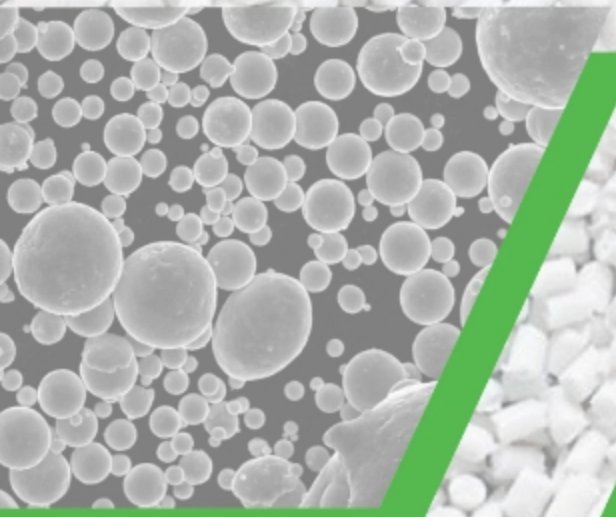
SUMMER 2026

SOCIETY OF PLASTICS ENGINEERS

CADNEWS



RETEC PRELIMINARY PROGRAM

TECHNICAL ARTICLE

FORMULATION OF LIQUID COLOR: A TUTORIAL
BY RICH COVELLI, PARAMOUNT COLORS INC

spe
COLOR AND APPEARANCE DIVISION
COLORING THE WORLD OF PLASTICS

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CHAIRMAN'S MESSAGE

Welcome to this edition of CADNEWS®. It is both an honor and a privilege to serve as Chairperson of the Color and Appearance Division (CAD). I am grateful for the opportunity to follow the many dedicated leaders who have invested their time, talent, and passion into making this organization a valuable resource for our industry.

I would like to extend my sincere appreciation to our previous Chairperson, Kimberly Williamson, for her outstanding leadership and service. Her commitment has helped strengthen our division and positioned us for continued success. I also look forward to another outstanding CAD RETEC® conference in Louisville, Kentucky, September 13th- 15th 2026 and hope you will join us for this premier event, where we can learn, network, and celebrate the achievements of our industry together.

For those who may be less familiar with the Color and Appearance Division, I would like to highlight what makes our organization so impactful. Our mission is to advance education, foster professional networking, promote innovation, and support sustainability and environmental responsibility throughout the plastics industry. These accomplishments are possible because of the dedication and collaboration of our volunteer Board of Directors.

Our Board is made up of professionals representing a wide range of companies, backgrounds, and areas of expertise. Through numerous committees—including Education, Endowment, Communications, Color Advisory, Sponsorship, Technical Programs, and Strategic Planning—our volunteers devote countless hours to developing programs, supporting members, and advancing the goals of the division.

Education remains one of our highest priorities. Each year, the Endowment Committee provides scholarships to students pursuing careers that will strengthen our industry, helping to develop the next generation of leaders. We also continue to support educational outreach programs that introduce students of all ages to the science and opportunities within plastics manufacturing. In addition, CAD proudly partners with SPE' Plastivan to provide educational programming and professional development opportunities for members throughout the year.

Our close collaboration with SPE leadership and staU' continues to strengthen both organizations and expand the value we provide to our members. These partnerships, combined with the commitment of our volunteers, sponsors, exhibitors, and participating companies, ensure that CAD remains a vibrant and forward-looking division.

None of these accomplishments would be possible without the continued support of our members, corporate sponsors, conference attendees, and volunteers. Your enthusiasm, expertise, and generosity enable us to continue investing in education, advancing our industry, and delivering exceptional programs such as CAD RETEC®.

Thank you for your ongoing support of the Color and Appearance Division. I look forward to seeing many of you at this year's CAD RETEC® conference in Louisville and to another successful year of learning, collaboration, and innovation.

TJ STUBBS
Color and Appearance Division
2026 / 2027 Chairperson

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CAD RETEC®

Louisville, KY • September 13-15, 2026

Presented by SPE Color and Appearance Division

Pre-registration online Go to [CAD RETEC® 2026 Homepage]

Onsite Registration Omni Louisville

- Sunday, September 13 1:00 PM – 7:00 PM
- Monday, September 14 7:30 AM – 5:00 PM
- Tuesday, September 15 7:30 AM – 3:00 PM

Preconference Tutorial ***Coloring of Plastics***

Presented by Bruce Mulholland, SPE Fellow
Sunday, September 13, 2026 8:00 AM – 4:30 PM
Fee: $550 (Must Pre-register for event. Extra fee not included with CAD RETEC® 2026 registration)

CAD RETEC® 2026 Golf Outing

September 13th, 2026
Covered Bridges
Registration and lunch 7:30am–9:00am (Tee Times starting at 9:30)
Awards (hole prizes), scramble format
Price: $ 120 per golfer
Includes: the range, green fees, cart fee, lunch,
For more details, visit CAD RETEC® 2026 Homepage

Welcome Reception

Sunday, September 13, 2026
8:00 pm – 11:00pm
Sponsored by **TrustChem**

Breakfast Day 1

Monday, September 14, 2026

Sponsored by The Shepherd Color Company

PLASTIVAN®

Tuesday, September 15, 2026
For more information visit SPE Plastivan

Breakfast Day 2

Tuesday, September 15, 2026

Sponsored by Liberty Specialty Chemicals

CAD RETEC® 2026 Fun Run/Walk

Chroma Specialty Chemicals

Tuesday, September 15, 2026
Sponsored by Chroma Specialty Chem
$25 Registration fee
SPE CAD will match every $25 donation

Awards Lunch

Tuesday, September 15, 2026
12:00pm – 1:30pm
Sponsor TBD

Preliminary Technical Program

Keynote Speakers	
Patrick Krieger **Society of Plastic Engineers** *Appearances Aren't Deceiving: PLASTICS and SPE Look Good* Monday, September 14, 2026	**Robby Helminiak** **Color Pigments Manufacturers Association (CPMA)** *Color at the Crossroads: Navigating the Policy Landscape of the Color Value Chain* Monday, September 14, 2026

Panel Discussions
Yet to be determined at time of print

Preliminary Program		
Name	**Company**	**Title**
Bonnie Piro	Sudarshan	*Solvent Dyes in Plastics: Performance, Processing, and Regulatory Considerations*
Breeze Briggs	Sun Chemical	*Expanding Role of Heat-Management Pigments in High-Performance Technologies*
Mercedes Landazuri	Ampacet	*Color, Material and Finish Directions for 2028*
Edward Gay	Krauss Maffei	*Color Compounding with Co-Rotating Twin Screw Extruders*
Jack Ladson		*Why D65 Spectral Fidelity Matters in Industrial Spectrophotometry*
Anne Stelzer	Lanxess	*High-Tech Dyes for Plastics and New Mobility*
Galen Rende	Keller and Heckman	*How the Regulatory Landscape has Changed Since the Onset of 2025 for Plastics and Specifically the Color and Additive Industries for Plastics.*
Frank Neuber	Clariant	*Maintaining clarity, smoothness, printing, labelling and hot-sealing properties while using an FDA-approved, PFAS-free PPA to eliminate sharkskin in LLDPE films.*
John Howard	Tronox	*Green today, Red tomorrow? A traffic-light framework for regulatory-resilient substitution*
Doug Koerner	Paramount Colors	*The Influence of Carbon Black on Dye Photodegradation in Polymer Coloration Systems*

CAD RETEC®

Louisville, KY • September 13-15, 2026

Presented by SPE Color and Appearance Division

CAD RETEC® 2026 LOUISVILLE, KY

WHERE COLOR LEADS THE FIELD

Preliminary Program		
Name	**Company**	**Title**
Kevin Lucero	Susonity	*Additives for durable, fast and accurate laser marking silicones*
Mark Ryan	Shepherd Color	*Something old, something new, something borrowed, and two things Blue: Updates on recent inorganic pigment advances*
Kelsey Anlicker	Keller & Heckman	*Updates on the Regulation of Chemicals in Food Packaging*
Richard Broo	True North PMP Consulting	*Why Projects Fail: Lessons from the Trenches*
Doreen Becker	Ampacet	*Regulatory & Sustainability Updates for Colors, Effects and Plastics*
Joseph Fay	BASF	*TBD*
Anthony Sciscioli	Entek	*TBD*
John Seymour	John The Math Guy	*CIELAB at 50*

ELECTION RESULTS

NEWLY ELECTED BOARD MEMBERS

Bonnie Piro

Lori De La Cruz

Kelly White

RE-ELECTED BOARD MEMBERS

Cory Singleton

Mark Tyler

Christine Gehres

Steve Esker

Jeff Drusda

CONGRATULATIONS TO ALL

FEE STRUCTURE

LOUISVILLE | 2026

CONFERENCE REGISTRATION

(SELECT ONLY ONE TYPE OF REGISTRATION)

SPE Member	2026
❑ Advance	$480
❑ Late / Onsite (After 8/14/26)	$580
SPE Non-Member:	
❑ Advance	$740
❑ Late/Onsite (After 8/14/26)	$840
5-Pack Registration Bundle	
❑ 5 free registrations	$2,000
OTHER Registration Types:	
❑ RETEC Committee	$225
❑ CAD BOD member	$335
❑ Speakers/Moderator	$225
❑ Student (w/ Valid Student ID):	$100
❑ Emeritus:	$200
❑ Tabletop advanced registration	$1,650
❑ Tabletop late reg (After 8/14/26)	$1,850

EXTRA CONFERENCE LITERATURE:

❑ Extra RETEC 2025 papers	$150 x = $____
❑ Archive DVD (1961-2007) *(available on site)*	$100 x __ = $___

OTHER EVENTS REGISTRATION/RSVP

❑ Golf Outing (Sunday):	$120
❑ Pigments & Pours (Monday):	$35
❑ 5K Fun Walk (Tuesday):	$25
❑	
❑ "Coloring of Plastics" Tutorial (Monday):	$550

* *Full refunds available thru August 22, 2026*
* *Refunds less a $100 fee August 23 to September 4, 2026*
* *No refunds after September 4, 2026*

SOCIETY OF PLASTICS ENGINEERS

2026 CAD RETEC® GOLF OUTING

Sunday September 13th, 2026 at Covered Bridge

Price: $120 Per Golfer
Includes: Golf, Green and cart fees as well as lunch

COURSE LOCATION
12510 Covered Bridge Rd, Sellersburg, IN 47172
PH: (812) 246-8880

Tee times beginning at 9:30 am.
Registration starts at 8:30 am
Awards (hole prizes)

SCRAMBLE FORMAT
Teams will be drawn based on handicaps again this year. *When registering, input your Handicap typical 18 hole score. Please be honest to make this fair*

WELCOME TO COVERED BRIDGE

Covered Bridge is a Fuzzy Zoeller designed and owned 18-hole course nestled on a gently rolling plain at the foot of Southern Indiana's famous Floyds Knobs. Each hole has been laid out to emphasize the natural beauty of the landscape and panorama. This par 72 circuit features five lakes, a meandering creek and is pleasantly forested for a challenging yet scenic round of golf.

QUESTIONS CONTACT:
Mark Tyler (330) 697.1698 or Alex Prosapio 845-641-0596


CAD RETEC® 2026
LOUISVILLE, KY
WHERE COLOR LEADS THE FIELD

CAD RETEC®

Louisville, KY • September 13-15, 2026

Presented by SPE Color and Appearance Division

CAD RETEC® 2026 LOUISVILLE, KY

WHERE COLOR LEADS THE FIELD

SPE CAD RETEC® Coloring of Plastics Tutorial

The Color and Appearance Division of SPE has been presenting the "Coloring of Plastics" tutorial at the start of the CAD RETEC® conference for many years. Many SPE members and non-members have benefited from this program. The tutorial is a great starting point for those just beginning a career, or an excellent continuing improvement opportunity to those who wish to add to their base knowledge of coloring of plastics. The course is full of practical information which is embellished and enlightened by the active participation of all the attendees.

The tutorial runs a full day on Monday prior to CAD RETEC® and does require a separate registration and fee. The attendance is limited to 20 persons, so register soon. Attendees receive a full-color manual to use as a reference when they return home.

Who might benefit from attending the tutorial?

- Executives needing to better understand their company's coloring issues
- Managers newly appointed and/or desiring to communicate more effectively with peers and subordinates
- Color formulators/matchers to better understand the theory behind their work
- Color specifiers/approvers to understand limitations in coloring of plastics
- Sales personnel hoping to gain more technical knowledge to better serve their customers
- Product designers wishing to better understand the technology behind the coloring of plastics, to make better and more informed decisions
- Color manufacturing personnel to understand the impact of compounding on color
- Color processors (injection molding, extrusion, etc.) to better understand the technological ways they can impact the final color

Attendees will leave the course with a better understanding of color technology and should be more effective in their careers around color.

For more information about Color of Plastics Tutorial, please contact the Conference Chair and Tutorial Instructor Bruce Mulholland @ captcolour@gmail.com or call 859-982-5256

To register for this opportunity please visit the SPECAD Website

TECHNICAL ARTICLE INTRODUCTION

CADNEWS TECHNICAL CONTENT

The Technical Content portion of this edition of CADNEWS® includes a paper presented during the recent RETEC. The paper by Rich Covelli of Paramount Colors, Inc. The paper, FORMULATION OF LIQUID COLOR –A TUTORIAL highlights the optimization and formulations of Liquid Coloring. Take a moment to read and as always if you have any questions you can ask any questions using the Color Notes Link below.

CADNEWS COLOR NOTES

Welcome to CADNEWS® Color Notes. Do you have a question regarding color and effects? Don't miss your opportunity to anonymously ask our team of experts. We can help create discussion as well as provide answers. Color, appearance, color measurements, and colorants in general are all in our scope. Use the link below to submit your questions. Our SPECAD Color Notes committee will provide a response in the upcoming CADNEWS®.

HTTP://SPECAD.ORG/COLOR-QUESTIONS-FOR-CAD/

TECHNICAL ARTICLE

FORMULATION OF LIQUID COLOR – A TUTORIAL

Rich Covelli
Paramount Colors, Inc.
999 Lee Street
Elk Grove Village, IL 60007

Abstract

Liquid color is an alternative to resin-based masterbatches. The potential advantages are lower letdown ratios, compatibility with a large variety of resins, and lower cost of transportation and warehousing. This paper is an introduction to formulation and is intended to provide guidance for color suppliers that want to enter the liquid market for thermoplastics. Viscosity is a key property of a liquid, as it affects its pumpability: if a liquid is too thick to pump, it can't be delivered accurately to the molding machine or extruder. Therefore, this tutorial emphasizes viscosity and how it is affected by formulation parameters. Formulation examples show how surfactant polarity, pigment polarity, and proportions of the liquid components affect viscosity.

Materials

A liquid color consists of solid materials, such as pigments, dyes, or additives, that are dispersed into a liquid vehicle. These vehicle systems are made of surfactants and inert liquids. The vehicle system must be heat stable and must not adversely affect the color of the finished plastic goods. It must be chemically compatible with the colorants and end-use resin, non-volatile, and cost-effective. In addition to the requirements listed above, the vehicle components must be chemically compatible with each other. The surfactants should have a pigment-dispersing effect in the polymer melt, in the same way that waxes and stearates aid pigment dispersion in a masterbatch.

It may seem challenging to find liquid components that can meet all the above requirements. However, there are a few that have become industry workhorses because they perform well in liquid color vehicles. White mineral oil is an inert liquid that is colorless, is thermally stable, and is inexpensive. Surfactants that are widely used are Polysorbate 85 (P85) and Sorbitan Trioleate (STO). They are heat-stable, help disperse the colorant during manufacture, provide package stability of the liquid as it sits in a truck or warehouse, and disperse the pigment in the polymer melt. Mineral Oil, P85, and STO were the three liquid ingredients used in the present investigations.

Liquid Color Lifecycle

Before getting into formulation specifics, let us discuss the lifecycle of liquid color. A formula is manufactured by first combining the ingredients, and then subjecting the mixture to shear forces that break up solid particles and evenly disperse them in the liquid. The machinery used can be a high-speed disperser, sand mill, media mill, or any of a variety of machines. The finished color is then packaged. The packaging could be a 5-gallon bucket, a tote, a drum, or something else. The packaged liquid is shipped to the customer, where it could be used immediately or sit in a warehouse for a long time. Finally, the liquid is delivered to the processing equipment using a metering pump, which measures and pumps a precise amount relative on the amount of base material to be colored.

Of course, the most important property of a liquid color, or any colorant, is to produce the desired color in the end product. However, since the subject under discussion here is liquids, the viscosity of the product requires special consideration throughout its lifecycle. The liquid's viscosity must be thin enough to mix and accommodate the dispersed solids during manufacturing. It must be thin enough to be poured or pumped into its packaging. It must be thick enough to resist pigment settling during transportation and storage. Finally, it must be thin enough to be accurately pumped into the machine that makes the end product. Armed with the understanding of how formulation affects viscosity, the chemist will be able to create products that will be behave predictably during manufacture and storage, and will deliver consistent color to the customer.

Formulation

Polarity Matching of Colorants and Liquids

In order to understand how the ingredients in a formula affect viscosity, the chemical polarity of the materials must be considered. Polarity refers to the separation of positive and negative electric charges within a molecule or particle. In liquid color, ingredients with similar polarity combine to produce liquids that have lower viscosity. Organic pigments and dyes, STO, and mineral oil are low-polarity ingredients. Inorganic pigments and P85 have high polarity. (See Table 1). In this paper, "polarity matching" refers to using a high-polarity surfactant with high-polarity colorants, and a low-polarity surfactant with low-polarity colorants.

At first, the question might arise: Since mineral oil is less expensive than surfactants, why bother using them at all? The answer is that surfactants are usually necessary to create a dispersion that flows well. Figure 1 shows a TiO2 dispersion in straight mineral oil. This mix was liquid as it was under agitation, but after cooling to room temperature it solidified. Adding a surfactant would allow the dispersion to flow like a liquid should. Surfactants are also important because they reduce pigments specks in the final plastic part.

An experiment was performed that illustrates the effect of polarity matching. Pigments of low- and high polarity were dispersed with surfactants of low- and high polarity. The low-polar (organic pigments) used were Pigment Blue 15:1 (Phthalo Blue), Pigment Green 7 (Phthalo Green), Pigment Yellow 62 (Calcium Azo Yellow), Pigment Orange 34 (Diarylide Orange), and Pigment Red 170 F3 (Naphthol Red). For each pigment, a 20% by weight dispersion was made in both the low-polar surfactant (STO) and the high-polar surfactant (P85). The ingredients were combined in an 8-ounce plastic jar. Glass beads were added; the jar was covered and shaken on a Harbil paint shaker for 30 minutes to make the dispersion. After cooling to room temperature, the viscosity of the dispersions was measured using a Brookfield Model LVTDV-II viscometer.

For each of the low-polar pigments, the viscosity in the low-polar surfactant was significantly less than in the high-polar one. It should also be noted that even though these are all organic pigments at 20% loading, the viscosities for a given surfactant varied considerably. This shows that not all pigments will behave the same, even when loading and polarity are matched. A similar experiment was done for these high-polar (inorganic) pigments: Pigment Blue 29 (Ultramarine Blue), Pigment Yellow 42 (Yellow Iron Oxide), Pigment Red 101 (Red Iron Oxide), and Pigment White 6 (Titanium Dioxide). For each pigment, viscosity in the high-polar surfactant was less than in the non-polar one. This confirms the concept that polarity matching will give lower viscosities.

Ladder Study #1

It is possible to make liquid color using only colorants and surfactants. However, since mineral oil is less expensive than surfactants, it makes economic sense to include it in the formulas. Part of the formulator's task will be to determine the vehicle composition, i.e. the proportion of mineral oil vs. surfactants.

Ladder studies were performed to illustrate the relationship between ingredient levels in a TiO2 liquid. The pigment was held constant at 60% by weight; therefore, the liquid components totaled 40%. This 40% vehicle was the focus of the ladder study. Within the 40% liquid, three levels of mineral oil were used. Within each of these levels, the proportion of P85 to STO was varied. This is a lot of numbers to consider; one way to simplify is to consider the vehicle to be two parts: the mineral oil, and the surfactant mixture. Since the surfactant mixture has only two components, declaring the level of the P85 automatically sets the level of STO. The proportion of P85 in the surfactant blend can be 100%, 0%, or any value in between. Therefore, for a given level of oil, the viscosity of the dispersion is a function of the proportion of P85. Reducing the number of variables in this way makes it simpler to plot the data and comprehend it. The vehicle can then be described as consisting, for example, of X% oil and 100-X% surfactant package, and the surfactant package consisting of Y% P85 and 100-Y% STO.

Three tests were performed using 60% TiO2 and 40% vehicle. Within the vehicle, the oil levels were set to 0%, 20%, and 50%; the remainder of the vehicle was surfactant. The polarity of the surfactant mix was changed by varying the proportions of P85 and STO. The surfactant proportions were 100% P85, 50% P85, and 0% P85 (corresponding to 0%, 50%, and 100% STO). Results are in Table 4. For all three oil levels, viscosity was lowest when the surfactant was 100% P85, which is in agreement with the polarity matching test above. The viscosity was higher for the 0% P85 dispersions. Interestingly, for the samples within the 0% and 20% level of oil, the viscosity of the 50/50 dispersions is significantly higher than the other two. A possible explanation is that there was an interference between the two surfactants when there is a low oil level. This calls for another ladder study.

The question might arise: Why even bother using the STO in this TiO2 liquid, since the samples with it have higher viscosities? The answer again has to do with polarity. Of the three liquids used in this study, mineral oil has the lowest polarity, and P85 has the highest. Liquids with low and high polarity often don't mix well, as shown when mixing oil and water. In the same way, mineral oil and P85 don't mix completely because of their different polarity. A binary mixture of the two will appear homogeneous at first, but separate after a while. See Figure 2. This tendency toward separation will exert a destabilizing effect on the finished liquid color. To stabilize such a mixture, it is necessary to have some intermediate polarity liquid in the system, and STO serves that purpose. STO couples the other two liquids to form a stable vehicle.

Here is what has been learned so far: (1) Surfactants are necessary to have a flowable dispersion; (2) TiO2, being a polar pigment, gives lower viscosities when combined with a polar surfactant; (3) It is possible to vary the amount of oil in the vehicle, but at lower oil levels there seems to be an interference between the two surfactants; and (4) some STO is necessary to prevent the vehicle itself from separating.

Ladder Study #2

A more in-depth ladder study was conducted to see if there was another level of oil and surfactant that could result in a relatively low viscosity, while incorporating some STO to fight against

vehicle instability. The dispersions again consisted of 60% TiO2 and 40% vehicle. Within the vehicle, the oil level was 34%; the remaining 66% of the vehicle consisted of various proportions of P85 and STO. Table 5 shows the results. As the polarity of the vehicle decreases (by increasing the proportion of STO), the viscosity increases almost linearly. For dispersions with intermediate polarity, this 34% oil sample has no unexpected bump in viscosity.

Combining the two ladder studies, we can see that, for a 60% TiO2 dispersion, the following vehicle composition will give lower viscosity: 34%-50% mineral oil, the remainder consisting of a surfactant blend of predominately (but not entirely) P85. See Table 6 and Figure 3.

Summary

The polarity of the pigments used will dictate the polarity of the surfactant blend in the vehicle system. Inorganic pigments will require a surfactant blend of relatively higher polarity; organic pigments will behave best with a lower-polarity system. For mixtures of high- and low-polarity pigments, such as TiO2 and phthalo blue, a vehicle system of intermediate polarity should be considered. The above experiments show that some trial and error is required to understand how pigments and vehicle components interact and affect viscosity. A simple first test is usually required, then a more in-depth test can be performed if the data warrants it. Color evaluation will be necessary to see if the pigment is properly dispersed in the resin system used.

How does one determine an acceptable viscosity? At first, simply try pouring out the liquid from the mixing container. If a sample won't pour, then the viscosity is too high. Apply the principles discussed here to adjust the viscosity if necessary. Experimentation is called for to determine an acceptable viscosity. Experience will need to be gained to determine what viscosity has good package stability and yet is pumpable by the customer.

For Further Consideration

This paper has only begun to describe the formulation of liquid colors. Sometimes a liquid formula is just too thick, no matter what has been tried. In this case, there are dispersant additives, which are relatively expensive, that can be used at low levels to drastically thin out the liquid. If the liquid separates as it sits in the customer's warehouse, there are additives like clays or fumed silica that can counteract this tendency without making the product unpumpable. With good experimentation and the right materials, the formulator will be in a position to understand and control these issues.

Figures and Tables

Figure 1. TiO2 in mineral oil, no surfactants. A "solid" liquid.

Figure 2. Separation of Mineral Oil and P85

Left: Oil and P85. Right: Oil, P85, and STO.

Table 1. Polarity of Liquid Color Ingredients

Polarity	Colorants	Liquids
Low polarity	Organic pigments	Mineral Oil
	Organic dyes	STO (Sorbitan Trioleate)
High polarity	Inorganic pigments	P85 (Ethoxylated STO)

Table 2. Viscosity of Dispersions of Non-Polar (Organic) Pigments

CI Name	Pigment Loading	Viscosity, cP *	
		P85 (polar)	STO (non polar)
PB 15:1	20%	32,700	12,500
PG 7	20%	5,210	451
PY 62	20%	> 50,000	26,700
PO 34	20%	3,160	1,300
PR 170 F3	20%	10,500	5,610

* Brookfield LVTDV-II viscometer, spindle 4, 12 rpm

Table 3. Viscosity of Dispersions of Polar (Inorganic) Pigments

CI Name	Pigment Loading	Viscosity, cP *	
		P85 (polar)	STO (non polar)
PB 29	53%	11,900	16,700
PY 42	33%	12,900	34,100
PR 101	70%	23,200	25,400
TiO2	60%	8,130	27,400

* Brookfield LVTDV-II viscometer, spindle 4, 12 rpm

Table 4. Viscosities for Ladder Study 1

Composition: 60% TiO2, 40% Vehicle
Brookfield Viscosity, LVTDV-II, Spindle 4, 30 rpm

% Oil in Vehicle	Surfactant Composition: % P85 / %STO		
	100 / 0 (most polar)	50 / 50	0 / 100 (least polar)
50%	5,180	5,040	6,710
20%	6,380	13,100	12,200
0%	5,480	18,900	14,600

Table 5. Viscosities for Ladder Study 2

Composition: 60% TiO2, 40% Vehicle
Brookfield Viscosity, LVTDV-II, Spindle 4, 30 rpm

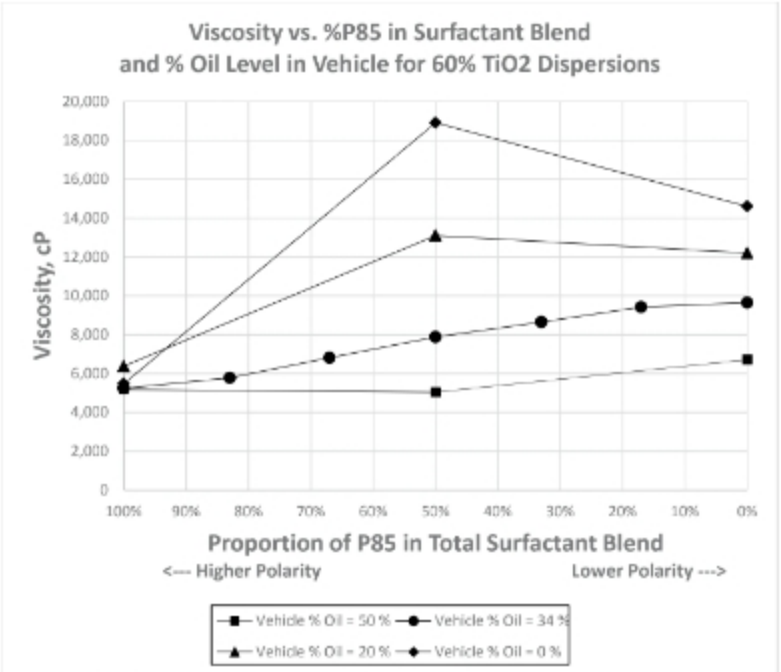
	Surfactant Composition: % P85 / %STO						
% Oil in Vehicle	100 / 0 (most polar)	83 / 17	66 / 34	50 / 50	34 / 66	17 / 83	0 / 100 (least polar)
34%	5,240	5,780	6,810	7,880	8,650	9,420	9,650

Table 6. Combined Data for Both Ladder Studies

Composition: 60% TiO2, 40% Vehicle
Brookfield Viscosity, LVTDV-II, Spindle 4, 30 rpm

	Surfactant Composition: % P85 / %STO						
% Oil in Vehicle	100 / 0 (most polar)	83 / 17	66 / 34	50 / 50	34 / 66	17 / 83	0 / 100 (least polar)
50%	5,180			5,040			6,710
34%	5,240	5,780	6,810	7,880	8,650	9,420	9,650
20%	6,380			13,100			12,200
0%	5,480			18,900			14,600

Figure 3. Plot of Data from Combined Ladder Studies



spe

SPE COLOR AND APPEARANCE DIVISION MISSION STATEMENT

The Color and Appearance Division of SPE strives to educate, train, inform and provide professional interaction opportunities to the global community involved in visual performance and aesthetics of plastics.

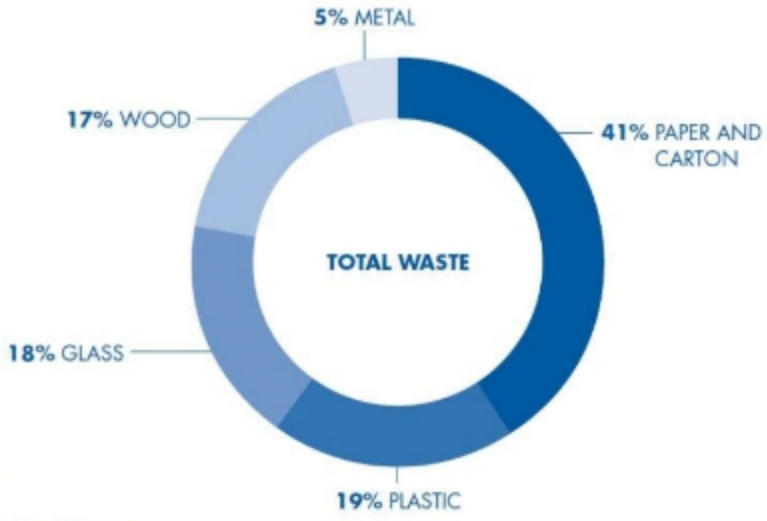
INVITATION TO ATTEND CAD BOARD MEETING

The Color and Appearance Division (CAD) holds 4 Board of Directors (BOD) meetings each year, either in person or virtually. Any CAD members in good standing with in SPE and has Color and Appearance as their selected division are welcomed to attend these meetings. If interested in attending these meetings, please contact the current CAD Chairperson or any BOD for more information.

9 MYTHS ABOUT PLASTICS

1. Plastic packaging is toxic? False: plastic packaging is inert & can save lives. Contaminated water can be purified in transparent PET bottles with UV rays. This helps those in regions where there is no access to clean drinking water. Plasticizers such as BPA have been identified as being harmful to health. These substances aren't used in PET bottles, caps or in plastic packaging used for personal care and household products. Ref: Eurostat (env_waspac)

2. Majority of packaging waste is plastic? False: plastic packaging is only a small portion of packaging waste. Across Europe, plastic packaging is only 19% of the total packaging waste. Most packaging waste, is from paper and carton and that has risen significantly since 2007. Ref: Eurostat (env_waspac)

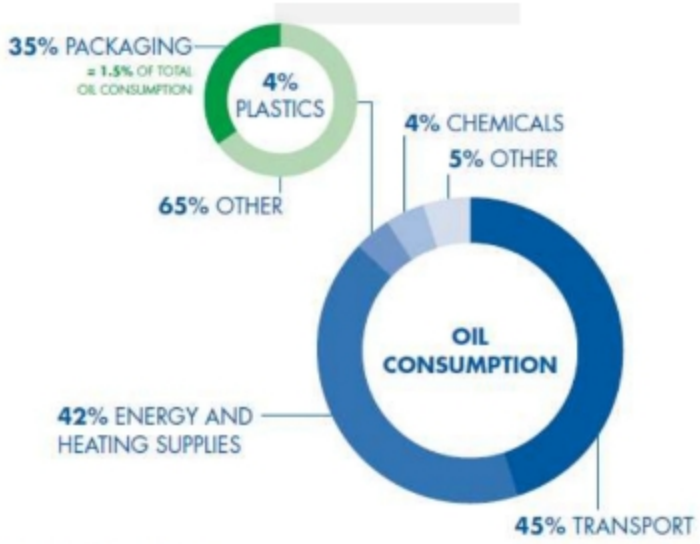


3. The industry isn't doing anything to reduce the use of plastic? False: new designs yielded an annual reduction of 6.2 million tons of plastic in Western Europe. Packaging made of plastic has become 25% lighter since 1991 while still retaining performance, safety and hygiene standards. Ref: German Association for Plastics Packaging and Films (IK):'Daten & Fakten –„Ressourceneffizienz von Kunststoffverpackungen'; PlasticsEurope: 'Plastics – the Facts 2019'

Changes in the Weight of Household Plastic Packaging (1991 - 2013)

Ref: German Association for Plastics Packaging and Films (IK): 'Daten & Fakten –„Ressourceneffizienz von Kunststoffverpackungen';
PlasticsEurope: 'Plastics – the Facts 2019'

4. Plastic packaging consumes extreme amounts of oil. False-only 1.5% of crude oil produced globally is used for manufacturing plastic packaging. Plastic packaging can be recycled 4-7 times without the need for new oil. ref: https://lnkd.in/eHjva9mE



Source: http://bpf.co.uk/press/Oil_Consumption.aspx

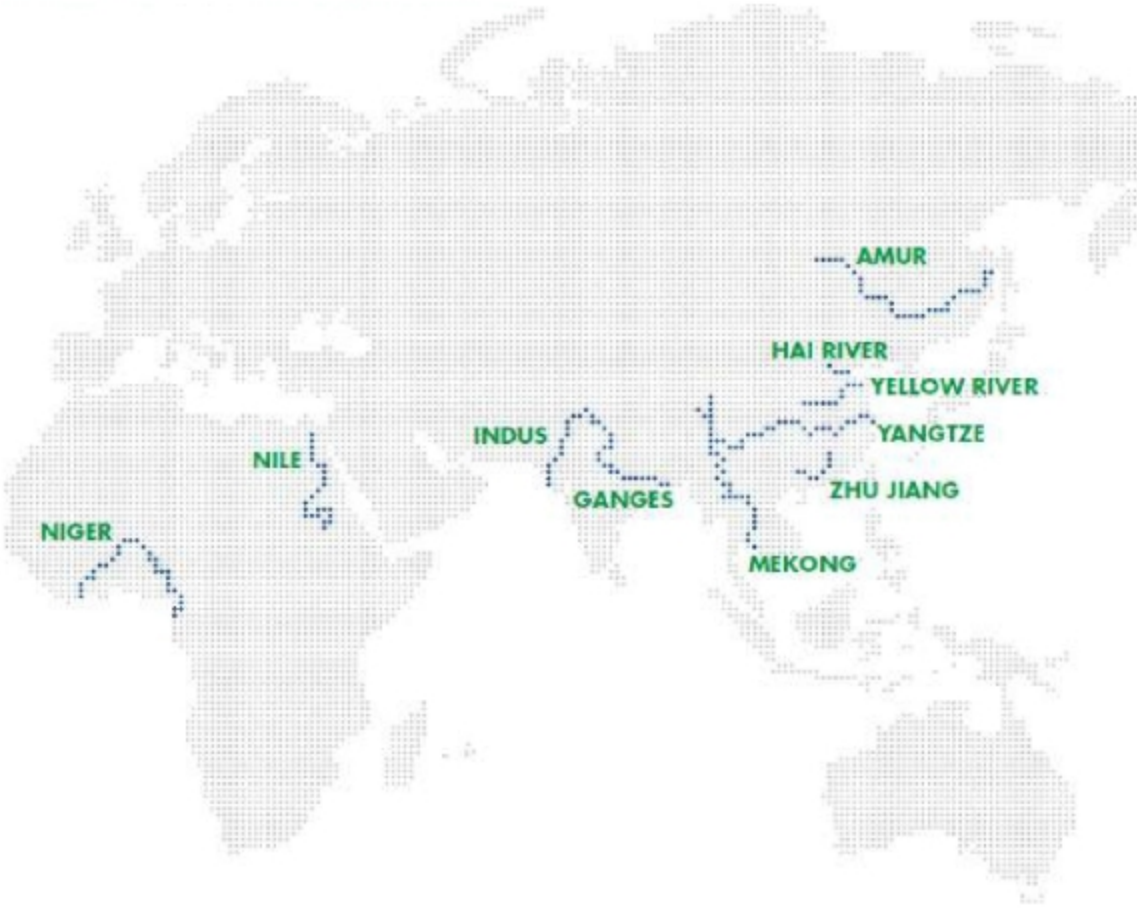
5. Plastic packaging prevents us from achieving carbon goals? False: plastic packaging generates small amount of carbon emissions (0.6%) compared to transportation, food production and energy generation. ref: European Environment Agency 2017; CO2 equivalent, myclimatecalculator.

CARBON EMISSIONS

Sources:
European Environment Agency 2017;
CO_2 equivalent, myclimate calculator, 2,900 km
Economy Class, return flight, 1 person

6. Oceans are full of plastic from the US & Europe? False: marine litter is a waste disposal problem not a plastic packaging problem. 80% of plastic waste comes from developing countries that lack proper waste collection systems. Most ocean plastic waste is from fishing gear. Ref: European Commission: 'A European Strategy for Plastics in a Circular Economy'

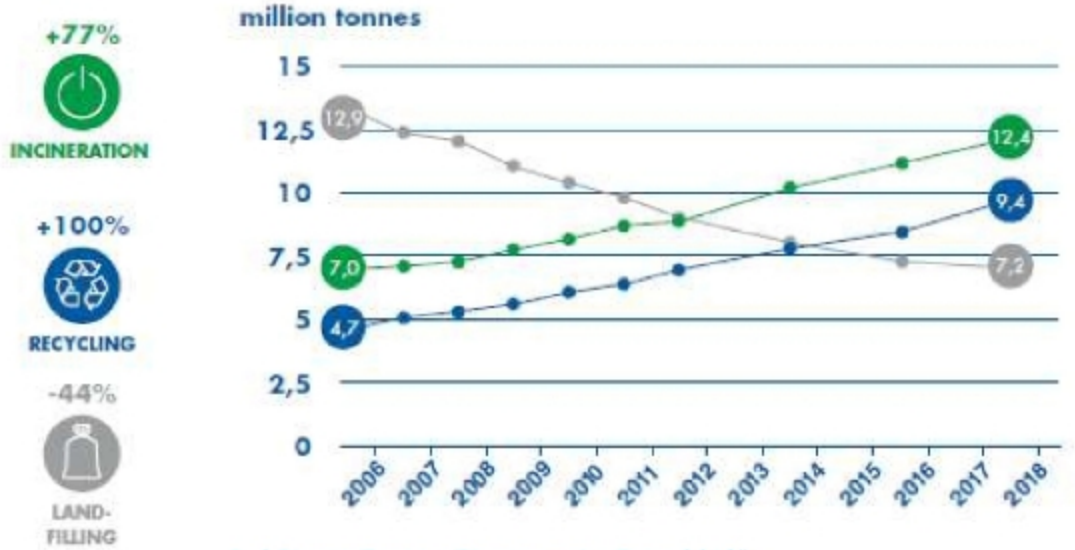
The majority of the plastic waste in the oceans enters the oceans from on land via rivers. The majority of this waste comes from these ten rivers:



Ref: European Commission: 'A European Strategy for Plastics in a Circular Economy'

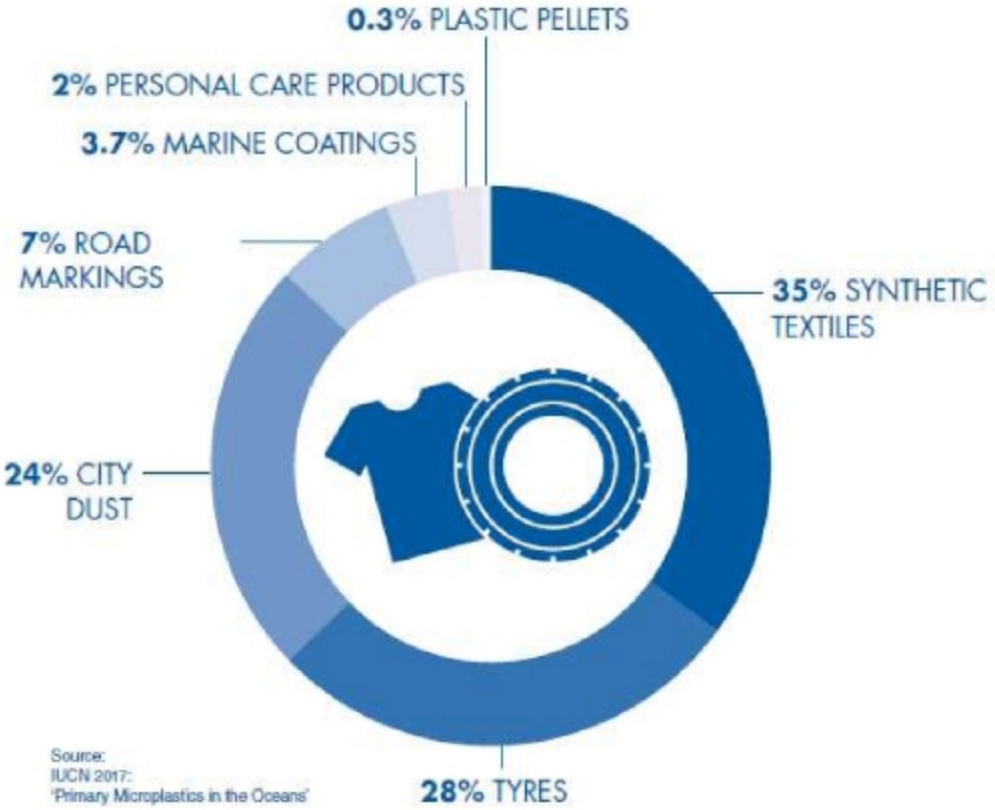
7. Most plastic packaging still ends up in landfill. False: there has been a significant reduction of plastic packaging in landfill in recent years. Higher plastic packaging collection resulted in higher recycling and waste-to-energy rates. Ref: PlasticsEurope: 'Plastics – the Facts 2024')

UTILISATION OF PLASTIC WASTE IN EUROPE
(EU + NORWAY AND SWITZERLAND)



Ref: PlasticsEurope: 'Plastics – the Facts 2019')

8. Majority of Microplastics in oceans are from plastic packaging. False: most microplastics are from clothing, tires and city dust. If plastic waste is managed correctly, through reuse, recycling and reduction then less will become microplastics, Ref: IUCN2017, 'Primary Plastics in the Oceans'



9. Plastic companies are spreading misinformation about plastics? False: Misinformation is actually being spread by organizations who either don't know the facts about plastics or manipulate statistics to mislead the public.

Life without plastics would be catastrophic, in particular medical durable and single-use plastics can prevent infections, reduce tampering, create devices that weren't previously possible and reduce medical costs.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