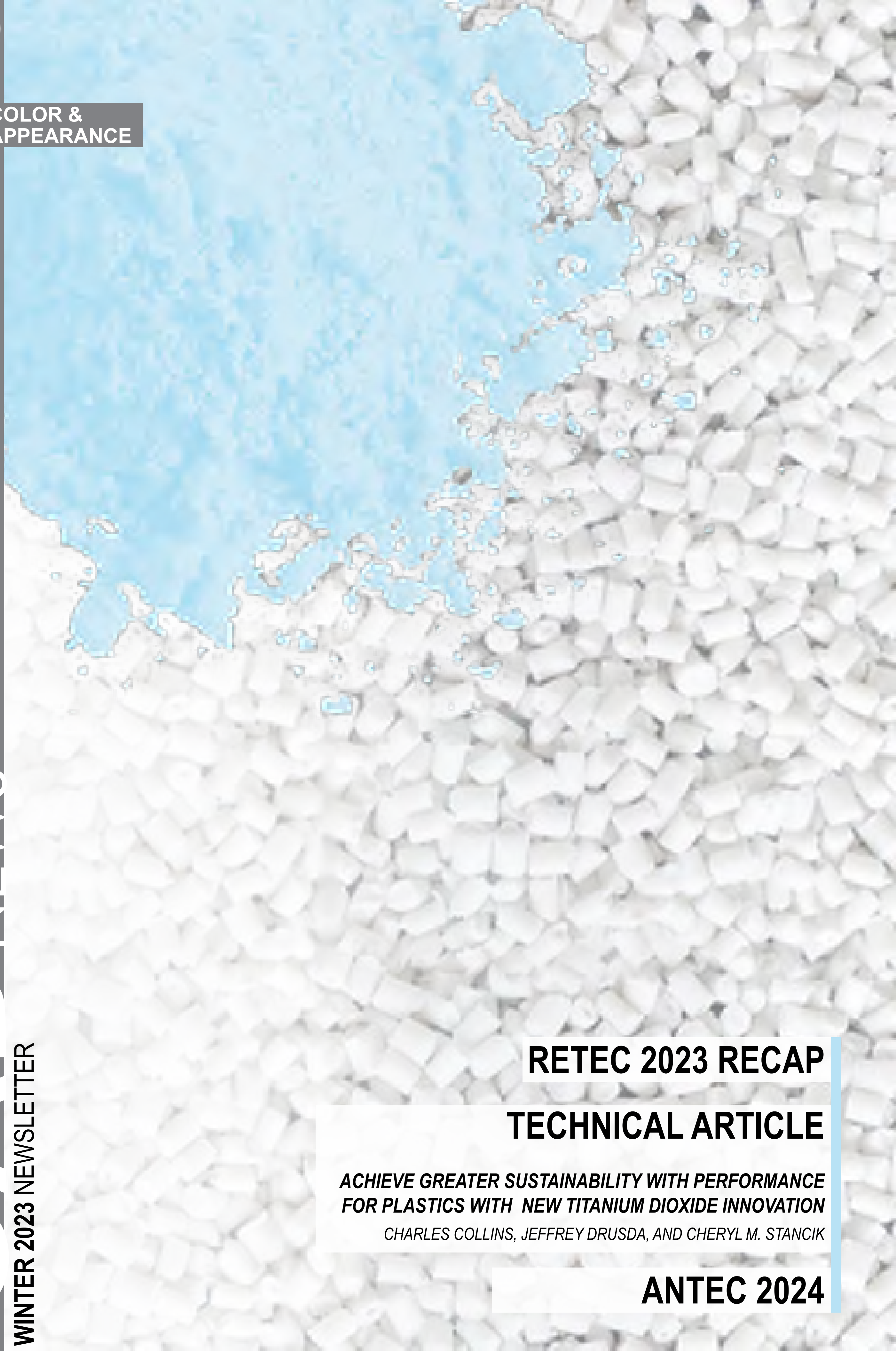


spe

COLOR & APPEARANCE

CAD NEWS®

WINTER 2023 NEWSLETTER

RETEC 2023 RECAP

TECHNICAL ARTICLE

ACHIEVE GREATER SUSTAINABILITY WITH PERFORMANCE FOR PLASTICS WITH NEW TITANIUM DIOXIDE INNOVATION

CHARLES COLLINS, JEFFREY DRUSDA, AND CHERYL M. STANCIK

ANTEC 2024

WINTER 2023 CHAIRMAN'S MESSAGE

Hello SPE Color and Appearance Division Members! Welcome to December and our Winter Issue of CAD Newsletter. I hope everyone had a great Thanksgiving and you are off to a good start to the Holiday Season. It is unbelievable how quickly the year flew by. In taking a quick peek back to September, I would like to thank Kimberly Williamson and Steve Esker for their fantastic job chairing our 61st SPE CAD RETEC, which was held at the Hyatt Regency in Columbus, OH. Kim, Steve, and team conducted an excellent show with interesting papers and an outstanding panel discussion focused on Regulatory Concerns. The panel, moderated by Betty Puckerin, included Eric Andrews from Colour Synthesis Solutions, Frank Lavieri of Paramount Colors, David Wawer from Color Pigments Manufacturers Association (CPMA), and Dr. Lillian Mawby from the FDA. Dr. Mawby presented some very useful and interesting information on the FCN process and approvals.

There were over 51 companies that exhibited this year in Columbus. The SPE Plastivan was in attendance again with students visiting the exhibit area on Tuesday morning. The students participated in educational programming sponsored by SPE and CAD. The very popular New Technology Forum was a full schedule of exhibitors showcasing their new products which stimulates discussions and attracts visitors to the respective booths. Mark Tyler again selected a great golf course for the outing at NorthStar Golf Club, and CAD was able to donate $1,400 to the local chapter of Habitat for Humanity from the proceeds of the Fun Run. Also, a big "Thank You" to all our sponsors as their support helps us offset the cost of RETEC.

Jack Ladson received this year's Terry Golding Outstanding Achievement Award for his exemplary work on the CAD Board over the years and his continued work today. In addition, I would like to give special recognition to Betty Puckerin in attaining the Honored Service Member Award, which is an honor given to those who have demonstrated long time outstanding service and support of the Society and its objectives. HSM Awards are limited to very few numbers of inductees per year. Congratulations to both of you and thank you for your many hours of service and dedication to our division.

We will have our Winter Board Meeting in Tampa, FL following the AMI Thermoplastic Concentrate meeting on February 1. The BOD meeting will be held at the conference hotel, the Renaissance International Plaza in Tampa, FL. Speaking of Tampa, it is never too early to start thinking about the 2024 SPE CAD RETEC, Sailing Away with Color, which will be held at the Tampa Marriott Water Street hotel on September 23-25.

In closing, on behalf of the CAD Board, thank you for your continued support. I would like to wish you and your family happy holidays and a healthy and prosperous New Year. Looking forward to seeing you in 2024!

ALEX PROSAPIO
Color and Appearance Division Chair
aprosapio@sudarshan.com

SPONSORS

Milliken presents

Milliken: The Color Experts

Milliken & Company understands the power and value of color as it relates to branding. Humans are visual creatures, and color plays a key role in purchasing decisions, as it helps to inform, personalize and speak the brand language.

The company continues to tap into its vast experience in this space to develop solutions for a wide variety of end markets and end-use applications.

Milliken's color journey began in 1964, when it launched its proprietary Versatint® washable colorants for textile identification. In 1981, it introduced its Reactint® range of colorants for polyurethane (PU). Five years later, Milliken unveiled its ClearTint™ polymeric colorants for use in NX® UltraClear™ polypropylene (PP), which can be made only with its Millad® NX® 8000 clarifier.

The year 2019 marked a major step forward, with the introduction of both its KeyPlast® products, as well as its KeyPlast RESIST™ high-performance colorants for plastics.

Milliken technology helps to color a vast range of sectors, including agriculture and turf; automotive and transportation; building and construction; coatings, paints and inks; home and laundry care; and plastics.

Milliken's KeyPlast RESIST colorants address another key challenge — coloring high-performance engineering polymers with bright and vibrant hues. These colorant are used in the high demanding applications such as high voltage connectors, control systems, structural parts and metal replacement.

Using KeyPlast RESIST colorants compounders and resin producers, offer a vast spectrum of stable and reproducible colors suitable for use with a wide range of resins such as Polyamides, PPA's, Poly Sulphones and other high heat polymer blends and alloys.

Additionally, Milliken continues to keep its finger on the pulse of end-user and market trends, which it documents each year in its ColorDirection report that forecasts the key shades and hues for the coming year. In doing so, it offers a palette of carefully curated colors, while providing the stories behind the inspiration and motivation driving their popularity. Brand owners can leverage this expert information to help capture the mood of consumers through effective branding and personalization.

Milliken's diverse portfolio of colorants can enable product makers to realize their aims to deliver on those colors that will help drive and shape consumer preferences in the coming year.

From the R&D lab to the production floor, Milliken's Chemical Division stands ready to help customers leverage color to design new products, reinvigorate existing products, and create opportunities to grow in new markets and applications.

For more details and information please contact us or visit us online at ***chemical.milliken.com***

EUROPE : eurochem@milliken.com | **NORTH AMERICA** : millichem@milliken.com
LATIN AMERICA : lachem@milliken.com | **ASIA** : asiachem@milliken.com

Milliken™

ANTEC® 2024 SAVE THE DATE

SPE is hosting **ANTEC® 2024** at the Marriott St. Louis Grand
St Louis, MO from March 4th –7th

ANTEC® 2024, SPE's Annual Technical Conference, will showcase the latest advances in industrial, national, laboratory, and academic work focused on plastics and polymer science.

At ANTEC®, there are multiple opportunities to spend time with colleagues at SPE-hosted meetings, receptions, an Honors and Awards Luncheon, and additional SPE Chapter networking events.

The 2023 RETEC® Committee and
Color and Appearance Division Board of Directors
would like to say a huge

THANK YOU

to this year's RETEC® Sponsors.

Registration fees for attendees are kept low in part by the generous donations of these corporate and individual sponsors.

Platinum Sponsors

- DCL — See The Difference We Make
- Liberty
- Shepherd
- Milliken
- SunChemical — a member of the DIC group — DIC Color & Comfort
- SUDARSHAN
- TRONOX

Gold Sponsors

- DCL — See The Difference We Make
- heubach — brighter colors - brighter life
- TOMATEC
- TRUST CHEM 信凯化工
- EMD Electronics
- Royce GLOBAL
- TORRECID USA
- vivify

Silver Sponsors

- Celanese — The chemistry inside innovation
- SILBERLINE — FROM SCIENCE TO SHINE
- CINIC
- CLARIANT
- monolith
- SPECTRA

The 2023 RETEC® Committee and Color and Appearance Division
Board of Directors would also like to say

THANK YOU

to this year's exhibitors.

COMPANY	COMPANY
AMI	Milana Colours
Barentz	Milliken & Company
Brilliant Group Inc.	MIXACO USA
Buckeye Color & Chemical Co.	NGF Canada Limited
CAD SPE/ SPE Plastivan	OXERRA
Chroma Specialty Chemicals	Paramount Colors Inc.
CINIC	PCBL, Ltd.
Colour Synthesis Solutions	ROHA USA
COVIA	Royce Global
Datacolor	Silberline Manufacturing
DayGlo	Sincol USA
DCL Corporation	Spectra Dyestuffs Inc.
Eckart America	Sudarshan North America
EMD Electronics	Sun Chemical Corporation
Exciton	The Shepherd Color Company
First Source Worldwide	Tomatec America, Inc
H. L. Blachford Ltd.	Torrecid USA LLC
Heubach Group	Tronox, LLC
Intercoastal Sales	Trust Chem USA, LLC
Keim-Additec Surface LLC	United Mineral & Chemical Corp
Kuncai Americas, LLC.	US Silica
Leistritz Extrusion	Vibrantz Technologies
Liberty Specialty Chemicals	Vivify Company
Lintech International	X-Rite Pantone
M Holland	Yipin USA
Mayzo	

SAILING AWAY WITH COLOR

CAD RETEC® 2024 TAMPA, FL

CAD RETEC® 2024

CALL FOR PAPERS

Tampa Marriott Water Street
Tampa, Florida
September 23 – 25, 2024

Deadline for Abstracts is February 2024

Chairperson:	Alex Prosapio, Sudarshan aprosapio@sudarshan.com
Vice-Chairperson:	Mark Tyler, Silberline tylerm@silberline.com
Technical Program:	TJ Stubbs, Teknor Apex tstubbs@teknorapex.com

Color and Appearance Division

spe COLOR & APPEARANCE

---

spe COLOR & APPEARANCE

Society of Plastics Engineers
Color & Appearance Division
Endowment Scholarship Program
for the 2024 – 2025 School Year

Color and Appearance Division

The Endowment Scholarship Program offered by the Color & Appearance Division of the Society of Plastics Engineers awards multiple 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 $3,000 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 and return it to the address specified on the application by June 7, 2024. 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.

For more information, visit www.specad.org or contact Ann Smeltzer at (412) 298-4373 or e-mail at ann.smeltzer@heubach.com

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.

COLOR & APPEARANCE

Society of Plastics Engineers Color and Appearance Division

Call for Board of Directors Candidates

2024 to 2027 Term

The Color & Appearance Division of the SPE will be conducting its annual Board of Directors elections April 2023.

SPE CAD Board of Directors

The election is open to current SPE members with CAD as their primary division. Time commitment would be for four meetings per year for 3 year terms. One of the meetings will correspond with RETEC where you will participate in CAD activities and initiatives. Members of the Board participate in the planning, organization and running of CAD activities including ANTEC programs, RETEC programs, Technical Programs, Scholarship Programs & Funding, as well as offering guidance and advice to other SPE members interested in coloring plastic resins.

SPE Council Representative (CAD)

The Color & Appearance Division of the SPE is also electing a Council Representative for the 2024 to 2027 term. The CAD Councilor provides the CAD members a voice in the government of SPE by representing the SPE Color & Appearance Division at SPE Council meetings (3-4 meetings per year – 2 meetings at ANTEC, 1 face-to-face meeting in the Fall and potentially one conference call).

To be listed as a candidate or have questions about becoming a candidate, please Email or call **Chair Elect George Iannuzzi**. Please Email a picture of yourself, educational background, employment (current and prior), and why you wish to be a candidate to:

George Iannuzzi
Email: george@koelcolours.com
Phone: 914-261-8189

All candidates must be identified and have all their information to SPE CAD BOD by March 31st, 2023

Visit SPECAD Website for more information

SPE Color & 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.

SPE CAD NEWS

HABITAT FOR HUMANITY

SPE CAD-RETEC has been supporting Habitat for Humanity since 2005 when Hurricane Katrina struck the Gulf Coast causing catastrophic damage from central Florida to eastern Texas. That year, SPE CAD-RETEC was held in Charlotte, North Carolina and in support of the vast rebuilding that would take place, SPE CAD-RETEC donated 25% of the profits from the event to HfH. Since that time the relationship between the two organizations has grown.

For the last 17 years, DCL has supported the Habitat for Humanity in their mission to bring people together to build homes, communities and raise hope through sponsorship of the 5K Fun Run. This past September we were in Columbus, OH and DCL once again hosted the annual 5K Fun Run. It raised $1,400. We are grateful to the runners who helped make this possible, as well as the matched donation made by the Society of Plastics Engineers Color and Appearance Division.

TERRY GOLDING OUTSTANDING ACHIEVEMENT AWARD

At the RETEC 2023 Conference Michael Willis, past chair of the SPE Color & Appearance Division, had the honor of presenting the Terry Goulding Outstanding Achievement Award. This prestigious accolade was awarded to Jack A. Ladson in recognition of his substantial contributions to color science and the CAD division. Jack holds the significant position of Color Advisory Chair, is integral to the development of international standards, and provides informative updates to the color science community. His dedication to the Education Committee, evidenced by his work on his color education series, highlights his commitment to advancing education in the field of color science. The award underscores SPE CAD's mission to support education and promote color science recognition in the industry.

SPE COLOR & APPEARANCE

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.

CADNEWS® Technical Content – Scott Heitzman

The Technical Content portion of our Winter 2023 edition of CADNEWS® includes a paper presented at this year's RETEC. The paper provides a background on sustainability policy, collaboration across the industry and innovations in Titanium Dioxide that provide sustainability value. If you missed the presentation or want to take a few minutes for a refresher, make sure to take time to view *Achieve Greater Sustainability with Performance for Plastics with New Titanium Dioxide Innovation*.

CADNEWS® Color Notes – Scott Heitzman

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

ACHIEVE GREATER SUSTAINABILITY WITH PERFORMANCE FOR PLASTICS WITH NEW TITANIUM DIOXIDE INNOVATION

Charles Collins, The Chemours Company – Leveraged Engineering | **Jeffrey Drusda**, The Chemours Company – Titanium Technologies | **Cheryl M. Stancik**, The Chemours Company – Titanium Technologies

Abstract

The plastics industry urgently needs viable solutions for sustainable products and production processes including polyolefin masterbatch (POMB). We have recently developed a revolutionary, innovative titanium dioxide (TiO_2) that delivers new dimensions of value to plastics processors including sustainability benefits. In this presentation, we will share the performance of this material and how we are extending our TiO_2 portfolio with additional pigments that feature a sustainability value proposition. This platform addresses industry needs by enabling flexibility to improve asset management and increase profits while advancing sustainability within the plastics industry. We will showcase the performance of this platform for plastics in masterbatch production and in downstream applications.

Introduction

Sustainability is transforming the Plastics Industry

The plastics industry is set for a dynamic transformation in how it serves applications, produces, designs, and manages plastic materials, particularly at end of life and with the move to a circular economy. While the path to achieve sustainability in the plastics industry is still being laid, it is clearly evident that new innovations will pave the way to advancements in the industry's sustainability through the value chain, including efficiency in use enabling the reduction of plastic waste, delivering opportunity for enhanced circularity, as well as supporting essential applications rooted in sustainable value such as agriculture, food packaging, and energy efficient building materials.

This drive for sustainability in the plastics industry cannot be obtained with developments of just plastics themselves, but for essential pigments and additives that render the functionality of plastics applications such as titanium dioxide (TiO_2). In fact, TiO_2 is a critical component to plastics applications, bringing opacity and enabling white color as well as rendering numerous functional benefits for application design such as thermal management and light protection (1). These TiO_2 functional benefits themselves are bringing sustainability value to applications spaces, such as improved food packaging to protect food quality and nutrition (2) to longer lasting and more durable materials for the building and construction markets (3).

Here we report on two TiO_2 pigment innovations to help the plastics industry not only reduce the footprint of plastics and the burden of plastic waste but also address the next challenges we face to evolve a circular economy to reuse and recycle plastics more effectively. The first innovation showcased demonstrates sustainability value while processing TiO_2 into masterbatch while the second is focused around the sustainable management of TiO_2 containing plastics at the end of their application life. Collectively, these innovations support the move toward a more sustainable world, maximizing the societal impact of plastics materials with their positive handprint (4) while lessening the burden of their footprint.

Drive for Sustainability in Plastics with Policy Development

Much attention has been drawn to the challenges plastics presents in the vision our global community holds of a more sustainable future. One example of this can be found in the global focus on managing plastics pollution. In 2021, representatives from United Nations Member States gathered in Nairobi, Kenya for a three-day meeting attended by nearly 5,000 participants from 175 countries, including 79 ministers and 17 high-level officials. At the meeting, representatives endorsed a historic resolution to forge an international, legally binding agreement to end plastic pollution (5). The sweeping resolution within the United Nations Environmental Assembly (UNEA) addresses the complete plastics lifecycle and could lead to major changes across the industry as it is implemented.

The focus of the UNEA is to mitigate the issue of mounting plastic waste and to eliminate plastic pollution with a shift to a circular economy. According to the UNEA, full circularity can reduce greenhouse gas emissions by 25%, reduce the volume of plastics entering oceans by over 80%, reduce new plastic production by 55%, save governments US$70 billion, and reduce greenhouse gas emissions 25% by 2040. (6)

The UNEA continued with meetings in May 2023 (7) to further progress the goal to frame a draft agreement by the end of 2024. With global policy evolving around management of plastic materials, plastics producers must begin preparing now to address these challenges. The industry is already making meaningful advancements in the sustainability of their products and manufacturing processes, and this resolution should help these initiatives gain further momentum.

Collaborating Across the Plastics Industry to Address Sustainability

While the UNEA actions will require consensus across a broad and diverse body of stakeholders, swifter actions are being considered industrial partnerships.

In the United States, industry led groups such as the American Chemistry Council are proposing directions and forging industry partnerships to advance objectives surrounding sustainability in the plastics industry. They state their Sustainability Goals to work "for a more sustainable future by developing innovative solutions to advance recovery, recycling, and reuse of plastic." (8)

The American Plastics Makers division has published position papers and strategies towards goals in sustainability. They summarize key focus areas for the direction they are taking:

> "Plastics help us ensure greater sustainability by lowering greenhouse gas emissions and saving energy at home, work, and on the road.
>
> - Plastic packaging helps to dramatically extend the shelf life of fresh foods and beverages while allowing us to ship more product with less packaging material—reducing both food and packaging waste.
> - Plastic insulation, sealants, and other building products are making our homes significantly more energy efficient, while reducing costs for heating and cooling.
> - Lightweight plastics in cars can dramatically increase miles per gallon, saving drivers money at the pump." (8)

Focused efforts are required towards sustainably-minded development in the key applications spaces important to the plastics industry. In the Consumer Packaged Goods (CPG) space, plastics play a major role in packaging food, beverages, and personal care products. In considering the plastics packaging used in CPG applications, organizations such as the World Wildlife Foundation (WWF) are driving cross industry collaboration including many CPG producers to build actionable plans and goals towards improved sustainability, including the responsible use and management of plastics materials. The WWF team states that their efforts called ReSource is to bring "together a consortium of companies and organizations leading the way to address our planet's plastic waste crisis."(9)

While policy and application development continue to advance plastics materials with a mind toward the needs and opportunities that will facilitate sustainability, we see that pigments for plastics, namely TiO_2, also need to advance to deliver sustainability value with the plastics industry.

New TiO_2 Pigment Innovations for Sustainability in Plastics

Delivering a new TiO_2 pigment with superior value with processing and sustainability value

Recent feedback from white polyolefin masterbatch producers (POMB) indicated opportunities for improvement in TiO_2 handling, processability, and processing rates in their masterbatch production (10). Each of these improvement opportunities further are linked to sustainability benefits as they enable improved utilization, processing energy, and resource use.

To address the performances gaps and sustainability needs for POMB producers, a new pigment design was innovated to deliver multifaceted benefits to address processability challenges while simultaneously delivering savings and sustainability value potential (10). While the plastics industry faces the challenges of managing costs in plastics production, this TiO_2 innovation concept further creates sustainability value while improving margins for the masterbatch producer.

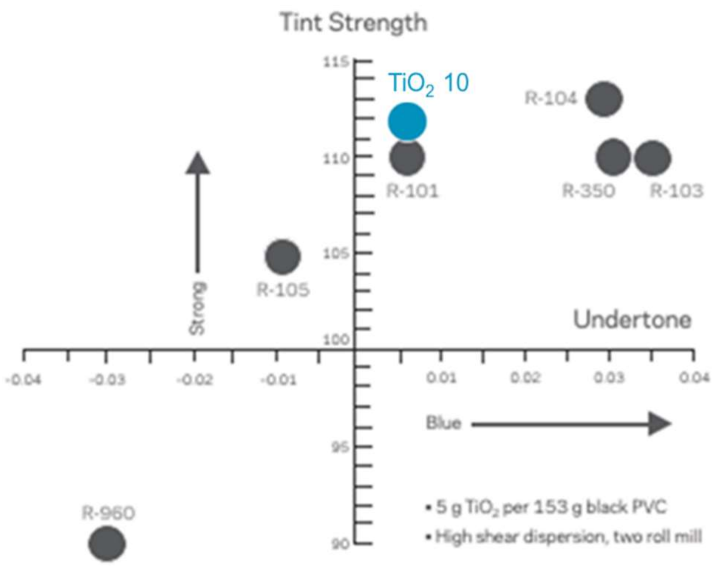
Enabled by proprietary technology, an innovative new TiO_2 design provides numerous quantifiable benefits to masterbatchers while improving their profit potential. The new TiO_2 offers high bulk density versus typical commercial TiO_2, enabling a smaller package volume, this concept requires less warehouse and line storage space. Its improved handling with low dusting helps masterbatchers keep production areas clean with less engineering control maintenance, while ensuring all of the TiO_2 is fully delivered to the masterbatch production process. Additionally, the pigment's improved flowability requires less labor, feeder energy, and time to unload, ultimately saving masterbatchers money through efficiencies in energy and labor while delivering sustainability value. By ensuring all TiO_2 pigment is fully discharged from the package, masterbatchers can also more easily facilitate package reuse and recycling

More specifically, the recently developed TiO_2 pigments were fashioned to meet current market aesthetics for color and undertone, while additionally offering masterbatch productivity improvements, demonstrating lower carbon footprint through masterbatch production both while offering improve worker safety.

New TiO_2 Pigment Optical Properties

In order to facilitate market applicability and acceptance, the new TiO_2 product was designed to meet tint strength value and undertone color spaces with demonstrated value to the plastics industry with optical attributes as shown in in Figure 1.

Figure 1. *Color Space of TiO_2 Pigments demonstrated by Vinyl Tint Strength and Vinyl Undertone*



Particle size and dispersion are key components for determining the hiding power and color tone of a TiO_2 pigment grade. Here the qualities of the new TiO_2 product are shown as indicated in blue versus the existing commercial Ti-Pure™ portfolio shown in gray. Each grade was evaluated using a flexible PVC formula (carbon black) with five grams of TiO_2 that was then measured for tint strength and undertone.

New TiO2 Pigment Handling Properties

TiO_2 is often cited as a poor-flowing material. Issues with not only discharge from bulk sacks but also in conveying and transfer of TiO_2 are highlighted as challenges to productivity. In order to make gains in productivity, the new TiO_2 products need to move easier in current industry equipment.

Accurate feeding of TiO_2 pigments has proven challenging in plastics processing with opportunity for improvement, particularly with the low bulk density of typical TiO_2 that makes feeding unreliable, labor-intensive, and rate limiting. Further, slow and inconsistent feed rates lead to problems in processing that require manual intervention and constant vigilance for process operators. Further, significant caking of TiO_2 can occur within the process equipment and on its surfaces, providing risk for upsets in the production process.

To evaluate the performance of the new pigments, we conducted trials in collaboration with Coperion K-Tron, a leading supplier of high-quality feeders and other compounding equipment to the plastics industry.(11) The feeder used in this trial was a K2-ML-S100 (Coperion K-Tron), a loss-in-weight screw feeder with a single 100mm-diameter auger and an agitated trough and hopper. The experiments were run at Coperion K-Tron's feeder test facility in Pitman, New Jersey.

In this experiment, the new pigment, *TiO_2 10*, was evaluated against similar competing pigments available in the market, which will be referred to as *TiO_2 A*, *TiO_2 B, TiO_2 C,* and *TiO_2 D* as listed in

Table 1. While all of these pigments are capable of generating a high-quality plastic when compounded, we aimed to explore their handling characteristics.

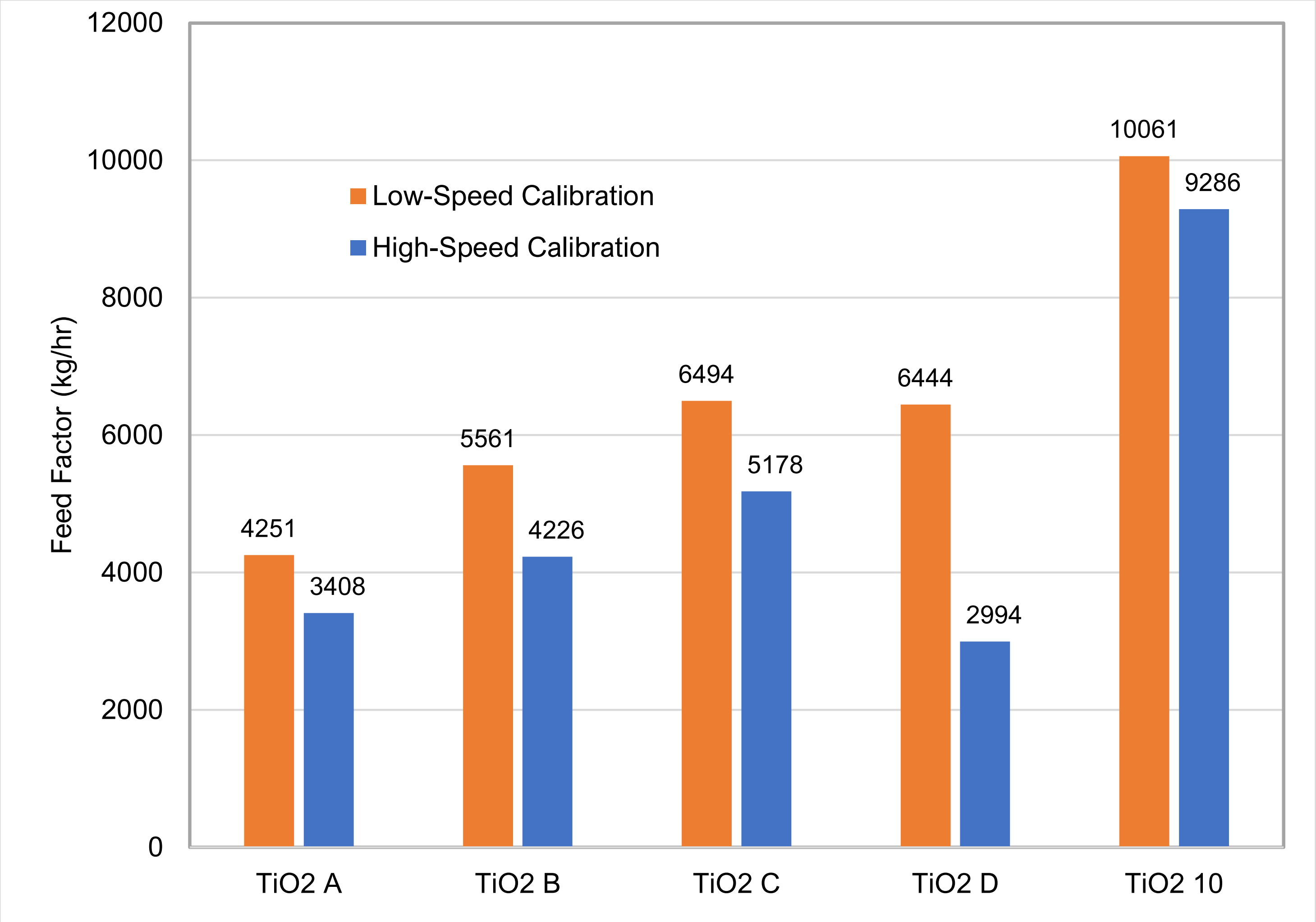
Table 1. *TiO_2 Pigments Examined in this Work*

Status	Pigment Code	Undertone
Commercial	TiO_2 A	Neutral
	TiO_2 B	Neutral
	TiO_2 C	Blue
	TiO_2 D	Blue
New	TiO_2 10	Neutral

For each pigment grade, the feeder was first calibrated by running volumetrically, with the screw at a fixed 10% speed, recording the change in weight of the hopper to determine a feeder factor. Then the feeder was run gravimetrically for a time, set to maintain a feed rate that was 10% of that feeder factor, with speed adjusted up and down according to continuous feedback from the hopper's weigh cells. The feeder was then calibrated again by running the screw at a fixed 80% speed, recalculating the feeder factor for the high-end of the feed rate curve. Finally, the feeder was returned to gravimetric mode and evaluated at target rates of 80%, 50%, and then 25% of the new feeder factor.

Feeder factors for the tested grades are shown in Figure 2. For all tested grades, feeder factor declined by about a ton per hour as the feeder approached top speed, indicating a small, but universal loss in efficiency, likely due to incomplete filling of the screw flights. The notable exception was TiO_2 D, which lost nearly half of the capacity predicted from calibration at low speeds.

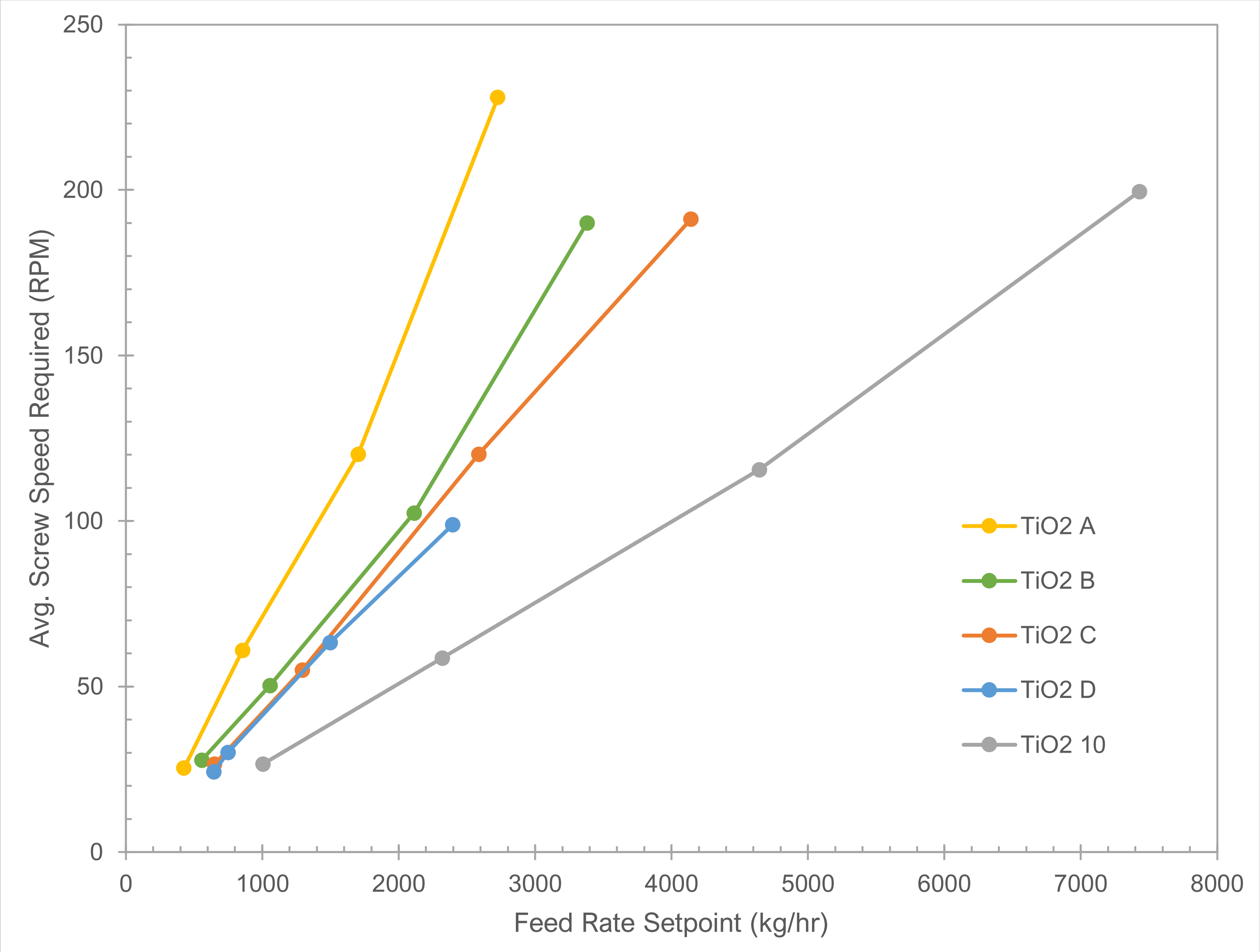
Figure 2. *Feed Factor for five grades of TiO_2 in a 100mm screw feeder*



For each feed rate setpoint tested, operating data was collected for the duration of the feeding period, most notably, the average screw speed at which the feeder settled at based on feedback from the weigh cells during the operation. Figure 2 shows the average screw speed for each grade tested as a function of the feed rate. The data is largely linear, as would be expected from the first order relationship between the volume of material conveyed by a turning screw and its rotational speed.

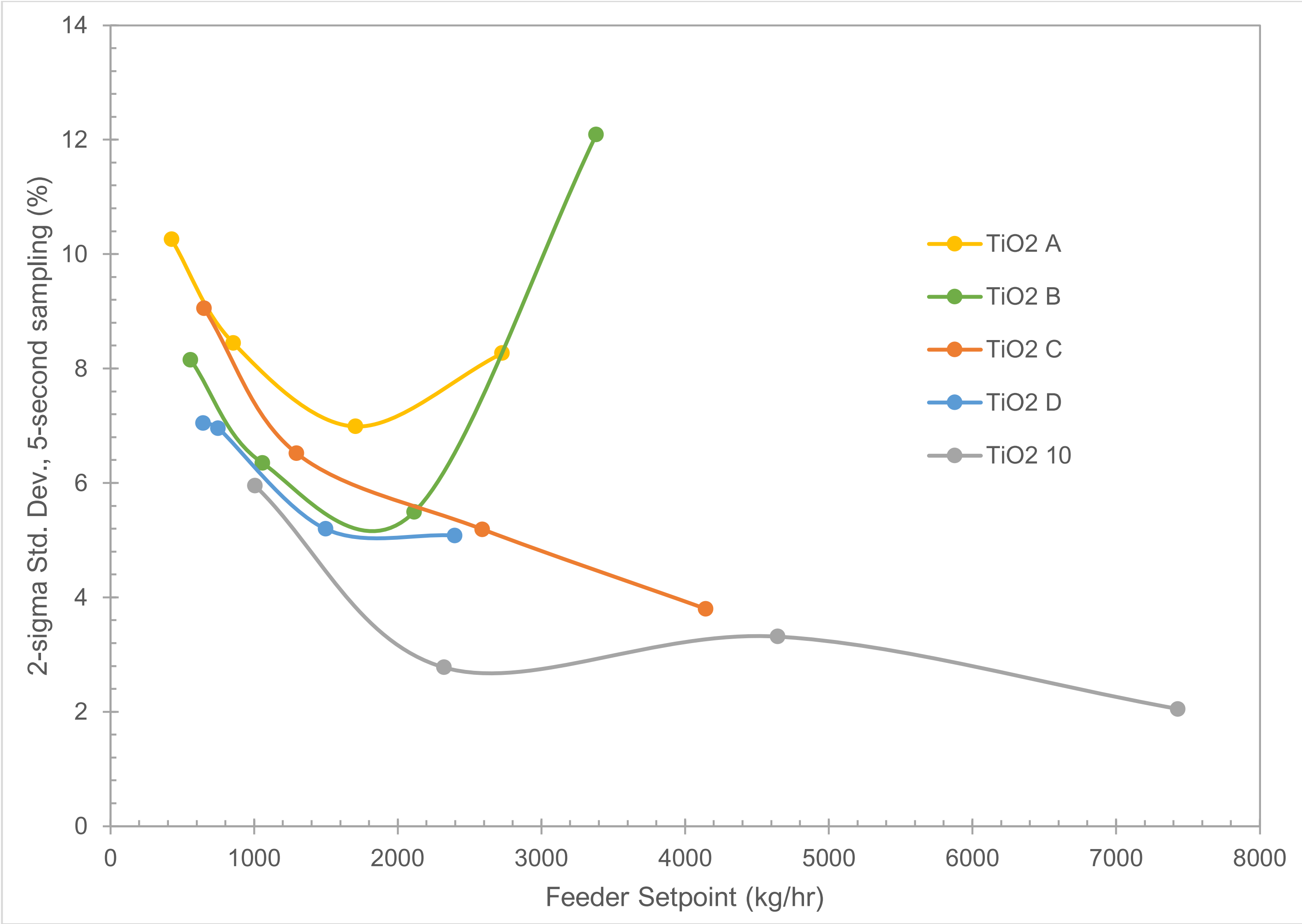
Notable again was the performance of TiO_2 D, which had put out a rate of 2395 kg/hr during calibration at 80% speed (200RPM). When set to maintain 2395 kg/hr however, the control system was able to bring the speed down by half. One likely explanation was that the feeder was already at the limit of flow rate of pigment into the screw, such that the screw speed had become irrelevant.

Figure 3. *Screw speed required to maintain set feed rates for the five grades of TiO_2 investigated*



We can evaluate the feed rate stability more stringently by examination of individual mass measurements. These may average out to only a very small deviation from our setpoint but can be quite significant for a truly plug-flow process downstream. In figure 4, 2-sigma standard deviations are provided for 5-second sampling intervals at varying rates. At very low feed rates, all grades have relatively high noise of 5-10%. At higher rates, some grades improve quite significantly (TiO_2 10, TiO_2 C) while others (TiO_2 A and B) seem to get even worse. Clearly, TiO_2 10 represents best-in-class performance, achieving the lowest levels of noise of the grades examined. Further, TiO_2 10 achieves this very high precision well before reaching the maximum conveying rates. This enables the use of the full range of a feeder's rate capabilities as needed for varying products, without the loss in precision at lower rates as seen with other TiO_2.

Figure 4. *Noise in masses of material fed over 5-second measuring intervals as a function of rate*



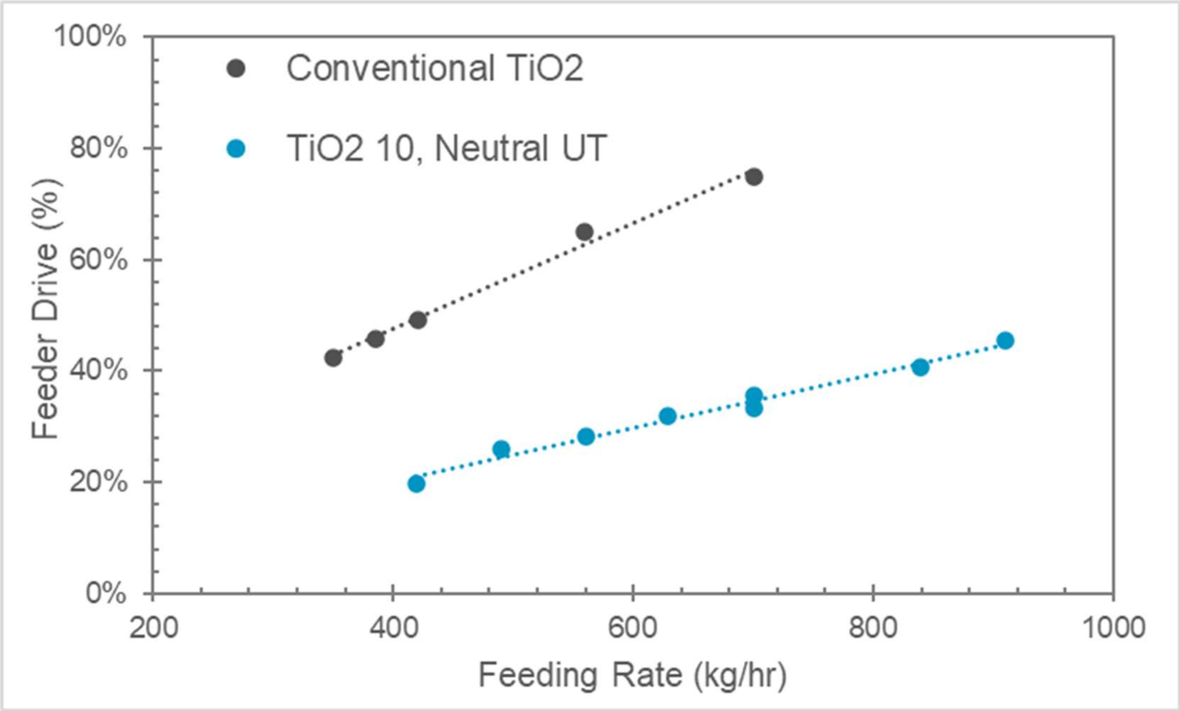
New TiO_2 Pigment Processing Performance

With improved bulk flow properties and necessary optics established, the new products were evaluated in pilot-scale masterbatch production using continuous mixer and twin-screw extrusion systems versus commercial TiO_2 grades. A simple masterbatch recipe of 70% by weight TiO_2 in polyethylene (PETROTHENE® NA206, Lyondell Basell) was produced and no additional pigments, additives, processing aids, nor fillers were used.

Partnering with Farrel Pomini and Krauss Maffei enabled use of equipment aligned with the masterbatch industry. As these processes enabled continuous processing at high volumes, collection of data regarding feeders, energy, mixer/screw RPM, torque, pressure, and throughput was gathered and analyzed. Additionally, qualitative observations on key processing steps including discharge and transfer of the new TiO_2 product, TiO_2 10, and resultant dust conditions were observed.

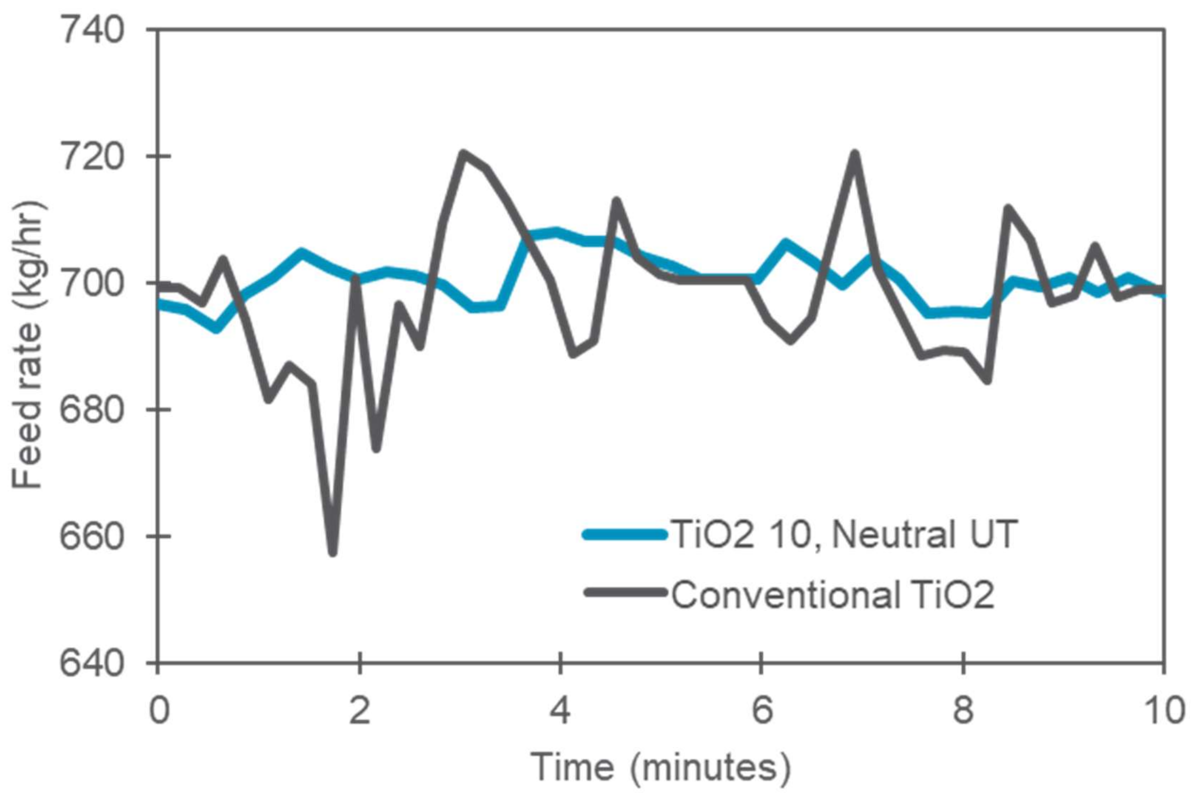
To evaluate the enhanced flowability of the new product, a comparison of TiO_2 10 to its commercial counterparts was measured using the feeder drive (percentage), feed rates (kg/hour), and time. The new TiO_2 product showed lower drive percentage requirement while enabling higher feed rates, eliminating a bottleneck in the equipment footprint (**Figure 5**). With this feature, the new product delivers TiO_2 to the mixer/extruder and enable higher RPM in the mixer/extruder.

Figure 5. Feeder Drive Efficiency as a Function of Rate



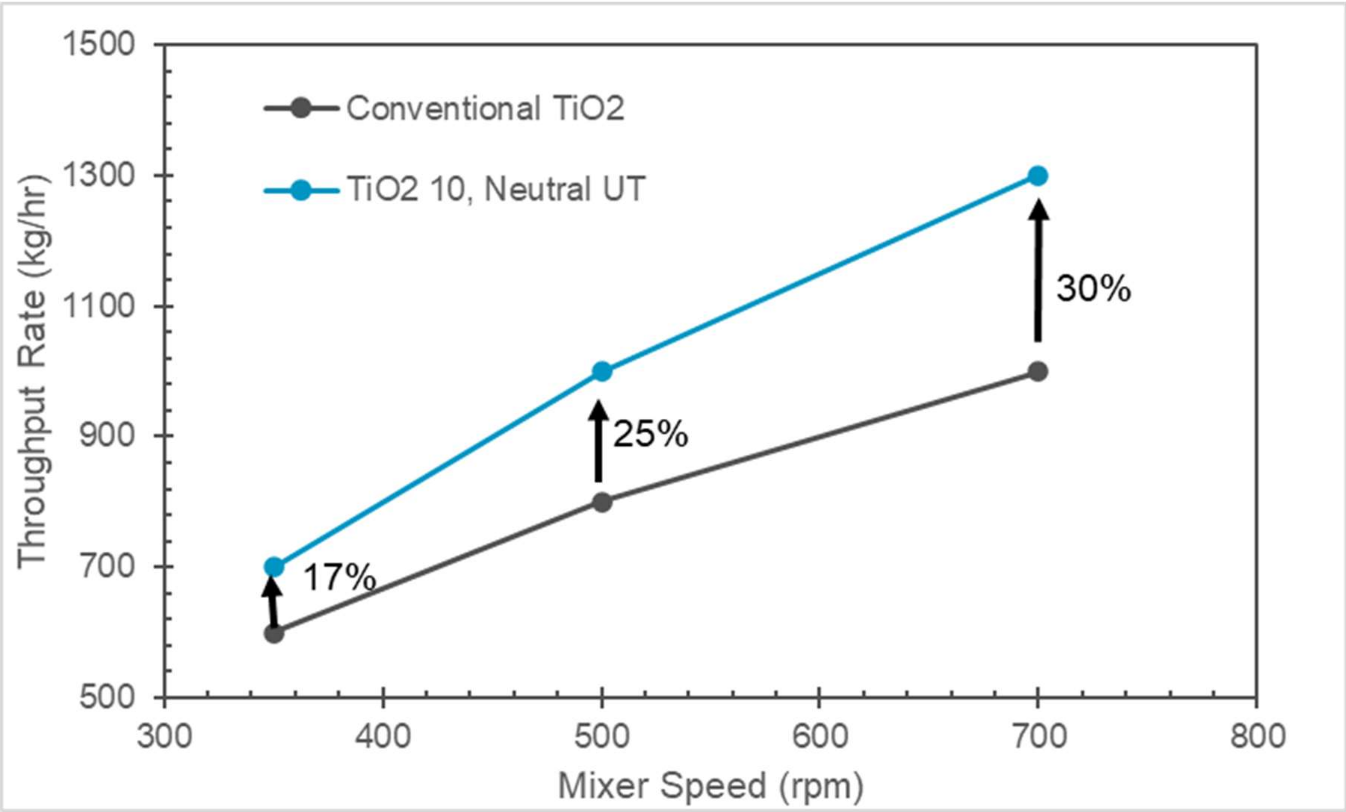
When processing TiO_2 10, the feeder rate response demonstrates much less feed rate variability (**Figure 6**). While this feature is especially evident at the start-up portion of the process, it is consistent through the same time period compared to the Conventional TiO_2

Figure 6. Feeder Rate Variability



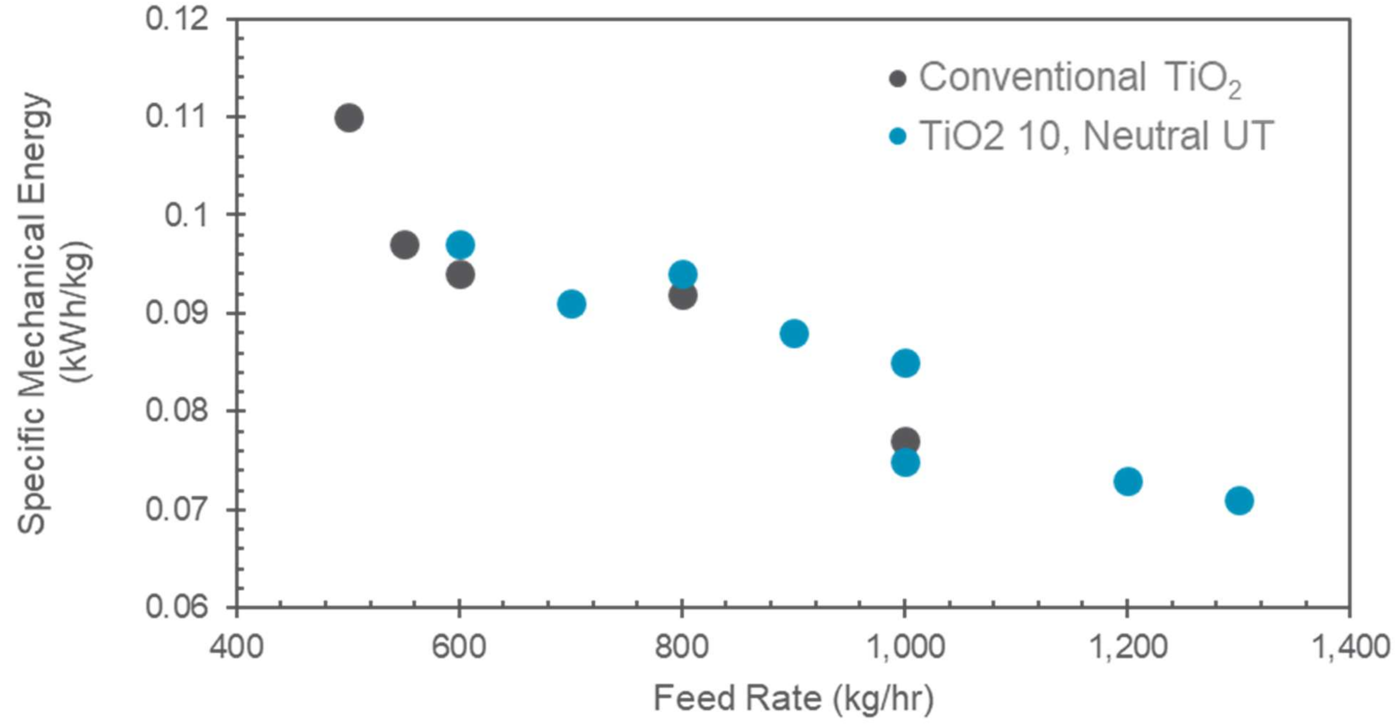
During processing of TiO_2 10 in a continuous mixer system, a 30% increase in feed/compounding rate is observed versus Conventional TiO_2. The higher amount of material delivery results from the improved physical properties of the TiO_2 10. As a result, efficiency in production increases with the magnitude of the increase expanded with higher compounder speeds (**Figure 7**).

Figure 7. Maximum Compounding Rate



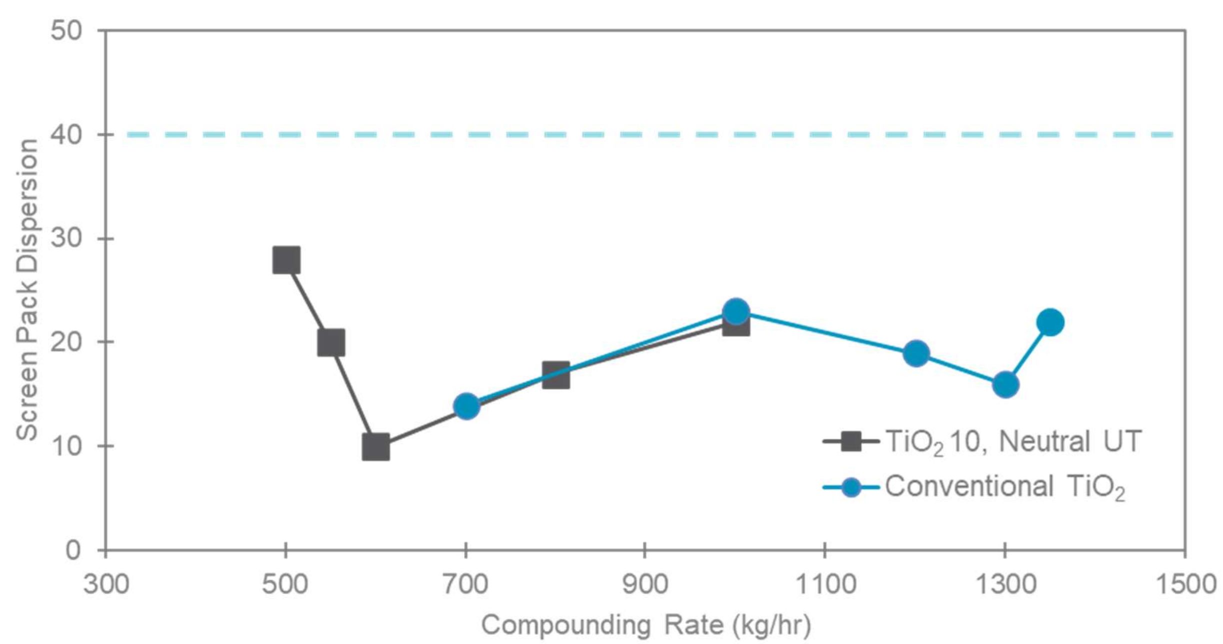
In the same scope, energy consumption during the continuous mixer process shows a notable decreasing trend for both TiO_2 10 and the benchmark grade. The decreasing trend in specific mechanical energy continues as TiO_2 10 feeding rate increases beyond the limit of the benchmark material. As a result, rate-limitation in the mixer section is reduced (**Figure 8**).

Figure 8. Specific Mechanical Energy



The quality of the masterbatch produced with all TiO_2 products was evaluated using modified screen pack test. A specified amount of masterbatch is processed through a 500-mesh screen and the amount of TiO_2 retained is measured. Using an upper limit of 40, all materials processed demonstrated adequate dispersion regardless of process rates and conditions (**Figure 9**).

Figure 9. Dispersion Quality – Neutral Undertone TiO_2



Mitigating Impacts of Pigment at End of Life

Devising compostable & biodegradable compatible TiO_2 products that help create end of life management options for plastic materials

For plastic goods designed for a defined and shorter service life, creating products that are compostable or biodegradable will be critical to enabling the management of plastic waste in safe and less burdensome ways. Further, doing so is also crucial to facilitating the elimination of uncontrolled plastic waste in our environment, be it microplastics or litter. According to the Ellen MacArthur Foundation (12), millions of tons of plastic end up in landfills, is burned, or leaks into the environment each year. Eight million tons end up in the ocean each year - a figure that is rising so quickly, there will be more plastic in the ocean than fish by weight in 2050 unless our waste management of plastics changes.

Ensuring a plastic material can safely biodegrade is not just about the polymer matrix – the pigments and additives in the plastics must also be considered. That is why steps must be taken to ensure ingredients like pigments, used for many plastic applications such as food packaging are considered in the design of materials. To enable these considerations, a TiO_2 pigment (Ti-Pure™ R-104) was rigorously evaluated and certified (13) as suitable for composting plastics applications by DIN CERTCO, an internationally recognized, independent certification body. DIN CERTCO adheres to EN 13432 (14), a globally preferred standard that defines the requirements necessary for flexible and rigid packaging to be considered compostable, giving plastics producers confidence in their compostable packaging.

The Ti-Pure™ team continues to investigate opportunities to support biodegradable applications with proprietary research in key application spaces with plans to expand the portfolio of offerings delivering performances valuable to end of life management.

Collaborating with the Industry to Reclaim the value of Pigments

Developing sustainably advantaged recycling processes that improve end of life management and contribute to our future circular economy

In a circular economy, plastic materials can be reused in many lifecycles to extend their value. While reuse models are being employed to eliminate the reprocessing of plastics, plastics recycling can also contribute to recapturing plastics for additional value and enhancing their circularity. Unfortunately, only 9% of plastic waste is recycled, according to the OECD (15). Another 19% is incinerated, 50% ends up in landfill, and 22% evades waste management systems altogether. Much of this stems from the lack of infrastructure, but also the lack of viable technologies and processes available to manage certain polymers and ingredients based on the diversity of plastic waste collected. The need to manage these polymers and ingredients in a cost-effective and scalable way is imperative to building a successful circular economy.

A new effort is aiming to address these challenges. Through an initiative called Remove2Reclaim, Chemours is partnering with diverse organizations across academia and the plastics value chain to develop an efficient, cost-effective, and sustainable process for recovering TiO_2, other additives, and polymers from plastic products at their end of life, such as post-consumer plastic waste (16). The approach has the potential to create a completely new recycling strategy that could enable reclaimed TiO_2 and polymers to be returned to high value applications contributing to the circular economy while yielding significant benefits to society and the planet. Finally, the demand from consumer goods brand owners to use post-consumer recycled (PCR) content in goods plastic packaging, like soda and shampoo bottles, is rising due to pressures from consumers, regulators, and brand owner commitments.

Conclusions

A shift in mindset in our industry is needed to advance plastic sustainability. Guided by industry-leading innovation, technical expertise, and customer collaboration, the Chemours team believes we have an opportunity and an obligation to advance sustainability, moving our industry and our planet forward. Innovations for further development of sustainably advantaged TiO_2 products for use in plastics applications will be critical to this effort. As the pressure on the plastics industry to reduce its environmental impact continues in the form of new government regulations, international guidelines, brand owner promises, and consumer needs, plastics producers and processors must bolster their sustainability strategies. These demands are only increasing, and plastics producers and processors must begin to forge their paths towards addressing these challenges for society and our planet.

References

(1) DOI:10.1002/pts.2326: Cheryl M. Stancik, Denise A. Conner, P. Jernakoff, P. Niedenzu, S. Duncan, L. M. Bianchi, D. S. Johnson; "Accelerated light protection performance measurement technology validated for dairy milk packaging design" Published 1 December 2017, Packaging Technology and Science.

(2) DOI: 10.1093/cdn/nzz050.P16-063-19: Cheryl Stancik, Susan Duncan, and Philipp Niedenzu; "Preserving Milk Nutrition with Light Protection Packaging (P16-063-19)" Published online 2019 Jun 13, Curr Dev Nutr. 2019 Jun; 3(Suppl 1): nzz050.P16-063-19. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6573868/

(3) Titanium Dioxide Solutions for Buildings & Homes | Ti-Pure™ (tipure.com), https://www.tipure.com/en/industries/buildings-homes

(4) Handprint: A Complementary Measurement of Positive Sustainability Impacts of Products, https://www.cscp.org/our-work/handprint/

(5) United Nations Environment Assembly of the United Nations Environment Programme, Fifth session Nairobi (hybrid), 22 and 23 February 2021 and 28 February–2 March 2022, Resolution adopted by the United Nations Environment Assembly on 2 March 2022, 5/14. End plastic pollution: towards an international legally binding instrument, https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/39764/END%20PLASTIC%20POLLUTION%20-%20TOWARDS%20AN%20INTERNATIONAL%20LEGALLY%20BINDING%20INSTRUMENT%20-%20English.pdf?sequence=1&isAllowed=y

(6) Press Release by the United Nations Environmental Program: https://www.unep.org/news-and-stories/press-release/historic-day-campaign-beat-plastic-pollution-nations-commit-develop

(7) Second Session of the Intergovernmental Negotiating Committee on Plastic Pollution, 29 May - 2 June 2023, Paris, France; https://www.unep.org/events/conference/second-session-intergovernmental-negotiating-committee-develop-international

(8) America Chemistry Council, America's Plastic Makers® Sustainability Goals, https://www.americanchemistry.com/better-policy-regulation/plastics

(9) ReSource Plastics Consortium, https://resource-plastic.com/about

(10) Customer-Centered Innovation: Driving Plastics Processing Performance While Improving Profits and Ensuring Sustainability | Ti-Pure™ (tipure.com), https://www.tipure.com/en/support/white-papers/driving-plastics-processing-performance-while-improving-profits

(11) Coperion K-Tron, https://www.coperion.com/en/about-us/coperion-k-tron

(12) Ellen MacCarthur Foundation, https://ellenmacarthurfoundation.org/

(13) An Integrated, Compostable Solution for Demanding Applications, Ti-Pure™ R-104 | Ti-Pure™ Titanium Dioxide Solutions (tipure.com), https://www.tipure.com/en/products/plastics/r-104

(14) DIN Certco EN13432, https://www.dincertco.de/din-certco/en/main-navigation/products-and-services/certification-of-products/environmental-field/additives-according-to-din-en-13432/

(15) OECD Report, https://www.oecd.org/environment/plastic-pollution-is-growing-relentlessly-as-waste-management-and-recycling-fall-short.htm?__cf_chl_tk=Hu3xHm8F4OmnFjJ2ixKFEqWWIhPZ_nnHp11Ea4SrzBw-1689104389-0-gaNycGzNDRA

(16) Press Release by Chemours: https://www.chemours.com/en/news-media-center/all-news/press-releases/2022/chemours-leads-remove2reclaim-project-to-advance-plastic-circularity


Looking for an experienced complex inorganic color pigment supplier?
Shepherd
The Shepherd Color Company
We Brighten Lives
Special effect pigments
Long lasting color
Heat & chemical resistant
Easy to disperse
StarLight
ARCTIC™
DYNAMIX
WE
BRIGHTEN
LIVES™
More Expertise. Better Performance. Best Value.
That's Shepherd Color.
Find your color at shepherdcolor.com


Royce Provides a Full Line of Solvent Dyes
Royce GLOBAL
4th Generation Family-Owned & Operated
U.S. Manufacturing Plants in NJ & SC
PS & PET FDA Dyes
Top Quality Standards
Industry Expertise & Customer Solutions
Superior Customer Service
Supporting your competitive advantage, in your market, for your customers.
201.438.5200 | 35 Carlton Ave., East Rutherford, NJ 07073 | info@royceglobal.com | www.royceglobal.com


ColorChem International Corp.
Colorants for Engineering Polymers
HIGH HEAT DYES FOR NYLON 6, NYLON 6/6 & PSU
MANUFACTURING IN THE U.S. & MEXICO
ONE DAY LEAD TIMES
AMAPLAST® • COLORPLAST® • NEOLOR™
TECHNOLOGY YOU CAN TRUST
WWW.COLORCHEM.COM
ColorChem International Corp.
Tel: 770-993-5500 | Email: sales@colorchem.com
COPYRIGHT © 2023 COLORCHEM INTERNATIONAL CORP. All rights reserved.

SPE CAD NEWS

2024 SPONSORSHIP PROGRAM

SPE COLOR & APPEARANCE

ABOUT 2024 CADNEWS® SPONSORSHIPS

CADNEWS®, the official newsletter of the SPE Color and Appearance Division, publishes at least three (3) issues per calendar year and four (4) when there is enough content. This publication is e-mailed directly to approximately 1,000 Plastic Color Industry professionals and is also posted on both the SPECAD and main iSPE sites. Each sponsor placement connects to your website when the viewer clicks on your image.

Participating in the CADNEWS® with a sponsorship is a great way to connect with Plastic Industry Coloring professionals by promoting your company and the services you offer.

Your sponsorship ad will also be included on the SPECAD Website for the entire 2024 year.

Listed below are the types of sponsorships available and the associated costs for 3 issues for the calendar year.

1/8 PAGE	2.0 INCHES X 3.5 INCHES HORIZONTAL	$ 450
1/4 PAGE	4.0 INCHES X 3.5 INCHES VERTICAL	$ 850
HALF PAGE	5.0 INCHES X 7.5 INCHES HORIZONTAL	$1,750
FULL PAGE	7.75 INCHES X 10.0 INCHES VERTICAL	$3,000

File Formats
Please submit all artwork in one of the following preferred formats in high resolution setting:

.JPG .PNG .PDF

Please do not submit any files in their raw format (ex. PSD, INDD, AI, WORD)

Sponsorship Changes and/or Updates: $35
If you want the ad to change after the first edition, the above charge will be assessed for each update, otherwise your ad will run as initially submitted in all issues for the term.

Contact
If you are interested in becoming a sponsor in the CADNEWS®, please contact:
Tony Tanner (304) 482-6904 / tanner.tony@baerlocher.com

FULL PAGE SPONSORSHIP

7.75 INCHES X 10.0 INCHES VERTICAL

$3,000.00

HALF PAGE SPONSORSHIP

5.0 INCHES X 7.5 INCHES HORIZONTAL

$1,750.00

1/4 PAGE SPONSORSHIP

4.0 INCHES X 3.5 INCHES VERTICAL

$850.00

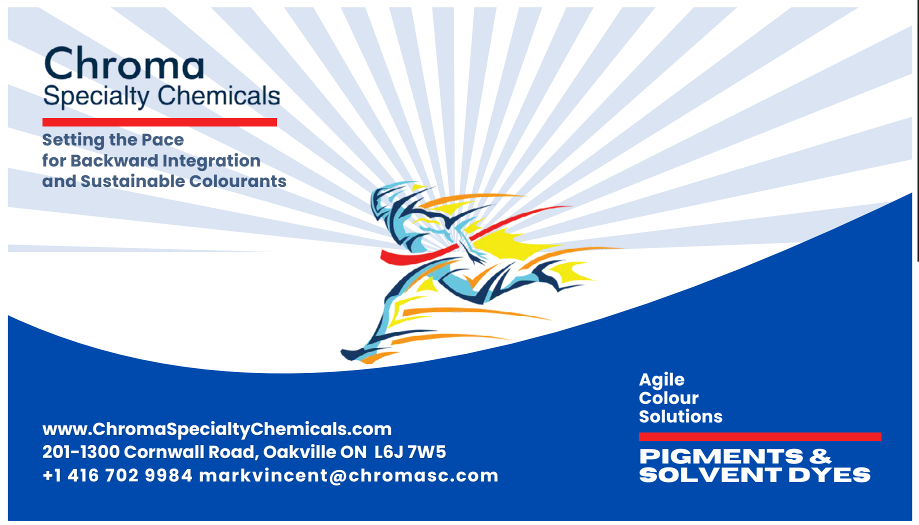
1/8 PAGE SPONSORSHIP

2.0 INCHES X 3.5 INCHES HORIZONTAL

$450.00

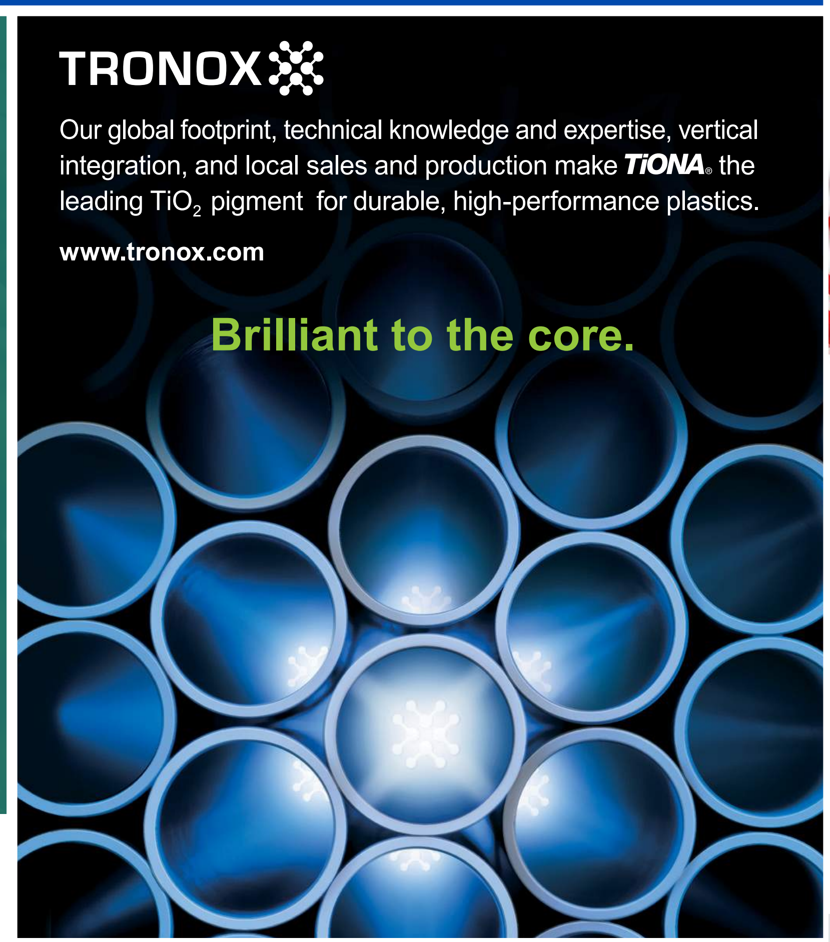

Shoot for the green....
and win deals with FORTUNE, we are stocked, ready to ship and offer fast turnaround.
Solvent Dyes • Anti-Oxidants • Stearates • Waxes • UV Absorbers
FORTUNE INTERNATIONAL TECHNOLOGY
Fortune International Technology • Hoffman Estates, Illinois 60192
Contact Ron Oberstar • tel 847-429-9791 • www.fortuneintltech.com


CINIC
A Global Leader in HPPs - CINIC is the No. 1 global producer of Diketo-pyrrolo-pyrrole (DPP) (PR254) and Anthraquinone pigments (PR177) and a world leader in Isoindolinone (PY110 & PY109) and Isoindoline (PY139) pigments.
Cinipol
New Coloring Solution for Plastics (Solvent Dye) - The Cinipol™ portfolio consists of high quality polymer-soluble colorants suitable for various
CINIC Chemicals America, LLC
681 Andersen Drive, Suite 301, Pittsburgh, PA 15220, USA
Tel: 412 458 5569
Email: dkeenan@cinic.com
www.cinic.com/en

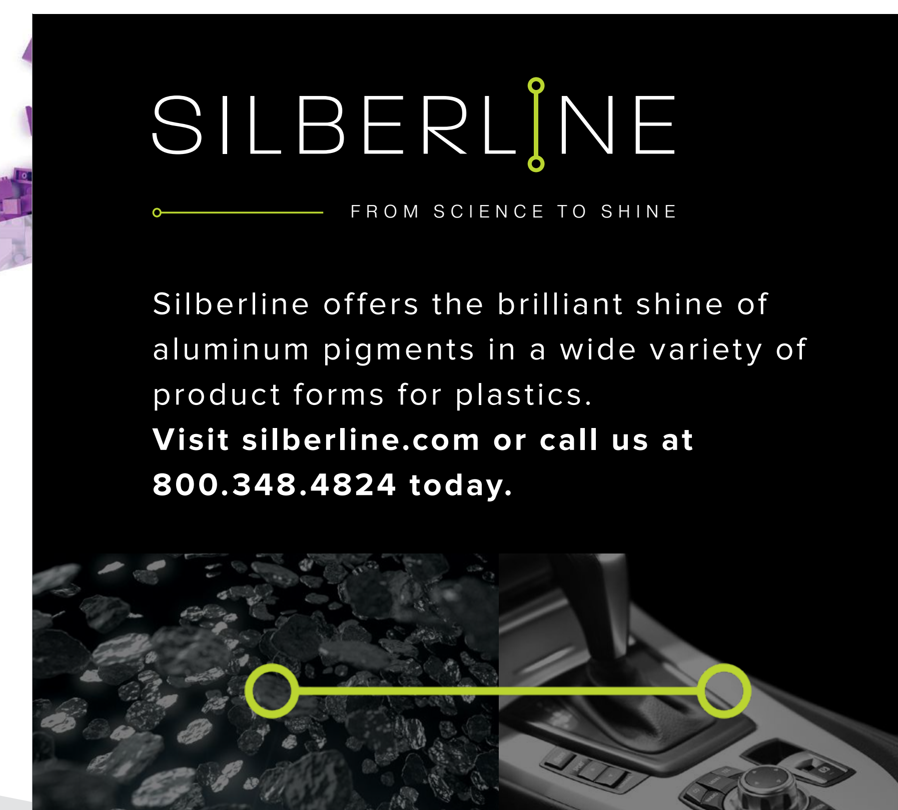

Chroma
Specialty Chemicals
Setting the Pace for Backward Integration and Sustainable Colourants
www.ChromaSpecialtyChemicals.com
201-1300 Cornwall Road, Oakville ON L6J 7W5
+1 416 702 9984 markvincent@chromasc.com
Agile Colour Solutions
PIGMENTS & SOLVENT DYES


MIXACO MASCHINENBAU
CONTAINER MIXER i4 fleX
Technological INNOVATION
ONE mixer, THREE container sizes
A step forward into the FUTURE!
SCAN ME
Scan the code for details and benefits!
MIXACO USA LLC
1784 Poplar Drive
Greer, SC 29651 • USA
Tel. +1 864 331 23 20 • Fax +1 864 331 23 21
info@mixaco.com
MIXACO
Dr. Herfeld GmbH & Co. KG
Niederheide 2 • 58809 Neuenrade • Germany
Tel. +49 2392 9644-0 • Fax +49 2392 62013
info@mixaco.de
MIXACO.COM
made in germany


who is conscious of the impact their products make?
we are.
Conscious is Colorful
Sustainable solutions focusing on the environment, social responsibility and the economy.
DIC Color & Comfort
SunChemical
a member of the DIC group


TRONOX
Our global footprint, technical knowledge and expertise, vertical integration, and local sales and production make TiONA the leading TiO2 pigment for durable, high-performance plastics.
www.tronox.com
Brilliant to the core.


DCL
See The Difference We Make
New company, generations of expertise.
The Broadest Selection of Pigments Worldwide
DCL is a global leader in the supply of color pigments and dispersions for the coatings, plastics and ink industries. DCL has the broadest portfolio of color pigments in the world today. We are poised to positively impact our customers' business by continuing to innovate, rapidly respond to customer needs, and be the difference our customers are looking for.
DCL invites the world to "See the Difference We Make."
pigments.com


SILBERLINE
FROM SCIENCE TO SHINE
Silberline offers the brilliant shine of aluminum pigments in a wide variety of product forms for plastics.
Visit silberline.com or call us at 800.348.4824 today.

OFFICERS

Chairman:
Alex Prosapio, 845-641-0506
Sudarshan Pigments
aprosapio@sudarshan.com

Chair-Elect:
George Iannuzzi 914-261-8189
Koel Colours
george@koelcolours.com

Immediate Past Chairman:
Michael Willis, 513-681-5950
Sun Chemical
michael.willis@sunchemical.com

Treasurer:
Bruce Mulholland, 859-982-5256
Celanese (Retired)
captcolour@aol.com

Finance Chair:
Kimberly Williamson, 706-892-8102
Techmer PM LLC
kwilliamson@techmerpm.com

Secretary:
TJ Stubbs, (270) 827-5571 Ext. 7142
Teknor Color Corp
tstubbs@teknorapex.com

Councilor:
Mercedes Landazuri, 773-988-0857
Ampacet
mercedes.landazuri@ampacet.com

DIRECTORS until 2024

Earl Balthazar, 817-719-0224
DataColor
ebalthazar@datacolor.com

Brian Colemen, 859-525-5814
Celanese
Brian.Coleman@celanese.com

Josh Jacobs, 419-575-4806
Uniform Color
Joshua.Jacobs@audia.com

Jack Ladson, 267-981-7112
Color Science Consultancy
jack@ColorScienceConsultancy.com

Bruce Mulholland, 859-982-5256
Celanese (Retired)
captcolour@aol.com

Cheryl Treat, 313-570-3911
Sun Chemical
cheryl.treat@sunchemical.com

Brian West, 865-805-0702
West Color Technologies
cadexhibits@gmail.com

Mark Freshwater, 201-665-0091
Paramount Colors
mark@paramountcolors.com

DIRECTORS until 2025

Scott Aumann, 912-210-0175
Brilliant Group
SAumann@fluorescent-color.com

Doreen Becker, 914-769-1679
Ampacet Corporation
doreen.becker@ampacet.com

Chuck DePew, 765-914-3363
Holland Colours Americas, Inc.
cdepew@hollandcolours.com

Jim Figaniak, 215 736-1126
Americhem Engineered Compounds
jfiganiak@americhem.com

Bruce Howie, 905-823-3200
H.L. Blachford
bhowie@blachford.ca

Scott Heitzman, 513-708-9142
DCL Corporation
sheitzman@pigments.com

Betty Puckerin, 812-466-9828
Ampacet Corporation
betty.puckerin@ampacet.com

Mark Ryan, 513-874-0714
Shepherd Color
mryan@shepherdcolor.com

Ann Smeltzer, 412-298-4373
Heubach Company
ann.smeltzer@heubach.com

DIRECTORS until 2026

Matt Billiter, 412-260-0146
LANXESS Corporation
matthew.billiter@lanxess.com

Bennett Chin, 310-632-9211, Ext. 3664
Techmer PM
bchin@techmerpm.com

Karen Carlson, 914-536-7241
EMD Performance Materials Corp.
karen.carlson@emdgroup.com

Jeff Drusda, 302 683 8025
Chemours
jeffrey.drusda@chemours.com

Steve Esker, 614-679-4677
Paramount Colors, Inc.
Steve@paramountcolors.com

Christine Gehres, 973-641-4852
Special Chem
Christine.Gehres@specialchem.com

Cory Singleton, 513-967-4861
Vivify
cory.singleton@vivifycompany.com

Tony Tanner, 304-482-6904
Baerlocher
tanner.tony@baerlocher.com

Mark Tyler. 570-952-5255
Silberline Mfg
tylerm@silberline.com

BOARD OF DIRECTORS

spe
COLOR & APPEARANCE

CAD NEWS®

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.