CPM Twin-Screw Compounding Workshop

September 13-15, 2022

Workshop Leader: Adam Dreiblatt
The Polymers Center
Charlotte, NC

Program Overview

This three-day workshop focuses on the application of intermeshing co-rotating extruders in compounding applications. Training is directed towards machine operators, process engineers and supervisors as well as product development scientists in both research and manufacturing environments. *Participants are reminded that the goal of compounding is to produce properties, not pellets*. The goal of this workshop is to explain *how* twin-screw extruders create properties.

Interactions between screw design, raw materials and process parameters are presented in such a way that both experienced users and novices will benefit. Common unit operations are explained in practical terms with no prior knowledge or experience required. Upon completion of the training, participants will return to the workplace armed with techniques to improve quality, production rate and yield.

Participants will conduct hands-on compounding experiments using a Theysohn TSK 20 with split-barrel capability. The hands-on portion of this workshop is designed to be an interactive experience rather than a demonstration for spectators. Workshop participants will be introduced to experimental design as a method to identify optimum compounding conditions.

Adam Dreiblatt

Adam has been involved with the practical aspects of twin-screw extrusion for over 40 years. He was formerly Manager of Process Development at Werner & Pfleiderer Corporation and Director of Manufacturing for the Novon Products Division of Warner-Lambert. Adam is now Director of Process Technology for CPM Extrusion Group, a global supplier of twin-screw extruders and replacement parts.

Adam has authored and presented numerous technical papers as well as published articles on various aspects of twin-screw extrusion. He has contributed several chapters in reference books including: "*Screw Design,*" Encyclopedia of Polymer Science and Engineering (John Wiley), "*Intermeshing Co-rotating Twin Screw Extruders,*" Mixing in Polymer Processing (Marcel Dekker), "*Internal Mixers, Single and Twin Screw Extruders,*" Handbook of Process Plant Machinery (Butterworth Publishing). Adam holds a M.S. in Applied Science from New York University.

The Polymers Center

The Polymers Center (former Polymers Center of Excellence) provides the technical and training needs of the plastics industry through polymer processing, physical testing, educational products and consulting. The Polymers Center has evolved from the Industrial Extension Service at North Carolina State University and the North Carolina Polymers Extension Program into a full-service product and process development organization with ISO 9001 certification.

The workshop will highlight The Polymers Center's compound development capabilities utilizing the Theysohn TSK 20 twin-screw compounding line and related support equipment. Complete physical testing, extrusion, injection molding, blow molding and vacuum forming resources are also available at The Polymers Center.

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Workshop Program

Tuesday, September 13, 2022, 8:00 a.m. - 4:30 p.m.

Twin-Screw Extruder Design

- Introduce concepts responsible for creating properties on co-rotating twin screw extruders
  - → Degree-of-fill, shear rate, residence time/residence time distribution, heat transfer
  - → Dispersive vs. distributive mixing
- Influence of extruder configuration on compounding performance
  - → How machine design impacts mixing (e.g. d_0/d_i, co versus counter rotation, etc.)
  - → What is optimum extruder configuration?

Processing Unit Operations

- Deep dive into unit operations: feeding, melting, mixing, venting, pressurization
- Introduction of the process model – role of specific energy
- Interaction of process parameters
- Process optimization

Wednesday, September 14, 2022, 8:00 a.m. – 4:30 p.m.

The "Art" of Screw Design

- Functional description of the working principles for each element type (conveying, mixing)
- Overview of available screw element designs
- Characterization of dispersive and distributive mixing elements
- Selection of the optimum screw type for each of the unit operations

Process Troubleshooting

- Identification of assignable cause for most common product quality and process-related problems

Thursday, September 15, 2022, 8:00 a.m. - 3:00 p.m.

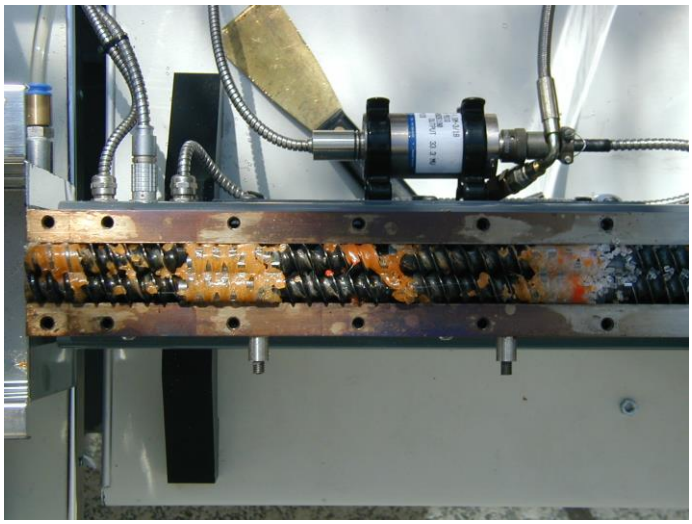
Compounding experiments on TSK20 extruder

- Introduction to Design of Experiments (DOE)

The TSK 20 split-barrel extruder allows participants to visualize what is happening to the materials inside. Hands-on compounding experiments are conducted to reinforce concepts discussed during the classroom sessions.

Bring your current processing problems or screw configuration questions to discuss privately with the instructor…this alone can justify the workshop fee!

Participants will return to the workplace prepared to design and optimize screw configurations as well as develop operating conditions to meet compound specifications.



General Information

Location: The workshop will be held at The Polymers Center, University Research Park, 8900 Research Drive, Charlotte, North Carolina. Their phone number is (704) 602-4100.

Hotel Reservations: Attendees are responsible for making their own lodging arrangements. The Marriott SpringHill Suites Charlotte/University Research is conveniently located less than a mile from the workshop location. There is also a Marriott Towne Place Suites at the same location. Both properties may offer a discounted room rate while attending The Polymers Center.

Time: Workshop hours are from 8:00 a.m. to 4:30 p.m. on September 13th and 14th. On September 15th, workshop hours are from 8:00 a.m. to 3:00 p.m. The Polymers Center will provide morning and afternoon refreshment breaks and lunch each day.

Cancellations: If you must cancel, call The Polymers Center Seminar Registrar, Beverly Jarrell at (704) 602-4127. ***There is no refund for cancellations***: the student may take the seminar the next date it is being offered or a different person may be substituted. **REGISTRANTS WHO FAIL TO ATTEND ARE LIABLE FOR THE ENTIRE FEE UNLESS THEY CONTACT THE POLYMERS CENTER PRIOR TO THE WORKSHOP TO CANCEL.**

The Polymers Center reserves the right to cancel a workshop or substitute instructors. If The Polymers Center should cancel, they will call that phone number which the attendee has provided as the contact on the registration form, no later than 10 days prior to the workshop. You will receive a full refund if the workshop is cancelled by The Polymers Center – refunds are only provided using the same form of payment used for registration. **The Polymers Center is not responsible for airline penalty fees or any other costs incurred by the attendee due to the cancellation of a workshop.**

Registration Information

All registrations must be guaranteed by a purchase order number or a credit card, otherwise the registration will not be processed. Checks should be made payable to ***The Polymers Center*** and must include a copy of your registration. **WORKSHOP FEES MUST BE RECEIVED AT LEAST ONE WEEK PRIOR TO ATTENDING.**

Note: all participants are required to sign a "Safe Use Agreement" prior to the hands-on portions of this workshop (see last page of workshop brochure).

All registrations whether by phone, fax or mail will be confirmed by email and considered binding and subject to all cancellation policies. If your do not receive a confirmation by email prior to the workshop, please call The Polymer Center to verify your registration.

Workshop fee includes classroom and hands-on instruction, seminar manual, lunch and refreshment breaks. It does not include hotel accommodations.

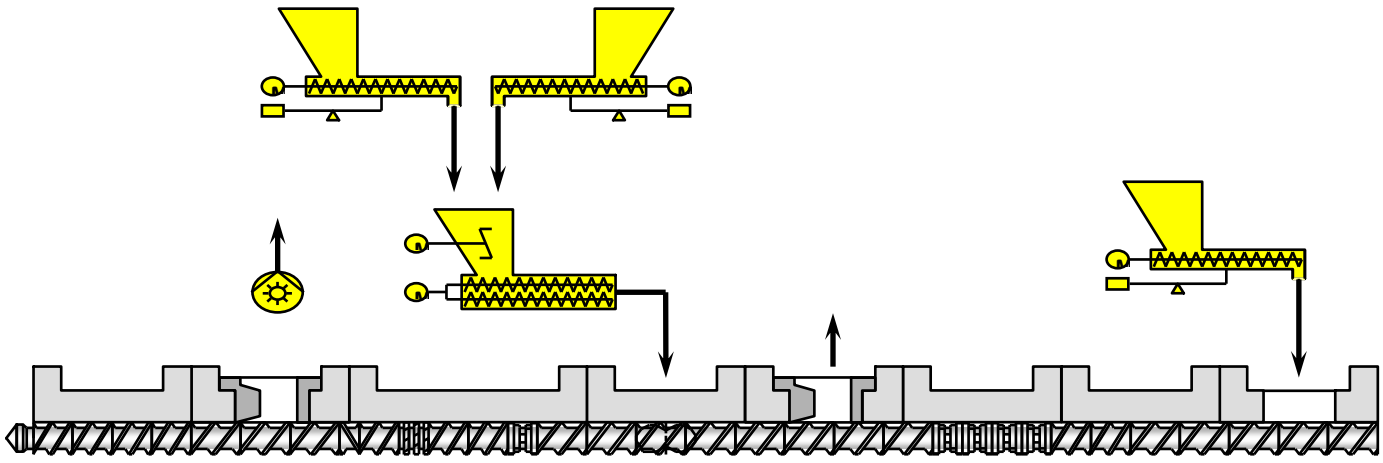
To register by phone: Call The Polymers Center Seminar Registrar, Beverly Jarrell (704) 602-4127.

To register by fax: Send by fax to (704) 602-4114. All registrations must include credit card information, check, or a purchase order number.

To register by mail: Send completed registration form to The Polymers Center, Attn: Beverly Jarrell, University Research Park, 8900 Research Drive, Charlotte, NC 28262 with a purchase order number, check, or credit card information.

ENROLLMENT IS LIMITED AND ON A FIRST-COME, FIRST-SERVE BASIS

EARLY REGISTRATION IS STRONGLY RECOMMENDED!



REGISTRATION FORM

CPM Twin Screw Compounding Workshop

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Charlotte, North Carolina

All forms of registration must be guaranteed to a credit card or a purchase order number.

To register: call The Polymers Center Seminar Registrar, Beverly Jarrell at (704) 602-4127, or fax the completed registration form to (704) 602-4114, or mail the form below with payment to:

The Polymers Center, University Research Park,
8900 Research Drive, Charlotte, NC 28262
Attn: Beverly Jarrell

Name_____

Company_____

Title _____

Address_____

City _____ State _____ Zip _____

Phone _____Fax _____

E-mail _____

WORKSHOP FEES

Workshop registration fee, per person $ 1450
Company registrations of three (3) or more employees save 10% each

If you require special accommodations to fully participate, please attach a description of needs.

PAYMENT INSTRUCTIONS

WORKSHOP FEES ARE DUE ONE WEEK PRIOR TO ATTENDING. Please indicate method of guarantee or payment. Make checks (in U.S. dollars) payable to The Polymers Center and send with registration.

Check Amount $ _____ Check # _____

P O #_____ Amount $ _____

☐ VISA ☐ MC ☐ AMEX ☐ **To guarantee** ☐ **To charge**

Account # _____ Exp. Date _____

Cardholder's name _____ Today's date _____

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Safe Use Agreement and Assumption of Risk to Use Compounding Machinery

It is my understanding that twin-screw compounding machinery can be very dangerous and misuse can result in serious personal injury if all safety practices are not followed. As a result, I will follow all safety instructions presented in the workshop entitled “Making Properties and Profits.” I acknowledge that I have been trained in the proper and safe use of this machinery and equipment and that safe practices for machinery and equipment to be used are also listed in the course notes. Furthermore, I will not attempt to operate any machinery or equipment without direct supervision of The Polymers Center personnel. If an accident should occur, I will immediately notify instructor(s) or The Polymers Center personnel reasonably available.

Name_____ Date_____

Address_____

Affiliation_____

Signature_____