



COLOR & APPEARANCE

# WINTER 2015/16

## Chairman's Message

Welcome everyone, to the 2016 Winter edition of CADNEWS®.



First, we'd like to thank Betty Puckerin and Scott Heitzman for organizing the 2015 Society of Plastics Engineers CAD RETEC® at the Westin Indianapolis. This was the 53rd anniversary of the show and used the theme "Winning with Color." Playing host to approximately 63 exhibitors and 482 attendees, the event was very successful and lived up to the standards as the premier event for the coloring of plastics. The exhibit space and program offered a venue for networking and information exchange for everyone involved. Twenty-two corporate sponsors contributed to the show, and the 2015 Fun Run/Walk collected \$1,880 for Habitat for Humanity.

The technical program, co-chaired by Tom Chirayil and Jack Ladson, offered 17 quality papers on a variety of topics regarding the coloring of plastics. Sandra Davis hosted the New Technology

Forum, which gave a commercial showcase for new products and technologies available from exhibitors. The Monday keynote presentation, given by Ron Beck, gave a start to the program. These shows would not have as much success without the research and innovation given by these presenters and companies.

We'd also like to thank Doreen Becker for assembling the interactive panel discussion "Color Trends for 2016 And Beyond." This session featured Doreen, Linda Carroll, George Ianuzzi, and Dr. Danny Rich as market experts offering their experience and insights regarding future color style and trends. In addition, the audience was polled for their input to questions concerning the same topics. As with previous RETEC® events, the panel discussion offered a great forum for coloring of plastics dialogue.

The 2015 CAD RETEC® was joined with members of the Inter-Society Color Council. The ISCC offered several papers for this event, including keynote presentations by Dr. Francoise Viénot and John Seymour during the Tuesday Sessions. On behalf of the CAD Board of Directors, I'd like to thank the ISCC for their contributions to this show.

*continued on page 2*

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CAD NEWS®

PUBLISHED BY THE COLOR AND APPEARANCE DIVISION OF THE SOCIETY OF PLASTICS ENGINEERS



Color and Appearance Division

## Chairman's Message (continued)

Finally for 2015 CAD RETEC®, we'd like to thank the volunteers from the BOD and SPE who gave time from their busy show schedules to contribute to the event. So many of the "behind the scenes" details are covered and handled by these folks to ensure smooth operations for all attendees, exhibitors, and presenters. In addition, we'd like to recognize Kathy Schacht for her time and support with registration and information.

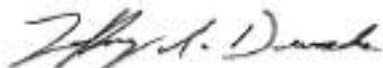
Our group continues to change its shape and grow. CADNEWS® is now edited by Mark Tyler, and Betty Puckerin is the interim chair for the Education Committee. Cheryl Treat is the new coordinator of moderators for ANTEC® and RETEC® sessions. In addition, we will be holding our Board of Director elections for the 2016-2019 term. The BOD handles the organization of ANTEC® (CAD Sessions) and CAD RETEC® events, scholarships, education, and many other activities related to the coloring of plastics. Anyone interested in running for election should contact Brenda Mullins by February 18.

The next event for the Color and Appearance Division will be the 2016 Society of Plastics Engineers ANTEC®. Situated at the JW Marriott Indianapolis from May 23-25, this conference will host business and technical papers, tutorials, student functions, exhibits, and networking opportunities for the plastics industry. The Color and Appearance technical program will be co-chaired by Tom Chirayil and Brain West. Following the Color and Appearance paper session, we will hold our annual business meeting for our Division.

CAD RETEC® will return September 11-13, 2016, at the Sawgrass Marriott Resort in Ponte Vedra Beach, FL. The 54th CAD RETEC® event promises an excellent venue for technical, marketing, and business papers, networking, exhibits, and the Coloring of Plastics tutorial. We are seeking technical papers for this show - contact Betty Puckerin or Michael Willis for details. For all other show inquiries concerning exhibits, attendance, or conference details, contact the event chair, Scott Aumann.

Thank you for taking the time to read our updates and we hope to see you in 2016!

Best regards,



2015-2016 SPE CAD Chair

### Disclaimer:

The information submitted in this publication is based on current knowledge and experience. In view of the many factors that may affect processibility and application, this data/information does not relieve processors from the responsibility of carrying out their own tests and experiments; neither do they imply any legally binding assurance of certain properties or of suitability for a specific purpose. It is the responsibility of those to whom this information is supplied to ensure that any proprietary rights and existing laws and legislation are observed.

## Editor's Note



Hello and let me welcome you to the latest issue of your CADNEWS®. I have taken over the role as Editor this year and I hope you find this copy not only informative but educational as well. A lot of work goes in to putting together this publication and it is a collaboration by many people. We all hope that there something of substance that is engaging to you.

CADNEWS® is a great place to capture what has been going on with your SPE Color and Appearance Division and what is coming up in the near future.

Board of Directors elections will be coming up in March so once the candidates are selected, please view them and vote for the next class of BOD members on the SPECAD.org website. ANTEC® will be here before you know it so check out the ANTEC® at [4SPE.org](http://4SPE.org) and register for the event. Color and Appearance Division presenters and papers will be held Monday morning the 23rd. If you see Earl and Sandy congratulate them on their Outstanding Achievement Award and better yet, thank them for their service. Do the same for Betty and Scott for organizing and shaping another successful RETEC® this last year in Indianapolis. It was a great show and we hope most of you were there to experience it. Speaking of RETEC®, next year's event will be in Ponte Vedra Beach, Florida at the Marriott Sawgrass Resort on September the 11th through the 13th. Enjoy the issue and if there is anything you want to see in this newsletter please contact me at by email or give me a call.

Sincerely,

*Mark Tyler*

[mark.tyler@celanese.com](mailto:mark.tyler@celanese.com)

Ph: 859.372.3221

### SPE Color & Appearance Division Mission Statement

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.

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## Newsletter Sponsorship Opportunity

The Color and Appearance Division (CAD) commits to the publishing of at least three newsletters a year (*four, if there is sufficient material to justify the extra issue*). Each newsletter is electronically distributed to our membership of nearly 1,000.

Each sponsor's art directly links to the company's website.

In addition, we print one of these newsletters on 80# gloss coated stock. All electronic versions are also posted on the SPE website where it available for anyone to download.

For the small donation of \$300 per year, we offer a business card sized (2 x 3.5 inches) mention in our newsletter,

We currently have the following slots available for sponsorship:

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# SPE ANTEC® 2016

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## CONNECT WITH SPE CAD VIA SOCIAL MEDIA



### Join SPECAD's Group On Linked In

to network with industry peers, participate in group discussions of industry and technical topics, find job opportunities, and get the latest division and conference announcements.

**Group Name:** SPE Color & Appearance Division

**Group ID** 152108

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# CAD RETEC® 2015 Recap

CAD RETEC® 2015 – Huge Success

SPE CAD RETEC® 2015 at the Westin Indianapolis was held October 4-6, 2015 in Indianapolis, IN. The Color and Appearance Division of the Society for Plastics Engineers (SPE) and the Inter-Society Color Council (ISCC) jointly presented this conference.



This year we were able to bring together Designers, Colorists, Color Engineers, Color Scientists and Academics from around the world. With two full days of technical sessions (*emerging technology, color science, raw materials...*), 60 plus exhibitors showcasing products and services, excellent networking opportunities / receptions, Preconference Color Seminar, New Technology Forum, remote presentation, Interactive Panel Discussion, the 2015 SPE CAD RETEC® had something for everyone in attendance.



Scott Heitzman and Betty Puckerin  
(RETEC® Chairs)

Thank you to all who were in attendance and those who supported the annual conference. A special thanks to all the sponsors that allowed for tremendous receptions, lunch and breaks as well as the free in room and conference area internet.

SPECAD is dedicated to the communication and education in the art & science of coloring plastics.

ISCC is the principal professional society in the field of color in the United States, encompassing the arts, sciences and industry.



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## Terry Golding 2015 Outstanding Achievement Award Winners

The Terry Golding Outstanding Achievement Award was formerly known as the Outstanding Achievement Award, but Terry did so much good work organizing the awards format that we named the award after him. This year we have two very deserving persons of this prestigious award, Earl Balthazar and Sandra Davis.



Sandra Davis of Chemours accepting her award

### **SANDY DAVIS**

Sandy has been on the CAD Board of Directors for many years now and the list of accolades she is collecting is endless. She has made the run through the chairs, has been recognized as an Honored Service Member, is a member of the Executive Committee and has just completed over 6 years as our Division Councilor (more than two full terms in that position). Every now and then we get the privilege of granting a second Terry Golding Outstanding Achievement Award and Sandy is so very deserving of this award to recognize and show our appreciation for the work she has done on behalf of the Color and Appearance Division as our Councilor



Earl Balthazar (right) of Datacolor accepting his award

### **EARL BALTHAZAR**

Many of you will recall that back in 2005 RETEC® was scheduled to be held in New Orleans. However, weeks prior to the RETEC®, Hurricane Katrina abruptly changed those plans and forced an unprecedented last minute change of venue to Charlotte, NC. Undaunted, the Chair of that 2005 Conference made a commitment that we would have a RETEC® in New Orleans and in 2014 he made good on that commitment. This award is for his dedication and for all that he does for the Color and Appearance Division. Also for chairing the 2014 RETEC® and bringing it back to New Orleans, his home state after 9 long years.

## Call for Candidates

### Annual Board of Directors Elections for Color & Appearance Division

The Color & Appearance Division of the SPE will be conducting its annual Board of Directors elections in the first quarter of 2016. 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. Two of the meetings will correspond with ANTEC® and RETEC® where you will participate in CAD activities and initiatives.

If you are interested or if you would like to nominate a colleague or just have questions concerning the CAD BOD, please contact Brenda Mullins of Clariant Corporation at [brenda.mullins@clariant.com](mailto:brenda.mullins@clariant.com) or by phone +1 678.237.2975.

Deadline for Nomination and Biography Submissions is February 26th, 2016



## Councilor's Report



Notes from the Fall Council Meeting, October 10-11, 2015, Pittsburgh, PA

**Financial Performance:** 15 years ago, revenue from dues was \$3.5M and ANTEC® was \$2M. Today, ANTEC® is \$800K and total revenue from these two is \$2.2M (\$3.3M reduction). Need a different business model and alternate revenue streams to sustain SPE. New revenue streams would include more Topcon's, increase advertisement on website and other venues. Hoping to add an additional \$1M by 2017. For 2015, ANTEC® revenue down by \$350K due to no exhibit revenue (NPE year). ANTEC® profit was \$180K. ANTEC® Dubai 2014 made approx. \$30K. ANTEC® Europe was cancelled in 2015 because of financial risk. Revenue gap for 2015 of about \$250K. Controlling spending, 2015 shortfall projected to be \$150K. Cash balance OK even with shortfall as SPE did not pay-off or increase the loan of \$252K on the books. Current cash: \$250K, Investments: \$1.3M, Foundation: \$2.4M

**Membership Benefits:** New product database coming soon which would be free to SPE members. SPE is partnering with a French firm to share this database including over 80,000 polymer grades and 35,000 additives. Would include tradenames, spec sheets, sample requests, etc. SPE may see a slight benefit in revenue (\$5 – 10K). An overview of the new proposed governance structure was presented. Not much change in structure, but likely changes in roles and responsibilities. The Governing Body (GB) would replace the current Executive Committee of SPE. The GB would include 10 SPE members plus the Chief Staff Executive. GB would be elected by Council and SPE members. Proposed structure is:

Chief Staff Executive	President
President-Elect	Past President
VP Sections	VP Divisions
VP Young Professionals	VP Finance & Business
VP Events	VP Marketing
VP Education	

*VP's would have 2-yr terms; overall term limit of 6 years.* All positions will have job descriptions/roles and responsibilities, requirements/qualifications, and some sort of KPI's to ensure they are effective in their roles. The GB would meet roughly once/month (10 times per year minimum). They would have at least 5 face-to-face meetings which will be held regionally to interact with local SPE leadership.

As Chair of the Bylaws & Policies Committee, I asked to be kept informed of proposed changes so we can work in

parallel to update these documents. I was asked to participate on this task force which I have been doing. We have bi-weekly meetings.

### Sections Committee:

Seven sections moved to provisional status. Three sections were abandoned: Central Florida, South Florida and Arkansas. Two sections in formation were approved: Middle East Section and ASEAN (based in Singapore). Two new student chapters were formed: University of Toledo and Nanyang Tech University.

### Divisions Committee:

Moved Electrical & Electronics Division to provisional status.

### Headquarters Update:

New consultant page implemented. Charging a \$200/yr fee for consultants to be listed. They must be a SPE member to be listed. Russ presented information on Educational Giving by Group. I supplied the CAD data.

By total dollars, CAD ranked 4th:

Detroit: \$120K South Texas: \$82K

Milwaukee: \$58K CAD: \$50K

By percent of revenue, CAD ranked 9th. Lifetime, CAD ranked #7 (\$200K).

*Personnel changes:* Sarah Sullinger resigned (moved to PA), Barbara Spain resigned. Hiring Web/IT manager position (30+ applications). Planning to hire a sales strategy person to find new revenue streams.

*Membership:* 16,600 including about 3,000 e-members. Of these, 2,000 are lapsed Premium Members (paying membership) and 1,000 new

### Bylaws and Policy Committee:

Policies approved to cover the establishment of the e-member status. Policies approved to allow for President/VP elections to be handled electronically if a system is found that accommodates this.

### Other Actions:

Motion passed to add the red SPE logo into the StyleGuide document. Comment was made for SPE to show the effect on revenue since the new TopCon policy was implemented mid-2014.

The next Council meeting is a virtual meeting to be held on February 5, 2016.

Respectfully submitted,  
Bruce Muholland





COLOR & APPEARANCE



# CALL FOR PAPERS

## Driving Color into the Future

September 11-13th, 2016  
Sawgrass Resort, Ponte Veda Beach Florida

Abstract Deadline – March 18th, 2016

The 54th Annual Society of Plastics Engineers Color and Appearance Division RETEC® is approaching. The 2016 CAD RETEC® committee has been working hard to develop a conference that celebrates not only where CAD RETEC® has come from but also the future of plastics coloring.

CAD RETEC® is the premier technical conference devoted to the color & appearance of plastics. Attendees range among technical, sales & marketing, and processing departments from many plastics producers, colorant & masterbatch providers, and plastics compounders. With the wide variety of attendees, CAD RETEC® is the best venue for interaction with people passionate about the coloring and aesthetics of plastics. If you've ever been to a CAD RETEC®, you know there are a lot of familiar faces who attend year after year, creating a unique networking environment for our industry where new and long term professional relationships can develop over time. If you have not been to a CAD RETEC® conference before, this is a great opportunity to learn about the value this conference brings to the industry and why so many attendees attend faithfully each year.

For information or questions about presenting a paper please contact the following persons:

Mike Willis  
Sun Chemical Corporation  
Cincinnati, OH  
(800) 343-2583 x 4370  
[michael.willis@sunchemical.com](mailto:michael.willis@sunchemical.com)

Betty Puckerin  
Ampacet Corporation  
Terra Haute, IN  
812-466-9828  
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# Technical Article

## INFLUENCE OF TiO<sub>2</sub> FEEDING ON TWIN SCREW EXTRUSION COMPOUNDING

J.D. Connolly Jr., Sandra P. Davis, William T. Sedar Jr.; DuPont Titanium Technologies, Wilmington, DE; Charles B. Michel; DuPont Center for Corporate Analytical Sciences, Wilmington, DE

### ABSTRACT:

Masterbatch manufacturing issues, including reduced throughput and poor dispersion, have often been attributed to product quality issues for TiO<sub>2</sub> pigments or other fillers. In the past, understanding the causes of reduced throughput has been limited by the inability to understand the sources. Through the development of some innovative analysis techniques, it has become possible to characterize the debris captured on a screenpack from a masterbatch manufacturing line. It has been demonstrated that the debris can be related to the feeding of the TiO<sub>2</sub>

### INTRODUCTION:

When compounding cohesive fillers, such as TiO<sub>2</sub> pigments, into polyolefins or other polymeric materials, it is not uncommon to encounter situations whereby undispersed filler is manifested. This is most often encountered when screenpacks in the compounding machine experience shorter than expected life. The undispersed material may also be detected in subsequent laboratory testing and, more rarely, be found in finished articles, once the affected masterbatch has been let down with additional resin. It is important to be able to track the source of the undispersed material such that the issue can be corrected and quality returned to the compounding operation. The discovery of undispersed filler is often attributed to quality issues with the original filler powder, and the problem is thus attributed to the manufacturer of the filler.

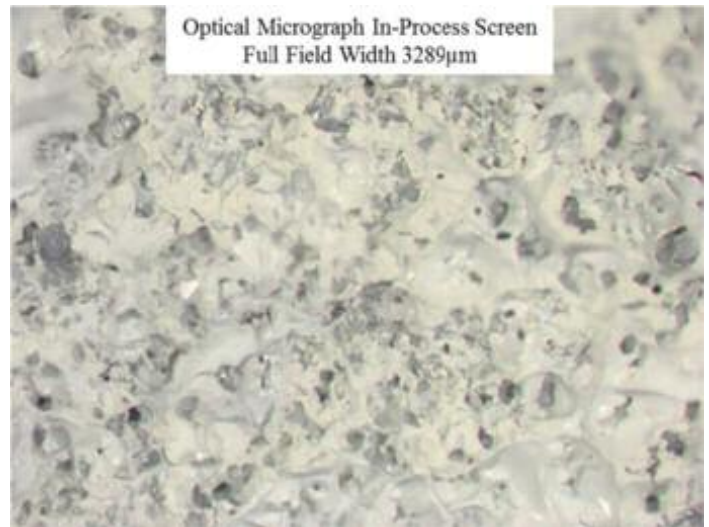
While these undispersed filler incidents can occur on an almost random basis; at other times, there may be systematic reoccurrences, (in both polyolefins and polyesters), which defy analysis by either the filler manufacturer or the compound manufacturer, based upon lot specifications and adherence to specifications. After a recurring series of episodic dispersion issues experienced by multiple users of TiO<sub>2</sub>, a method for examining screenpack debris was developed. Analysis of undispersed agglomerates of TiO<sub>2</sub> uncovered a characteristic morphology revealing that equipment related issues can have a profound influence on the formation of certain classes of undispersed filler.

### DISCUSSION:

In order to determine the true nature of screenpack pluggage, it is necessary to examine the debris that is actually blocking the screen openings. Examination of screenpacks from the manufacture of masterbatch, as received, did not provide any meaningful information because of the overall opacity of the high TiO<sub>2</sub> content polymer residual on the screens after removal from the machine (**Figure 1**). A technique needed to be developed to remove residual TiO<sub>2</sub> while still retaining the original blocking debris on the screens for examination.

Utilizing a modification of a TiO<sub>2</sub> product release dispersion test method, customer screens were machined to fit a screen holder in a 3/4" Killion single screw laboratory extruder and purged with virgin resin (DuPont™ 20 Specialty Polyethylene) (**Figure 2**),

thereby clearing away fully dispersed TiO<sub>2</sub>, and leaving behind the debris that was originally responsible for the premature blockage (**Figure 3**).

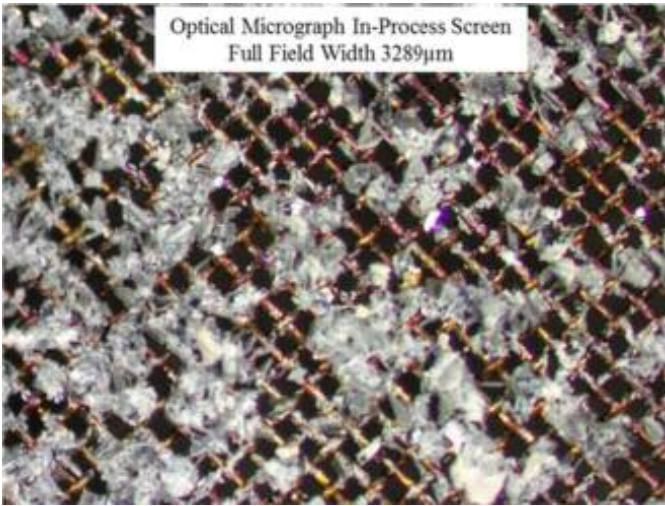


**FIGURE 1** Debris fouled screenpack illustrating visual difficulty in analysis owing to highly reflective TiO<sub>2</sub> masterbatch present.

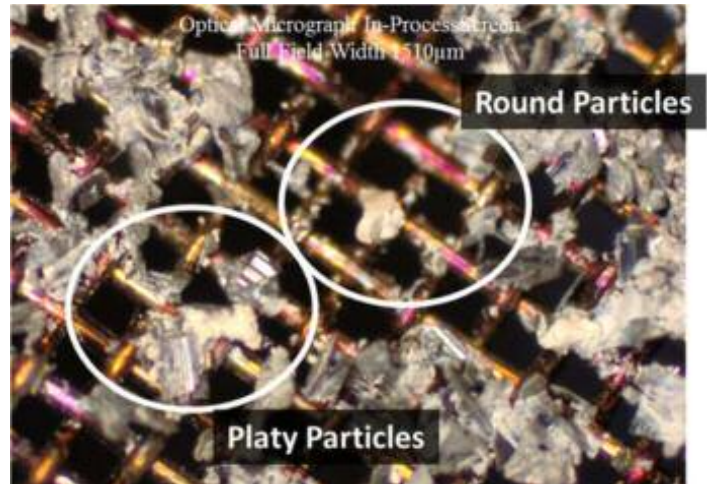


**FIGURE 2** Purging TiO<sub>2</sub> masterbatch from debris fouled screenpack.



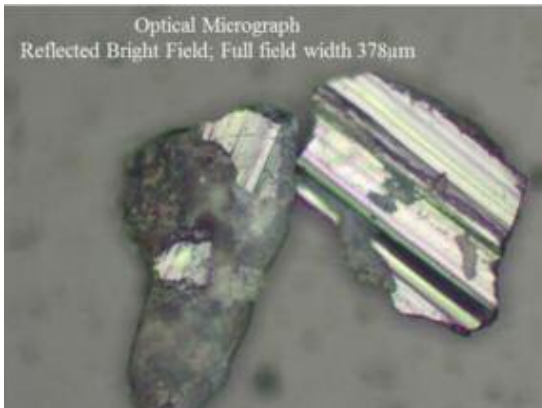


**FIGURE 3** Photomicrograph displaying the debris responsible for fouling the screenpack.

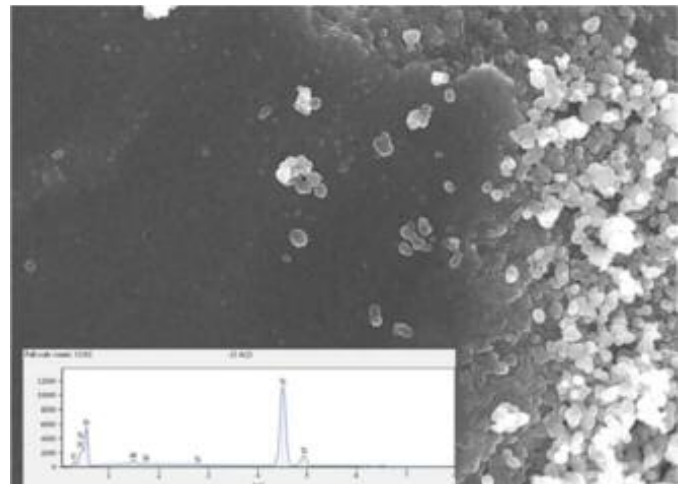


**FIGURE 4** Higher magnification photomicrograph illustrating the presence of two distinctively different particle morphologies present.

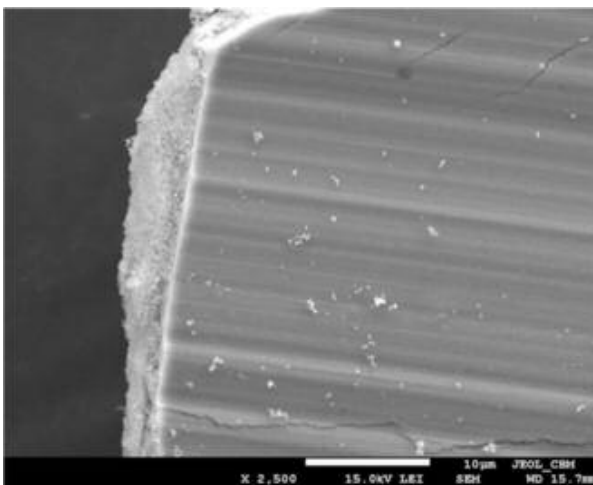
Optical and electron microscopic examination was undertaken to characterize the residual debris. After numerous examinations, the debris could be characterized as the consistent formation of two distinctive types of debris. The first was notably a plate-like structure (**Figures 4-7**) and, often times, appeared metallic with striations on the flat surfaces (**Figures 5-6**). The second was a relatively uniformly sized, mostly round “dumpling” type of morphology (**Figures 4, 8**).



**FIGURE 5** Higher magnification – illustration of characteristic striations on flat plate-like particles.



**FIGURE 7** SEM photomicrograph illustrating the internal compacted TiO<sub>2</sub> nature of the flat agglomerate. Note that there is no resin present within the agglomerate.



**FIGURE 6** SEM photomicrograph illustrating the striated flat surface and the compacted particles within the agglomerate at the edge fracture surface.



**FIGURE 8** Photomicrograph illustrating “round” agglomerate morphology.

Once the characteristic morphology was identified, it was necessary to identify how the morphology could be formed with such regularity within customer compounding machines, which were

all twin screw extruders. Prior research into feeder effects upon twin screw operation had earlier yielded some information regarding the formation of similar types of agglomeration. The research showed that plate-like agglomerates were observed to form whenever a rear feed configuration was utilized, while round uniform agglomerates were observed whether a rear feed or side feed configuration was utilized<sup>1</sup>.

Expanding upon the original work, the following theory of agglomerate formation was developed.

### AGGLOMERATE FORMATION THEORY:

Twin screw extruders are designed to operate efficiently in starve feed mode only<sup>2,3</sup>. If the feed operation is disrupted, unstable, and/or unintentionally operated such that the machine transitions to flood feed mode, then unintended compaction occurs as the cohesive powders transition from the feed hopper into the feed section of the machine. This compaction results in the unintentional densification of the powder and the formation of characteristic agglomerates. The shape of these agglomerates depends on where in the machine the compaction occurs. The cohesive nature of  $\text{TiO}_2$  gives the agglomerates significant strength, which precludes dispersion of the agglomerates in the existing shear fields of the extruder. Certain other inorganic additives are expected to behave similarly.

A twin screw extruder (TSE) under normal conditions of starve feeding has significant void volume in the feed section of the initial section of the screw (Figure 9). This allows the density of the powder/resin mixture to remain low and preclude any significant compaction of the  $\text{TiO}_2$

If the TSE is allowed to transition into flood feed mode, either temporarily or as a mode of operation, then the dynamics of the TSE operation can shift dramatically (Figure 10). With the feeder hopper full above the initial feed section of the TSE, the flights are full also. As the TSE moves the powder forward into the machine, a compression occurs at the entrance of the machine, initiating compaction. Downstream, as the pitch of the feed section of the TSE changes; further compaction occurs resulting in the densification of areas within the powder bed (Figure 11). Compaction forces can also smear cohesive powders, such as  $\text{TiO}_2$ , onto the inner wall of the extruder barrel, resulting in thin platelike accumulations, which can slough off into the moving stream of resin and powder (Figure 11).

Both types of agglomerates have considerable strength owing to the cohesive nature of  $\text{TiO}_2$ . This complicates the ability of the TSE to disperse the agglomerates once formed.

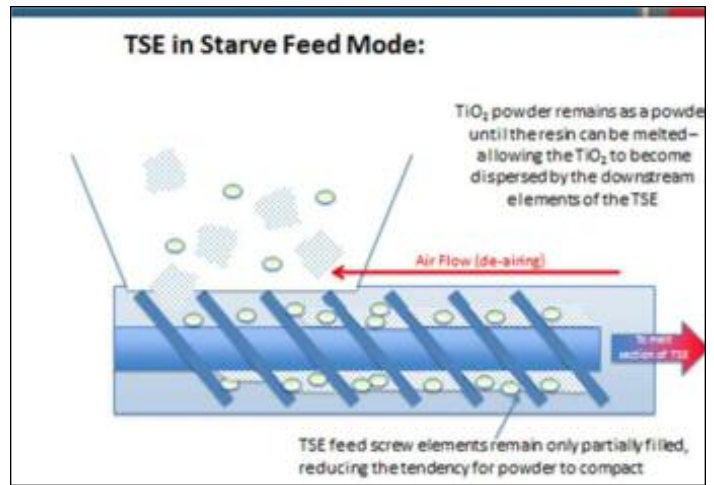


FIGURE 9 Illustration of Twin Screw Extruder (TSE) operation in starve feed mode

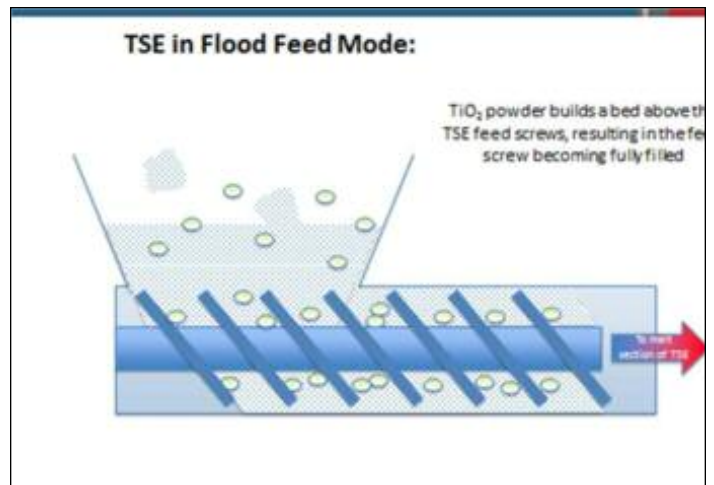


FIGURE 10 Illustration of Twin Screw Extruder (TSE) operation in flood feed mode

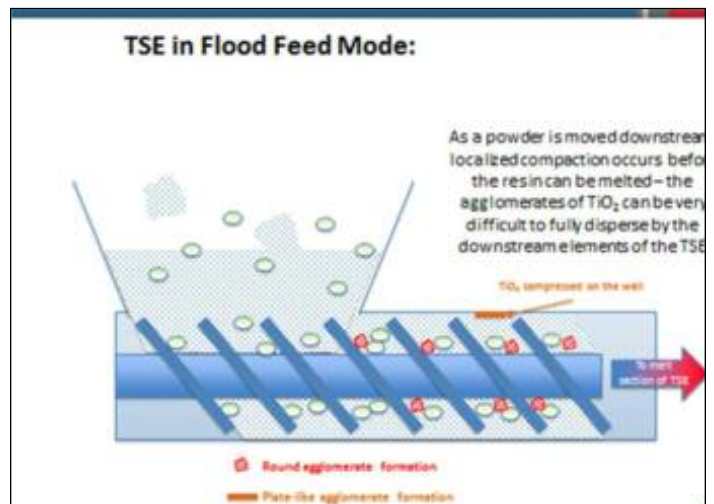


FIGURE 11 Illustration of formation of characteristic agglomerates while Twin Screw Extruder (TSE) operation is in flood feed mode.



## EXPERIMENTAL CONFIRMATION OF AGGLOMERATE FORMATION:

In order to confirm the theory, a continuous series of TSE experimental runs were performed utilizing a 30mm Werner & Pflieder (Coperion) co-rotating twin screw extruder (**Table 1**). The intent of the experiment was to run the extruder at various conditions simulating postulated agglomerate formation conditions caused by flood feed (Samples 3 and 5), interspersed with starve feed conditions (Samples 1, 2, 4, 6), and evaluate the formation of the previously observed agglomerates. Expectations were that the flood feed conditions would form agglomerates and that return to starve feed conditions would return the TSE to normal operation.

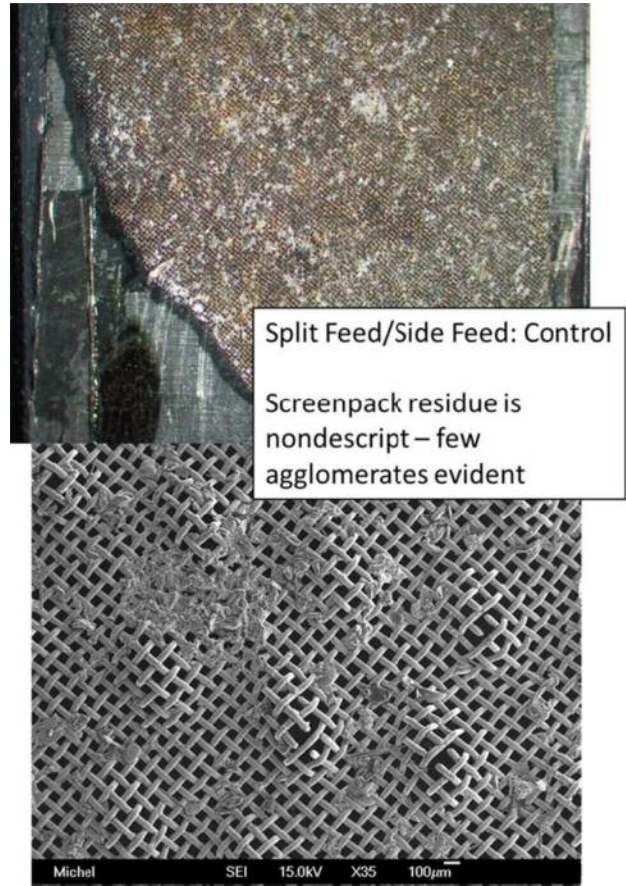
A number of interesting observations were evident from the experimental runs. **Figures 12 and 13** illustrate that side feeding TiO<sub>2</sub> has less propensity to form the agglomerates than rear feed operation. It also confirms no evidence of plate-like structures formed during side feed operation, as originally noted by Sedar and Musiano<sup>1</sup>.

**Figure 14** shows that once the conditions were set for flood feeding via intermittent feeder operation, both types of agglomerates began to appear. Surprisingly, a return to the control; (starve feed) conditions did not return the TSE to steady-state conditions. Agglomerates continued to appear (**Figure 15**), indicating a residence time within the TSE once agglomerates were formed.

Fully flood feed conditions (**Figure 16**) produced more frequent and much larger agglomerates, which continued to appear even after returning to steady-state starve feed conditions (**Figure 17**).

## CONCLUSION:

For Twin Screw Extrusion (TSE) operation utilizing cohesive TiO<sub>2</sub> filler, examination of residual debris on customer screenpacks, from masterbatch production with shortened life, has shown the consistent presence of two types of characteristically shaped agglomerates. The first, a plate-like striated structure is modeled to form on the inner barrel of the feed section of a twin screw extruder when the extruder is operated in flood feed mode. The second agglomerate, a uniformly sized, round agglomerate is modeled to form within the feed screw flights for the feed section of a twin screw extruder or the feed screw flights of a side feeder when either are operated in flood feed mode. Both types of agglomerates are the result of compaction of cohesive TiO<sub>2</sub> (powders) being forced through the machine with no residual space to lessen the compaction forces. They are of sufficient compaction levels as to be un-dispersible under normal operating conditions within a twin screw extruder. The formation of the agglomerates is shown to contaminate the TSE machine for a period of time even after the TSE returns to starve feed operating conditions.

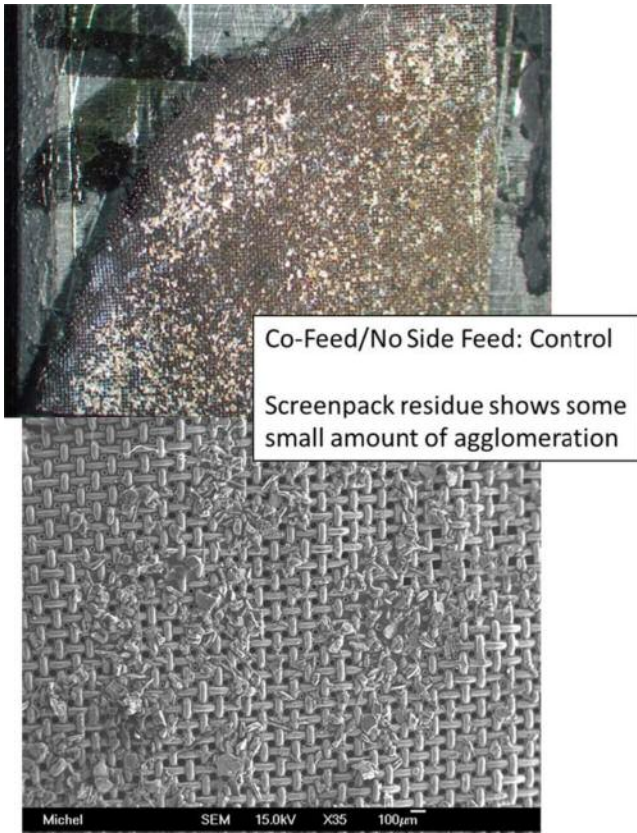


**FIGURE 12** Screenpack screen after side feed control for starve feed conditions. Top view is low magnification and bottom view is higher magnification of the same screen.

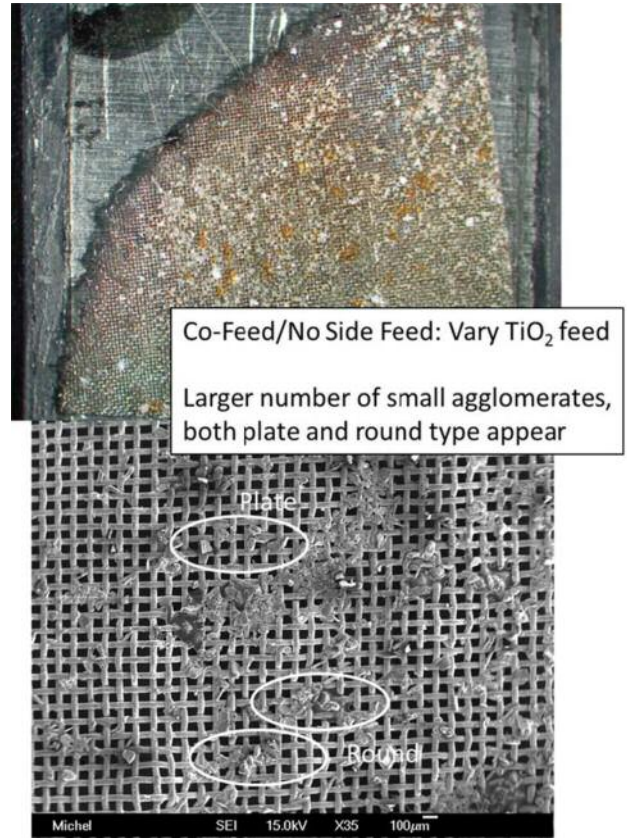
**TABLE 1: 30 MM TWIN SCREW EXPERIMENTAL CONDITIONS:**

SAMPLE	EXTRUDER FEED	SAMPLE DESCRIPTION	COMMENTS
1	Split Feed / Side Feeder	Control	Normal Side Operation - Starve Feed - Medium Feed Rate
2	Co-Feed / No Side Feeder	Control	Normal Rear Operation - Starve Feed - Medium Feed Rate
3	Co-Feed / No Side Feeder	Vary TiO <sub>2</sub> feed - 1 minute high and 2 minutes low	Periodic Flood Feed/Starve Feed Operation - Low/High Feed Rate
4	Co-Feed / No Side Feeder	Control	Normal Rear Operation - Starve Feed - Medium Feed Rate
6	Co-Feed / No Side Feeder	High Rate - 60 lb/hr	Flood Feed Operation - High Feed Rate
7	Co-Feed / No Side Feeder	Control	Normal Rear Operation - Starve Feed - Medium Feed Rate





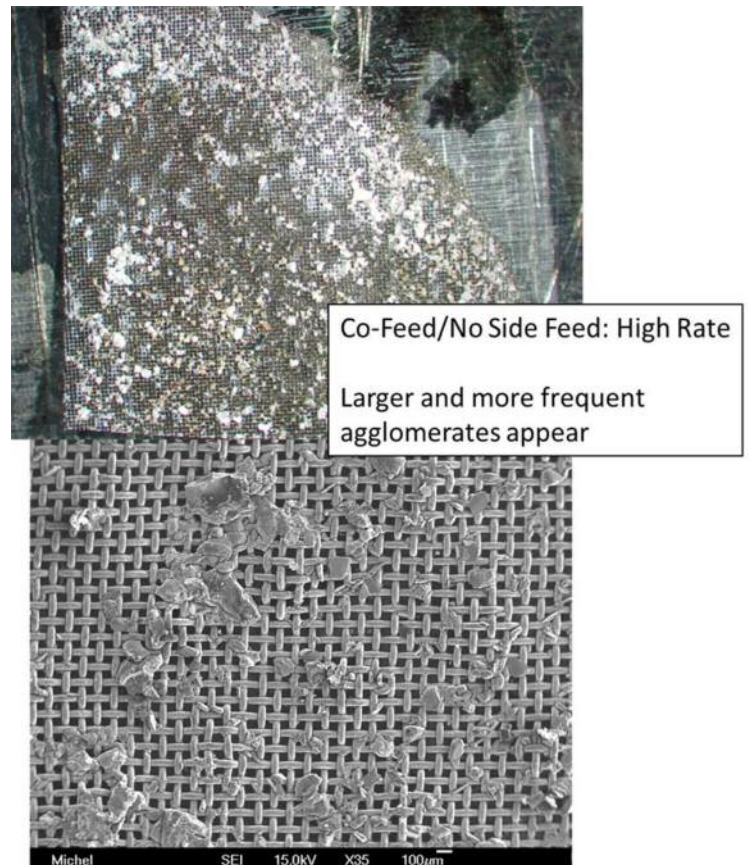
**FIGURE 13** Screenpack screen after rear feed control for starve feed conditions.



**FIGURE 14** Screenpack screen after rear feed condition for flood feed caused by variable feeder operation.

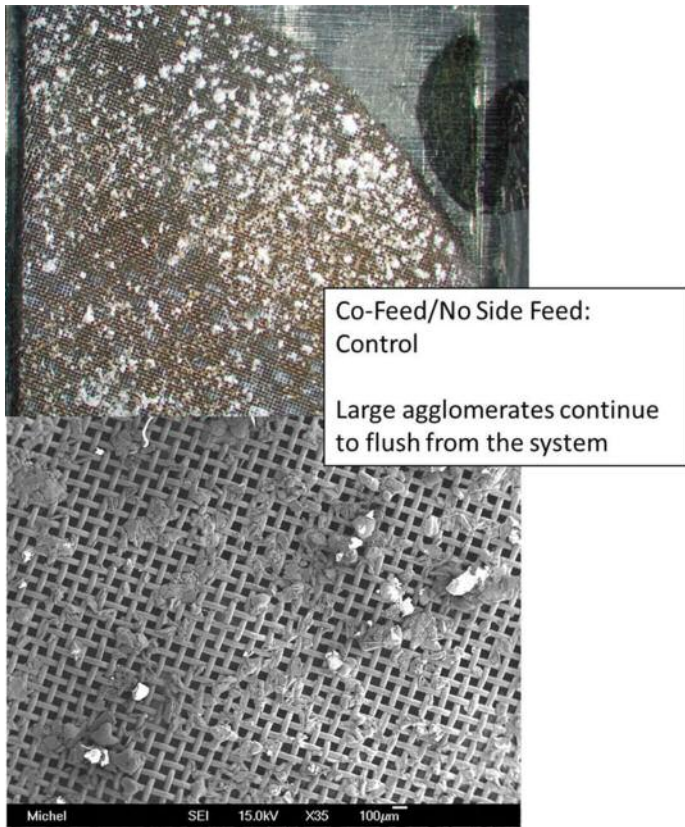


**FIGURE 15** Screenpack screen after rear feed control for starve feed conditions after variable feeder flood feed conditions.



**FIGURE 16** Screenpack screen after rear feed condition for flood feed conditions caused by constant high feeder rate.





**FIGURE 17** Screenpack screen after rear feed condition for flood feed caused by variable feeder operation.

#### REFERENCES:

1. W. T. Sedar Jr. and J. A. Musiano, TiO<sub>2</sub> Agglomerates in Co-Rotating Twin Screw, Masterbatch Compounding, 1999 SPE CAD RETEC®, Nashville, TN, September 27- 29, 1999
2. <http://www.plastics.com/extrusion-what-is-pg2.html>
3. <http://www.ptonline.com/articles/cure-feeder-problems-in-twin-screw-compounding>

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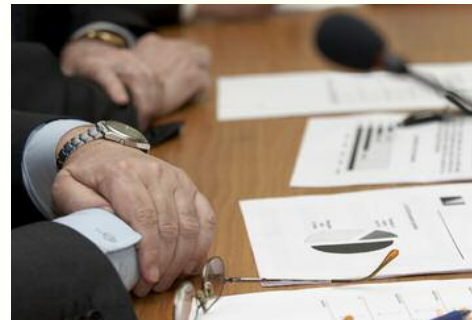
## Board Minutes

Dear Members:

Just a reminder that you can view past and current BOARD MINUTES on the SPECAD website.

We do not typically publish the minutes in the electronic versions of our newsletter, but they are always available for our members to view from our website.

Also, our Treasurer's Report is listed in the minutes as an attachment. All available on the link below.



To access the link see below.

<http://www.specad.org/index.php?navid=28>

## Invitation to Attend Our 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 CAD 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.

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## Society of Plastics Engineers Endowment Scholarship Program For the 2016 – 2017 School Year

The Endowment Scholarship Program offered by the Color & Appearance Division of the Society of Plastics Engineers awards 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 re-apply 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.
5. 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](http://WWW.SPECAD.org) and return it to the address specified on the application by June 3, 2016.**

All submitted applications 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.

Please feel free to contact [Ann Smeltzer](#) or at 412-298-4373 with any questions.

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