



The SPE Press

www.socalspe.org

March 2016

The Southern California Section of the Society of Plastics Engineers
Local information on resources and education available to plastics professionals

**Date: Tuesday,
March 15, 2016**

Vocademy

1635 Spruce Street,
Riverside, CA 92507

Registration: 5:30 p.m.

Dinner, Tour &
Presentation: 6:00 p.m.

Register Now!

Download Event PDF

Education Night

Education is the gateway to a successful career in Plastics Processing and Manufacturing. Creativity and inspiration are the keys for progress in our modern world. In addition to this, making things is just plain fun! This is how this year's SPE SoCal Education and Awards Night is being hosted by Vocademy-The Makerspace. The "Wonders of Plastics" Essay Contest draws the creativity and curiosity of many high school students across the region. They select a topic, and then do research on it and deliver a compelling case for how plastics benefit society. The various essays are then evaluated by members of industry and a selection is made with cash prizes and matching prizes to their schools.

VOCADEMY—THE MAKERSPACE We are the world's first education-focused makerspace. It is the best parts of makerspaces, school shop classes, trade schools, R&D labs, and dream garages, all in one place. We have classes that can take anyone from absolute beginner, all the way to expert, and anywhere in between. You don't have to be a member to take classes. Membership gives you access to the tools and machines which use the skills you have learned in our facility. Vocademy is open to everyone ages 10+/14 and up, 7 days a week, 10 am to 10 pm. We provide the best combination of tools, equipment, instructors, access, and education. We offer hands-on skills training for kids, schools, students, organizations, and companies. Every-one is welcome in groups or as individuals and families. We are a community of makers, united by our desire to create amazing things and become more valuable to the world.

SPEAKER—GENE SHERMAN'S VISION

Vocademy is an idea that I have had for many years. A place that teaches real "hands-on" skills. Not just traditional shop skills, but a place that also teaches the most state-of-the-art manufacturing techniques. A place open to everyone, ages 8 to 98, 7-days a week. With all the amazing tools you would want in your own dream garage, workshop, or inventor's lab. Then make it accessible to all those in the community (individuals, schools and companies) who want to learn, build, create, and become makers. Our goal is to bring back the learning of real skills for everyone!

SPE Event Coordinator: Victor Okhuysen - vfokhuysen@cpp.edu



PRESIDENT'S MESSAGE



We had a wonderful start for 2016 with our first Tech Dinner meeting program. Our Tech meeting in January was very well attended and the topic of FDA regulatory and Medical Molding was well received. In the coming months there are several exciting events that I would like to bring them to your attention and invite you to participate. The Education Night on March 15th to recognize the winners of the "Wonder of Plastics" essay contest, and on April 21st we will hold a day long molding workshop at ENGEL Tech Center in Corona. If you are involved with injection molding, do not miss this opportunity to learn about new developments concerning increasingly competitive molding business from industry experts.

It also is a time for us to think ahead and we direct our attention to our two biggest events of the year. The Golf Outing on June 23rd at the Sierra LaVerne Country Club and the Western Plastics Trade Fair on August 11th at the Phoenix Club in Anaheim. Planning for these two big events are progressing and we would like to get as many companies and individuals signed up for these events as early as possible. We will be mailing out an Advanced Registration and Program flyers. Stay tuned for more information.

I look forward to meeting you at our events.

Tuan Dao
President, SoCal SPE
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Register online [NOW!](http://www.socalspe.org)



33rd Annual Golf Tournament for Plastics Education

Thursday June 23, 2016

The Southern California Society of Plastics Engineers is proud to host this event.

Our Golfers will enjoy our return to the exclusive Sierra Lavern Country Club. Located in the rolling foothills of the majestic San Gabriel Mountains, the course offers a cool climate surrounded by great natural beauty. We have an early morning shotgun start at 7:30AM. Event proceeds help support the SoCal SPE education and scholarship programs. **Join in after the tournament for the golf awards presentation and luncheon after golf.**

SPE will also formally present the George Epstein Scholarship

<http://socalspe.org/Scholarships.html>

New this year: Rusty Miller perpetual trophy (The Rusty). Be the first foursome to have your name engraved on the trophy.

Past SPE presidents are invited for our traditional informal past presidents meeting

Any donations in the form of Raffle Prizes, Tee Sponsorship, Cash or Services for this fundraiser will be greatly appreciated. Your contribution will be recognized at the tournament.

registration: register online at www.socalspe.org

Event coordinators:

Kerry Kanbara 909 906 2332

Registration work sheet:

GOLF & CART+LUNCH /\$99.00 ea _____

GOLF & CART only\$ 75.00 ea _____

DINNER BANQUET only \$45.0 ea _____

SPONSOR tee\$100.00 / flag\$250.00 _____

TOTAL _____

Name of Participants (group contact as #1) Index (if used)

1- _____

2- _____

3- _____

4- _____

EDUCATION/SCHOLARSHIP donation \$ _____

I plan to donate a raffle prize or other services (NO REFUNDS FOR CANCELLATION AFTER 06/04/16)

MEMBERSHIP SPOTLIGHT

We are always so excited to announce new members! Welcome to SPE to the following new members:

Rafie Baboldashtian – Balda C. Brewer, Inc.

Layne Salmond – Ambrit Engineering Corporation

Miguel Solorio – Bernman Mold & Engineering, Inc.

SoCal SPE Wants YOU to Become a Member

The SPE Southern California Section is, for a limited time, offering one FREE registration to a single, exclusive local technical event for those who sign up for an SPE Membership! To be eligible for this special offer, visit our website @ socalspe.org to check out the event calendar and register as an SPE Member! Once a member, you will be sent a voucher to bring to the SoCal SPE event of your choice! Offer also applies to expired memberships. Don't let this opportunity pass you by, become an SPE member today!

For questions, contact Ashley Price at 562-217-1377 or aprice@ethorn.com.

SAVE THE DATE

Western Plastics

AUGUST 11, 2016

Hosted by The Southern California

Society of Plastics Engineers



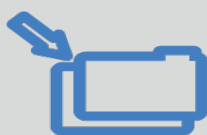
George Epstein Scholarship Award

The **George Epstein Scholarship Award** was established in 1984 as a tribute to his many contributions to plastics both commercially and educationally. Since inception, the Southern California SPE Section has awarded over \$33,000.00 in scholarships. The award is open to student members or son/daughter, grandsons/granddaughters of a member in good standing of the Society of Plastics Engineers, Southern California Section.



QUALIFICATIONS

- 1) Son/daughter or grandsons/granddaughters of a member or a current student member in good standing of the Society of Plastics Engineers, Southern California Section.
- 2) Applicants must have a demonstrated or expressed interest in the plastics industry.
- 3) An Applicant must be in good academic standing at his/hers school.
- 4) High School graduating senior accepted to a University or Jr. College.
- 5) Matriculating undergraduate student at a University College or Jr. College.
- 6) Matriculating graduate student at a University College.



APPLICATIONS

Applications must include the following minimum information:

- Name and relationship to the member of SPE
- Address, phone number and email address (if available)
- Institution attending and Student ID number
- GPA, SAT, Major, Goals, Awards, Clubs, Activities, Achievements, Hobbies
- Include any additional information that would assist the selection committee.



LATE APPLICATIONS

Late applications and those that do not include the above information as a minimum will not be considered.

\$250 & \$500 scholarships are available and will be awarded based on the above criteria and Scholarship Committee evaluation of the effort put into the application, format, grammar, spelling, etc., the applicants ability to express him/herself in writing and subjective evaluation of applicants activities in/out of school and awards and achievements. SoCal SPE reserves the right not to award a scholarship in a given year if it so chooses.

For more information email - socalspe@gmail.com

Entry Deadline: May 31st

Awards are presented at the banquet following our Annual Golf Tournament for Plastics Education

Additional scholarships are available through The SPE Foundation Scholarship Program. For more information click [here](#).

Hot Runner Questions

Tech Tips by
Terry L. Schwenk

Question: What kind of hot runner systems are more prone to leak plastic into the system?

Answer: The answer to the first question can be quite complex. Without knowing specifics, I will answer like this. No one type of hot runner system is more or less prone to leaking. There are certain laws of physics that need to be paid attention to in order to design a system to be safe and leak resistant. With that said the question should be what types of resins are more prone to leakage in hot runner systems? The answer to this question is resins with a low viscosity and low melting point. Reason is, it takes less pressure and temperature for these type resins to leak. Three things need to be present for any leak to occur. Heat, Pressure and a Flow Path. Take any one of those three things away and a leak can not occur. The hot runner system is designed to maintain heat, however in a good design the system will allow heat loss in certain areas, where it contacts the mold based and these areas are taken advantage of.

By having lower temperature in an area such as a Flow Path will cause the resin to solidify preventing a leak. A Flow Path is any area where the melt can flow. Such as the fit between the nozzle body and manifold, between the nozzle and gate seal and in the case of a valve gated system the fit between the valve pin and valve bushing. The fits and finishes are critical to prevent material leakage. As in the gate seal area and manifold areas. The pressure will always be present, dictated by the process. However hot runner suppliers perform pressure drop analysis and reduce the pressure losses as much as possible resulting in less pressure needed to fill a part, reducing the chance of a leakage.



Question: What causes the actual melt temperatures coming out of each drop to be different when the settings are all the same?

The answer to second question on different melt temperatures on each drop, has to do with a couple of items. If all hot runner components are identical, then a possible cause could be the nozzle integration being different from one nozzle to another. If a nozzle has more contact with the mold base then the one next to it, this becomes a heat sink and the temperature controller will try to compensate for the heat loss by turning on the heat resulting in a higher nozzle temperature. Another possible cause is damaged thermocouple resulting in poor temperature sensing. Other possible causes are damage or failing heater elements. The heater element may not have uniform resistance resulting in a higher or lower wattage. The heat profile of the nozzle could not be correct for the process. It also could be a problem with the cooling circuit on the cavity or core, resulting in a higher or lower nozzle temperature. If using an older temperature controller, the unit may not be calibrated correctly. The thermocouple cables could be damaged along with the electrical plugs in the cables, mold or controller.

A good electrical person would be able to trouble shoot any of these areas.

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Contributor:

Terry L. Schwenk has over 40 years of experience in the plastics industry, including more than 27 years of specialized experience in hot runner technology. Terry's greatest strengths are in his abilities to identify, brainstorm, conceptualize, and then deliver the best solution that fits the customer's injection molding needs supported by a strong technical background.

Terry holds several patents relating to hot runner systems, venting and silicone molding.

Terry L. Schwenk currently holds position of Executive Account Manager with Ewikon Molding Technologies Inc., providing hot runner systems to North America.

For more information, contact Terry at: terry.schwenk@ewikonusa.com

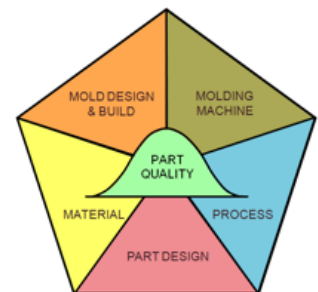
The 5 Critical Factors to Successful Injection Molding

Tech Tips by
Suhas Kulkarni

In the present day global economy where manufacturing has become extremely competitive, an injection molding operation can be successful only when the productivity and efficiency is consistently high. Low scrap rates and lean operations are therefore imperative to achieve this goal. Scrap parts or reject parts are those that do not meet the required quality specifications which means an attempt was made to mold the parts to specifications but the molder was not successful. The process that the molder set at the molding press was not robust and/or not optimized leading to the inconsistencies. A molding process must be repeatable, reproducible and optimized.

For a process to be repeatable, reproducible and optimized, there are five factors that must be considered. These are mentioned below. (See figure).

- i. The Part Design
- ii. The Material Selection
- iii. The Mold Design and Construction
- iv. The Molding Machine
- v. The Molding Process



1. **Part Design:** The part must be designed for molding. Rules for plastic part design are considerably different from metal part design because of the inherent nature of the plastic. Since most designs are adapted from metal parts this factor must be considered carefully. For example, part thicknesses in metal can be more than those acceptable in plastic. Thick sections cannot be present in a plastic part. Thick sections result in sink. All corners must have a radius to avoid stress concentration and premature failure. Parts must also be designed for assembly. With the need for plastics recycling, the concept and requirement of Design for Disassembly is getting more common. The plastic part designed must also consider the mold design aspect of the part and must design the part for acceptable gating locations, ejection systems and so on. For example, a cosmetic part needs a non-cosmetic area for a gate location.

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2. **Material Selection:** Based on the part design and the part performance requirements, the plastic material must be selected. Material selection must be also selected based on the tolerance requirement of the part. Tight tolerance parts must be molded with low shrink materials unless they are micromolded products or parts that are dimensionally small (around 10mm in their maximum dimension). If a thick section must be present, a filled material may need to be selected or if there is a sliding surface then an additive to reduce the coefficient of friction needs to be added to the plastic. Material selection should be done when the basic part design is done and the requirements are detailed. The material manufacturers are the best source of information. Since the mold cavity dimensions are based on the part shrinkage material selection is critical. Colorants can affect shrinkage and these must be taken into consideration.

3. **Mold Design and Construction:** The mold must be designed and constructed such that the mold is robust enough to withstand the molding process and the plastic material. For example, during the molding process, the mold can be subjected to high mechanical stresses especially during the plastic injection and the packing. All these material specific factors such as shrinkages must be considered. The required amount of parts from the mold is another factor that will dictate the actual material of construction since the wear on the components must be considered. A robust process needs a mold that is capable of having a good cosmetic process window and so mold construction is critical. The mold must not flash easily at high plastic pressures.

4. **Machine Selection:** Selecting the right machine for the mold should be done once the mold design is complete or should be done concurrently during the mold construction stage. The machine plays a very important role in the stability of the molding process. For example, machines with large shot sizes must not be used to mold small shots since the part quality consistency suffers. Vice versa, using a large percentage of the shot size can give rise to problems with melt homogeneity and therefore issues with fill and dimensions. Maximum available plastic pressures, injection speeds, auxiliary systems such as core pulls and monitoring systems must be considered in the initial design stages.

5. **Molding Process:** The molding process must be optimized using scientific molding techniques. Once the mold is in the molding machine the 6-Step Study and a Designed Experiment must be performed to determine the cosmetic and dimensional process window. Process windows that are not wide lead to non robust processes which are the main cause of inconsistencies and subsequent scrap and rejects. In such a case the first four factors must be revisited. Process optimization is the last step and is often not done correctly or is even completely ignored.

Since there are various departments involved in the production of the molded part, regular meetings between the different departments must be held. Each department will have specific knowledge of their section and can then not just contribute to the process development but more importantly predict the potential issues in production. Practicing Concurrent Engineering leads to a more robust and consistent process. From a human perspective such a team effort also boosts the morale and increases the appreciation for each others' departments.

Contributor: Suhas Kulkarni, FIMMTECH www.fimmtech.com suhas@fimmtech.com

For Your Information**SPE & SpecialChem Partner to Bring Materials Database**

BETHEL, CT, U.S.A., and PARIS, FRANCE, February 3, 2016: The Society of Plastics Engineers (SPE) and SpecialChem today announced a partnership that will offer SPE members full access to SpecialChem's Universal Selector database of plastics and additives.

Access to the Universal Selector, which includes 125,000 datasheets, will be available starting today.

The partnership will greatly benefit SPE members according to Wim DeVos, CEO of SPE. "This new Materials Database resource we are offering with SpecialChem is an exciting match for SPE, enriching the value we offer our members," said Mr. DeVos. "Whether they are looking for materials with specific properties or searching for alternatives or even technical solutions, our engineers and purchasers will find this tool a very valuable asset."

"This strategic partnership with SPE is completely aligned with our corporate mission to help engineers faster select the products they need by giving them access to all products in the world and the knowledge to select them," said Christophe Cabarry, founder and CEO at SpecialChem. "Our Universal Selector proposes 10 dimensions of search including the 'new' property search. We constantly strive to standardize the heterogeneous ways suppliers publish product data and to add new products as soon as they are launched, which has proven to be valuable for both formulators and engineers."

SPE and SpecialChem will cross-promote the partnership at conferences and through digital and social media. For detailed information on this program for SPE members and special offers for new members, please visit www.4spe.org.



SpecialChem has created the world's largest online professional network dedicated to chemicals and materials. The network counts over 500 000 engineers globally around 4 industries (Plastics & Elastomers, Paints, Coatings & Inks, Adhesives & Sealants, Cosmetics and Personal Care). SpecialChem offers engineers unlimited access to unique databases gathering all chemicals & materials in the world ("Universal Selectors"), and the knowledge to select them. As a B2B Digital Marketing company, SpecialChem leverages its network and data-driven industry insights to help 1. chemicals and materials suppliers wanting to speed up their innovation and new business development 2. digital marketers to increase their brand awareness and engage new customers 3. researchers to scout new technological solutions related to chemicals and materials. For more information, please visit <http://www.specialchem.com>.





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UPCOMING COURSES

The College of the Extended University Cal Poly, Pomona



<https://www.ceu.cpp.edu/courses/cert/EM/PET.html>

Comments Provided by Students

- ▶ Great course, very instructional...love the PowerPoint notes
- ▶ The instructor uses examples that are relevant to my industry/field
- ▶ The overall explanation of the basics of Plastics was very clear and concise, explained in plain English without having to use big and sophisticated words to explain theory or function
- ▶ The course's major strength was instructor's ability to relate to real life experience
- ▶ Very Practical – I highly recommend to anyone new to plastics industry
- ▶ Hand-outs are great, I refer to them on regular basis

Spring 2016

(April 30 & May 7, 2016)

Plastics Product Design and Tooling
For Injection Molding

Fall 2016

Scientific Injection Molding

Plastics Product Design & Tooling for Injection Molding

The College of the Extended University, Cal Poly, Pomona
Plastics Engineering Technology Certificate Program
Spring 2016 Saturdays - April 30th & May 7th

This combined course is designed for toolmakers, apprentices, technicians, product designers, process engineers and other plastics personnel desiring to acquire basic knowledge of product design and tooling technology. This course provides an overview of the design process for injection molded plastics parts. The emphasis is on concurrent engineering practices, which leads to elimination of barriers between various engineering groups, toolmaker and manufacturer. The student will learn about the importance of proper material selection, part design fundamentals, manufacturing (moldability) considerations, design for assembly, tooling considerations, rapid prototyping

techniques and testing. Design fundamentals discussed are applicable to parts designed for all plastics processing techniques. In the tooling portion the emphasis is on various mold components, mold design principles, cooling, venting, draft considerations, shrinkage, mold polishing, and tool surface enhancement techniques. Topics such as use of simulation software to enhance mold design, how to improve productivity, reduce down time, and lower maintenance costs by optimizing tooling design will be covered in detail. Course content: Plastics materials and material selection process; Concurrent engineering, plastics part design process overview; Manufacturing considerations; design for molding; Basic part

design and design related product failures; Rapid tooling and prototyping; Design for assembly and review of assembly techniques; Tooling considerations; Injection molding process; Injection molds (types of mold construction); Tooling considerations; Mold metallurgy, runners, gates, sprue bushing, sprue pullers; Mold design and simulation software; Venting, cooling; Draft angles, shrinkage, mold polishing, tool surface enhancement; Hot runner molds and systems. In addition, students will receive a variety of useful handouts showing How and Where to get more detailed information on a variety of plastics-related topics.

SPE Southern California Leadership



SPE Leadership		
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Membership Application

PH: 203-775-0471 • Fax: 203-775-8490
www.4spe.org • membership@4spe.org

Contact Information *Please print clearly*

First Name (Given Name)		Middle Name
Last Name (Family Name)		
Company Name/University Name (if applicable)		
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Alternate Email		
Date of Birth (Required for Young Professional membership)		
Graduation Date (Required for Student membership)		Job Title

Membership Types *Check one*

- ☐ **Student: \$31** (Graduation date is required above)
- ☐ **Young Professional: \$99** (Professionals under the age of 35. Date of birth is required above)
- ☐ **Professional: ~~\$144.00~~ \$129** (Includes \$15 new member initiation fee)

Choose 2 *free* Technical Division and/or Geographic Section Member Groups. →

Additional groups may be added for \$10 each. Add Special Interest Groups at no charge.

1. _____ 2. _____

3. _____ 4. _____

Dues include a 1-year subscription to *Plastics Engineering* magazine—\$38 value (non-deductible). SPE membership is valid for 12 months from the date your membership is processed.

Payment Information Payment must accompany application. No purchase orders accepted.

☐ Check Enclosed Amount _____

Charge: ☐ Visa ☐ Mastercard ☐ American Express Expiration Date: _____

Account Number: _____

Amount Authorized: _____ CSC#: _____ Last 3 digits from the back of MC/Visa.
4 digits from the front of AMEX.

Cardholder's Name (as it appears on card): _____

Signature of Cardholder: _____

Payment by Wire Transfer Instructions

You **must** include account number + ABA number + bank fees.

Please include the Member ID# and Name so we may apply payment to the correct person.

USD: WELLS FARGO: 108 Federal Road, Danbury, CT 06811 USA

ACCT #2681786097 ABA #121000248 SWIFT CODE #WFBIIUS6S

The SPE Online Member Directory is included with membership. Your information is automatically included unless you indicate otherwise.

- _____ Exclude my email address from the Online Membership Directory
 _____ Exclude all my information from the Online Membership Directory
 _____ Exclude my address from 3rd party mailings

By signing below, I agree to be governed by the Bylaws of the Society and to promote the objectives of the Society. I certify that statements made in the application are correct and I authorize SPE and its affiliates to use my phone, fax, address and email to contact me.

Signature _____ Date _____

Technical Division Member Groups - Connect with a global community of professionals in your area of technical interest.

- Additives & Color Europe - D45
- Applied Rheology - D47
- Automotive - D31
- Blow Molding - D30
- Color & Appearance - D21
- Composites - D39
- Decorating & Assembly - D34
- Electrical & Electronic - D24
- Engineering Properties Structure - D26
- European Medical Polymers - D46
- European Thermoforming - D43
- Extrusion - D22
- Flexible Packaging - D44
- Injection Molding - D23
- Medical Plastics - D36
- Mold Making & Mold Design - D35
- Plastics Environmental - D40
- Polymer Analysis - D33
- Polymer Modifiers & Additives - D38
- Product Design & Development - D41
- Rotational Molding - D42
- Thermoforming - D25
- Thermoplastic Materials & Foams - D29
- Thermoset - D28
- Vinyl Plastics - D27

Geographic Section Member Groups - Network with local industry colleagues.

- ☐ Alabama-Georgia-Southern
- ☐ Asean*
- ☐ Australia-New Zealand
- ☐ Benelux
- ☐ Brazil
- ☐ California-Golden Gate
- ☐ California-Southern California
- ☐ Caribbean
- ☐ Carolinas
- ☐ Central Europe
- ☐ China
- ☐ Colorado-Rocky Mountain
- ☐ Connecticut
- ☐ Eastern New England
- ☐ France
- ☐ Hong Kong
- ☐ Illinois-Chicago
- ☐ India
- ☐ Indiana-Central Indiana
- ☐ Israel
- ☐ Italy
- ☐ Japan
- ☐ Kansas City
- ☐ Korea
- ☐ Louisiana-Gulf South Central
- ☐ Mexico-Centro
- ☐ Michigan-Detroit
- ☐ Michigan-Western Michigan
- ☐ Middle East
- ☐ Nebraska
- ☐ New Jersey-Palisades
- ☐ New York
- ☐ North Carolina-Piedmont Coastal
- ☐ Ohio-Akron
- ☐ Ohio-Cleveland
- ☐ Ohio-Miami Valley
- ☐ Ohio-Toledo
- ☐ Oklahoma
- ☐ Ontario
- ☐ Oregon-Columbia River
- ☐ Pennsylvania-Lehigh Valley
- ☐ Pennsylvania-Northwestern Pennsylvania
- ☐ Pennsylvania-Philadelphia
- ☐ Pennsylvania-Pittsburgh
- ☐ Pennsylvania-Susquehanna
- ☐ Portugal
- ☐ Quebec
- ☐ Spain
- ☐ Taiwan
- ☐ Tennessee-Smoky Mountain
- ☐ Tennessee Valley
- ☐ Texas-Central Texas
- ☐ Texas-Lower Rio Grande Valley
- ☐ Texas-North Texas
- ☐ Texas-South Texas
- ☐ Tri-State
- ☐ Turkey
- ☐ United Kingdom & Ireland
- ☐ Upper Midwest
- ☐ Utah-Great Salt Lake
- ☐ Virginia
- ☐ Washington-Pacific Northwest
- ☐ West Virginia-Southeastern Ohio
- ☐ Western New England
- ☐ Wisconsin-Milwaukee

*Asean: Indonesia, Malaysia, Phillipines, Singapore, Thailand, Cambodia, Laos & Vietnam

Special Interest Groups - Explore emerging science, technologies and practices shaping the plastics industry. Choose as many as you would like, at no charge.

- Advanced Manufacturing / 3D - 033
- Bioplastics - 028
- Failure Analysis & Prevention - 002
- Joining of Plastics & Composites - 012
- Marketing & Management - 029
- Non-Halogen Flame Retardant Tech. - 030
- Plastic Pipe & Fittings - 021
- Plastics Educators - 018
- Plastic in Building and Construction - 027
- Quality/Continuous Improvement - 005
- Radiation Processing of Polymers - 019
- Reaction Injection Molding - 032
- Thermoplastic Elastomers - 006

Recommended by (optional) _____ ID# _____