



SPE EXTRUSION NEWSLETTER | SPRING 2023

CHAIRMAN'S MESSAGE

It is my honor to address the SPE Extrusion Division Members as well as the SPE organization as the new Extrusion Division Board Chair. Let me begin by introducing myself. For the past seven years I have worked for Kuraray America at the Research and Technical Center in Pasadena, TX. During this time, I have served on the SPE Extrusion Board first as a young professional and then as a member. The opportunities to network with this community has been a tremendous benefit to my career. My hope as Chair is to continue to bring our extrusion and plastics community together and foster the next generation of talent.

I first became involved with SPE as a graduate student at Texas A&M University. As a student I worked at the PTIC (Polymer Technology Industrial Consortium) under Dr. HJ Sue and was fortunate enough to collaborate with many companies within the plastics industry. The research also afforded me opportunities to both attend and present at many SPE conferences (ANTEC, Polyolefins, etc.). I have been involved with SPE since this time and credit the organization with fostering my career and my tremendous network of colleagues.

The past few years have certainly been a challenge for everyone within our industry. However, I have witnessed firsthand the strength and resilience of our industry and SPE. Last year we were able to hold our first in person ANTEC since the start of COVID. This past March also saw a return to a more in-person event in Denver. The resumption of more normalcy in ANTEC has allowed our community to become better engaged and we were able to hold our Extrusion Awards banquet for the first time in 4 years. I would like to thank Mark Spalding for arranging this award ceremony as well as our Technical Paper Committee and Saurav Sengupta for their hard work in supporting the ANTEC program as Technical Program Chair. I would also like to thank our outgoing chair Rich Kanarski for leading our division and helping put on these events.

The resumption of normalcy within the plastics industry along with the current economic environment will place greater importance on our Extrusion Division activities. Events such as TOPCON held in Nashville, TN last year showed the eagerness of plastics professionals to network professionally and collaborate. As such, being an SPE member allows professionals to attend these events as well as gain access to technical journals, webinars, and the SPE career center. I encourage anyone within the plastics community and especially graduating college students to join this organization. For graduating students SPE will



Kevin Laux, Ph.D.
2023/24 Extrusion
Division Chairman

also extend its support offering two years of free membership as a young professional upon graduation.

In closing I would like to express my gratitude to the Extrusion Division who have been a great network and small family of colleagues. This past year we lost one of our family Adam Dreiblatt who has been a tremendous resource, colleague, friend, and leader within our division. Adam was a frequent presenter at ANTECs and TopCons and was an Extrusion Division Board member since 2012. His expertise in extrusion and his presence will be greatly missed.

Kevin Laux, Ph.D.

2023/24 Extrusion Division Chairman

EXTRUSION DIVISION ANNOUNCES AWARDS AT ANTEC 2023

The SPE Extrusion Division gave out its annual awards during March's ANTEC 2023. Special thanks to Mark Spalding for his efforts in organizing this yearly effort.

Onto the winners:

Bruce Maddock Award: Bruce Maddock was a pioneer in the fundamental analysis of the single-screw extrusion process. This award honors his achievements. Sponsored by Dow, Award recipients have contributed significantly to the advancement of single-screw extrusion technology or associated processing technology by providing experimental achievements and understanding to the fundamentals of the process.



This year's winner is **John Christiano**. John is the Vice President of Technology for Davis-Standard. John is being recognized for the developed several key technologies for single-screw extruders including screw design, die design drive systems, grooved bore feed sections, barrel heaters and controls, and process control interfaces. He is a frequent presenter at ANTECs, TopCons, and TAPPI.

Distinguished Achievement Award: This award is sponsored by The Extrusion Division to honor individuals who have made significant contributions to the development and advancement in the extrusion industry as a whole.



This year's winner was **Gary Oliver**. Gary started his career at Dow, worked for Ball Plastics, Cloeren, and Nordson. He is now consulting as a polymer processing expert with special emphasis in dies. He is being honored for his service to the Extrusion Division Board of Directors (20 years), contributor to ANTECs and TopCons, Awards Chairman, Extrusion Division TPC, Chairman, and Winner of the Jack Barney award in 2013.

Heinz Herrmann Award: Sponsored by Coperion, award recipients are to have contributed significantly to the advancement of twin-screw extrusion technology. This can be accomplished through experimental or theoretical achievements that provide an understanding to the fundamentals of processing material in the extruder. These experiments could include (but are not limited to) work relating to solids conveying, melting, mixing, devolatilization, and pumping functions of twin screw extrusion.



This year's winner was presented posthumously to **Dr. Eduardo L. Canedo**. Dr. Canedo was Professor of Polymer Science at the Universidad Federale Campina Grande in Brazil where he mentored graduate students in Polymer Science. He was also President of PolyTech, developer of WinTXS Twin-Screw Extrusion Simulation software, which has been a commercial success.

Dr. Canedo started his career at Farrel Corp. as a Senior Research Engineer for compounding equipment.

Heinz List Award: Heinz List was a pioneer of modern industrial processing technology. He was the inventor of the Ko-Kneader, the founder of LIST, and a member of the Polymer Processing Hall of Fame.

Recipients are to have contributed significantly to the advancement of polymer devolatilization, drying, evaporation, or reactive polymerization technologies pertaining to extrusion processing.

The Heinz List Award is sponsored by List USA Inc.



This year the award was given to **Dr. Santosh Bawiskar**. Dr. Bawiskar is a Fellow in the Packaging & Specialty Plastics R&D group at Dow Inc. He has worked for over 20 years in areas of thermoplastic / thermoset elastomers product development, polymer compounding, reactive extrusion and post-reactor modification technologies. He is being honored for his reactive extrusion research for grafting with maleic anhydride, silane and glycidyl methacrylate (GMA); visbreaking PP copolymers; imidization, and ionomers. His individual contributions include developing new generation of functionalized products with step improvements in performance, productivity, and quality.

Jack Barney Award: The Jack Barney Award is to be presented to persons who have made a significant contribution to the development of the flat sheet industry. Their contributions can be technical or commercial, with value to the industry as a whole. The Jack Barney Award is sponsored by Nordson EDI.



This year's award was issued to **Dana Hanson**. As one of the company's original co-founders, Dana has served as President & CEO for PTi for the past 35 years. He is also the company technology and product development visionary, which has transformed PTi into a leading producer of high-performance sheet extrusion equipment. He is being honored for his patented innovations and the development of future leaders in the flat sheet industry.

Mid-Career Extrusion Professional Award – 2023: MCEP Award was established in 2022 by the SPE Extrusion Division Board of Directors. The award honors mid-career specialists that are engaged in any aspect of extrusion.



This year's winner was **Amit Chaudhary** (left, with Mark Spalding). Amit is being honored for achievements in new polymer process technology development, process optimization, process design, capacity increases, and process troubleshooting for various twin-screw extruders/mixer and single-screw extruder-based polymer processes. Over the past decade he has led the process development for the products based on Dow's proprietary BLUEWAVE™ Technology resulting in commercialization of several HYPOD™, ACCENT™, ADCOTE™ and CANVERA™ products.

EXTRUSION PRESENTATION OF THE MONTH: TWIN SCREW EXTRUDER SYSTEM DESIGN & CASE STUDIES FOR PLA, PHA & TPS

By Brian Haight, Leistritz Extrusion

Learn more about compounding system design to process biopolymers.

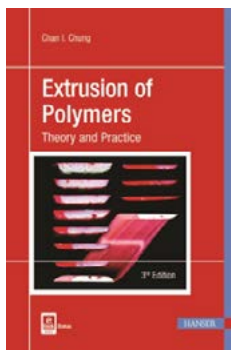
To download this presentation [CLICK HERE](#). ■

BOOK RECOMMENDATION:

EXTRUSION OF POLYMERS - THEORY AND PRACTICE, 3W

Chung, C.

Copyright: 2020 ISBN: 978-1-56990-609-5 Hardcover: 485 full-color pages



Conceptual understanding and basic analytical skill are sufficient in most cases to deal with practical engineering problems. This philosophy and the contents of this book reflect my industrial, academic, and consulting experience of over 50 years. I have been fortunate to have the opportunity to study the fundamentals of extrusion mechanisms, melt rheology, and polymer physics as well as the opportunity to apply them successfully in commercial practice.

My fundamental and practical knowledge of extrusion led to several commercially successful high performance screw designs. A process engineer must have a good knowledge of the material being processed as well as the engineering aspects of the process in order to fully understand the process and the product. This is especially true for polymers because the properties of a polymer product strongly depend on its processing history. Fundamentals of polymer physics and melt rheology are presented for those who lack previous training.

This book starts at a basic level emphasizing

conceptual understanding and progresses to an advanced level for ambitious readers. Theoretical models are presented with discussions on their capabilities, assumptions, and limitations. Examples show how the theoretical models can be used in practice. Discussions on disputed or ill-understood topics should be considered as my opinion. Practical engineering problems are usually too complex to obtain exact mathematical solutions. Approximate solutions with ambiguity are obtained using simplifying assumptions and approximate material properties. The knowledge learned from practical experience is essential to properly interpret the solutions.

I wrote this book to share what I learned through my career with other engineers and scientists. I have tried to present the topics accurately, clearly, and carefully. However, mistakes and ambiguities are inevitable. Your comments will be welcome and appreciated.

To order this book [CLICK HERE](#) ■

EXTRUSION FORMULA OF THE MONTH:

SCALE-UP

By Charlie Martin, Leistritz

Scale-up is useful for estimating rates for the production of twin-screw extruders based on lab experiments. The geometries for the two extruders should be nearly identical for this equation to be valid. For processes that scale up volumetrically, the formula is as follows:

Scale up: $\text{target reference OD}_{\text{target}} / \text{OD}_{\text{reference}}$

$$Q = Q \times [(\)]^3$$

Where:

Q = throughput rate (in any units)

OD = screw outside diameter (each)

For example:

A 27-mm twin screw extruder is producing 100 kg/h and the process is not limited by heat transfer or mass transfer boundary conditions. To estimate how much a 75-mm twin screw extruder will produce, the following calculations will apply:

$$Q(75 \text{ mm}) = 100 \times (75/27)^3$$

$Q (75 \text{ mm}) = 100 \times 2.783 = 2148 \text{ kg/h}$

Full screws

Medium screws fill

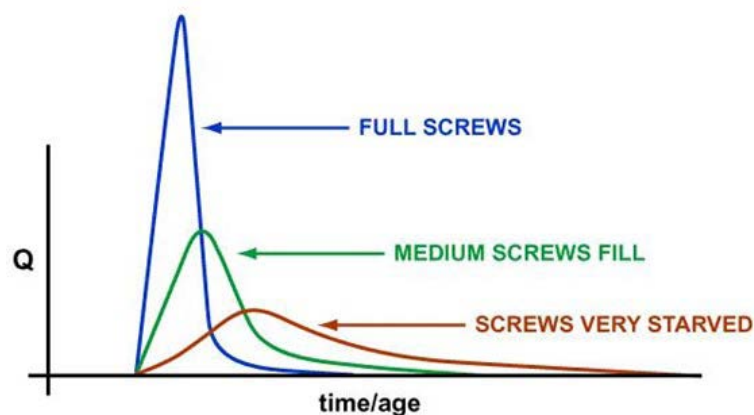
Screws very starved

Time/age

Q

Full screws = Good pump/less mass transfer

Empty screws = Poor pump/more mass transfer



Residence Time Distribution for Various Levels of Screw Fill

The greater the difference in extruder sizes, the less reliable this calculation becomes. For a heat transfer-limited process, the exponent is closer to 2. For devolatilization and many REX processes, the scale-up exponent is between 2.4 and 2.6. Advanced formulas and computer modeling approaches are also available for more intensive scale-up.

Source: *Processing Thermoplastics Urethanes via Twin Screw Extrusion* p. 889 ■

EXTRUSION TIP OF THE MONTH: HOW SCREW DESIGN CAN BOOST OUTPUT OF SINGLE-SCREW EXTRUDERS

By Mark Spalding, Dow

A capacity increase for an extrusion line can occur by an increase in run time or by a rate increase. For lines that are sold out, increasing the line rate can be very lucrative and can delay the installation of costly new equipment. Optimizing screw design for a lower discharge temperature has been shown to significantly increase output rate.

[CLICK HERE](#) to learn more. ■

ANTEC® 2023 BEST PAPER AWARD THE BENEFITS OF SCREW COOLING FOR IMPROVED SOLIDS CONVEYING FOR SMOOTH-BORE, SINGLE-SCREW EXTRUDERS

Timothy W. Womer, *TWWomer and Associates, LLC, Volant, PA*

Mark A. Spalding, *Dow, Inc., Midland, MI*

All sections of a single-screw extruder must be operating well to maintain the maximum profitability of the line. The solids conveying section must be able to operate at a rate high enough to keep the metering section full of resin and pressurized. Optimal solids conveying depends on the forwarding and retarding forces on the solid bed, and these forces depend on the barrel and screw temperatures. Usually, a considerable level of care is given to setting the barrel and feed casing temperatures. The temperature of the screw, however, is typically not controlled. Instead, the screw temperature is unknown and often hotter than optimal. Screw cooling can improve solids conveying for many processes. This paper discusses the fundamentals and operational practices for using screw cooling.

To download this paper, [CLICK HERE](#) ■

EXTRUSION DIVISION HONORS TWO STALWARTS



During this past spring's Extrusion TopCon, SPE's Extrusion Division acknowledged two of its long-tenured members. Eldridge Mount (left) was first elected to the board 1981. For the division, he has been technical program chair (TPC) for ANTEC (1989) chair (1990) and councilor (1992-1998). He was named an SPE Fellow in 2000 and an Honored Service Member in 2004. At the national level he served as SPE Executive Vice President from 2001-2004, seminar instructor for many years beginning in 2001, and ANTEC TPC in 2011.

John Wagner (right) was first elected to the Extrusion Board in 1984. He was TPC in 1985 and chairman in 1996. He was named an SPE Fellow in 1998 and an Honored Service Member in 2015, and currently serves as the board's treasurer.

Board member Charlie Martin (center) presented the two members with their awards during the reception. ■

EXTRUSION DIVISION 2022 SCHOLARSHIP WINNERS

A belated congratulations to the 2022 Extrusion Division Scholars. They are as follows:



Lew Erwin Scholar: Steacy Coombs, Queens University, Chemical Engineering.



Lew Erwin Scholar: Mona Kanso, Queens University, Chemical Engineering.



Lew Erwin Scholar: Olivia Ferki, University of Massachusetts-Lowell, Plastics Engineering.



Lew Erwin Scholar: Maria Camila Montoya Ospira, University of Wisconsin-Madison, Polymer Engineering.



Russell Gould Scholar: Olivia Hile, University of Wisconsin-Stout, Plastics Engineering



Russell Gould Scholar: Madison Pixler, University of Notre Dame, Chemical Engineering



Russell Gould Scholar: Carl Furner, Drexel University, Materials Science & Engineering



Ed Steward Scholar: Elle Bolstad, University of Wisconsin-Madison, Chemical Engineering ■

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EXTRUSION

SPE Upcoming Calendar of Events:
[CLICK HERE](#) for all upcoming SPE events.

For the latest on the SPE Extrusion Division
and for contact information [CLICK HERE](#).

Newsletter Editor:

Jim Callari, *Plastics Technology Magazine*