Innoplast Solutions presents 29th Course, a **HYBRID** *event, on…..*

Polymer Failure & Defects: Problem Solving Case-Histories

Award Winning Interpretations & Solutions "

[Product-Processing-R&D Related Problem Solving Strategies in **POLYMER** based Industries]

Thermal-Mechanical-Rheological Techniques

&

Failure Analysis via All-Analytical Techniques

June 16 (Wed) – June 17 (Thu), 2027

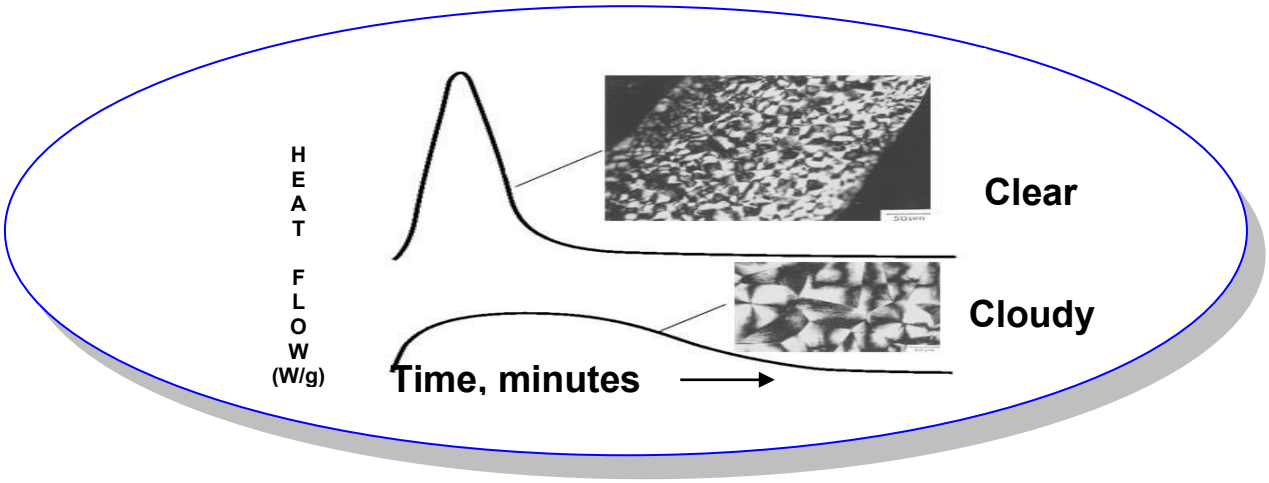
Zurich Airport Marriott Hotel

Zurich, Switzerland

***During his career at Honeywell, Dr. Yash Khanna demonstrated "Unique Interpretive Skills" in Thermal-Rheological techniques, which led to New Concepts & New Business Opportunities for the company*…..**
Dr. Kenneth O. MacFadden, VP-Honeywell Laboratories (1996-2002), Morristown, NJ, USA

***Dr. Yash Khanna's career highlights how Thermal-Rheological testing can be extended into identifying New Concepts & Problem Solving Strategies, even for old polymer systems*…..**
Prof. Eli M. Pearce, Polym Res Inst, Polytechnic Institute-New York University, Brooklyn, NY, USA

Prior to attending this course, I had never considered that TGA, DSC and DMA could be used to probe both PROCESS and Material properties; this training was invaluable in exposing the breadth of Opportunities
Dr. Chris Asemota, Chemical/Polymer Engineer, Valley Industrial Products, Participant-2016



Course Organizer: **InnoPlast Solutions, Inc., 735 Aran Drive, Roswell, GA 30076, USA**
Phone: (973) 801-6212 (Cell)
E-mail:www.InnoPlastSolutions.com

Who Should Attend & Why ?

One of the highlights of this course is the presentation of 10's of industrial case studies demonstrating how thermal analysis and rheology have solved complex technical challenges and generated multi-million-dollar business impact. Each case is supported by patents, peer-reviewed publications, and documented commercial success, providing practical insights that participants can immediately apply in their own work.

A featured session, "**How to Identify Innovation Opportunities During Routine Technical Operations**," will demonstrate how everyday analytical data can uncover new product ideas, process improvements, and competitive advantages.

Designed for professionals working in analytical laboratories, R&D, product development, process engineering, quality assurance, and technical service, this course goes beyond instrument operation. It teaches participants how to transform analytical results into actionable engineering and business decisions.

Participants will learn how to:

- Interpret thermal and rheological data with greater confidence and technical depth.
- Use analytical results to accelerate product and process development.
- Extract valuable information about material structure, processing history, aging, degradation, and manufacturing conditions.
- Recognize unexpected trends that can lead to innovation, intellectual property, and new technologies.
- Effectively communicate technical findings to colleagues, customers, and decision makers using widely accepted analytical techniques.

Whether you support internal customers through analytical services or drive innovation in product and process development, this course will equip you with practical tools to maximize the value of your analytical data and uncover opportunities that are often hidden in routine measurements.

So, ***join us to*** discover the full potential of thermal analysis, rheology, and complementary analytical techniques—and ***learn how to turn data into innovation***.

Course Instructors

Dr. Yash P. Khanna *has decades of highly diversified industrial experience in the areas of Plastics and Analytical Sciences, His career is credited with over 120 research publications, 25 U.S. patents, Society of Plastics Engineer's* ***International*** *"Engineering/Technology" Award (2001) and North American Thermal Analysis Society's Fellowship (1988) and its highest honor, the* ***Mettler Award*** *(1997). A highpoint of Dr. Khanna's career has been to identify several new phenomena in common polymers, already in existence for 40-60 years. His industrial affiliations include Chief Technology Officer at Applied Minerals (2013-2015), Senior Technology Fellow / Director of Technology at Imerys (2005-2009), a $5B minerals company and Manager of Reinforced Engineering Thermoplastics Program at Rayonier (2001-2004), a $3B forest products company. The great majority of his career was at* ***Honeywell*** *(1975-2001) formerly AlliedSignal, a $40B conglomerate company at its Corporate Research & Technology Center as a Research Group Leader / Senior Principal Scientist for* ***Thermal-Rheology laboratories****. During 1990-2001, he also held positions as Business Unit Liaison to Specialty Films and key technologist for Packaging Resins, where scientific fundamentals formed the basis of new product / process development as well as technology marketing in North America and Europe. These significant business contributions were recognized through 5 Special Recognition awards and 3 Business awards "****Growth*** *of the Year," "****Sale*** *of the Year," and "****Save*** *of the Year"). Since 2001, Dr. Khanna has had several corporate & consultation roles where he continued to rely on Thermal-Rheology techniques for*

complex problem solving. Now at InnoPlast Solutions, Dr. Khanna's technology driven business experience is playing a key role in offering "Value-Driven" courses and Consultation.

***Dr. Edgar Leone** has a wide range of experience in the application of advanced surface analytical techniques for industrial problem solving and materials characterization. Ed earned his MS and PhD degrees in Ceramics and Material Science from Rutgers University while working for AlliedSignal, which later merged with Honeywell. As a Principal Scientist in Honeywell's Analytical Science Laboratory, Ed was responsible for the Surface Analysis, Optical, and Electron Microscopy Groups. With over 30 years at Honeywell, Ed gained extensive experience in root cause failure analysis and industrial problem solving methods, and has numerous accomplishments in the Automotive, Aerospace, Polymer, and Engineered Plastics industries. He has broad technical expertise in XPS, Auger, ToF-SIMS, AFM, SEM, EDX, WDX and other surface and microscopy techniques. Ed is widely published, authoring a number of articles on a wide range of topics, and was co-author of a number of chapters in the book, Guide to Materials Characterization. In addition, Ed has 4 patents on spark plug tip design advancements and has made numerous presentations at professional meetings.*

DAY - 1

Mastering the Family of Thermal – Mechanical Techniques: Learning What They Can Do For Your Company

8:00-8:30 Continental Breakfast

8:30-9:45 **Critical Knowledge for Mastering Polymeric Materials**
Molecular architect of polymers in the solid and molten states, concept of amorphous vs crystalline states and their dependence on structure & processing, as well as impact on properties, modification of polymers via copolymers, blends or alloys, role of transitions such as Glass (T_g) and Melting (T_m) in polymer characterization and understanding polymer flow & fabrication. Emphasis on controlling **What** / **Why** / **How** in order to achieve the desired **Performance** from a polymer.
Dr. Yash Khanna, ***Innoplast Solutions***, USA

9:45–10:00 Coffee Break

10:00-12:00 **Extracting Information Buried in Thermal-Mechanical Analysis Data**
Thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), modulated DSC (MDSC), thermomechanical analysis (TMA) and, dynamic mechanical analysis (DMA). Role of transitions such as Glass (T_g), Melting (T_m), solid and molten-state Crystallization (T_{ch} and T_{cc}) in polymer characterization. Measurements in simple and complex systems with confidence, quantification & separation of the various competing physical-chemical factors; theme being "*Getting the Most out of Thermal-Mechanical Techniques*", presentation of "*Tricks & Tips of the Trade*"
Dr. Yash Khanna, ***Innoplast Solutions***, USA

12:00-1:00 Lunch

1:00-1:45 **Applications of Thermal / Mechanical Techniques Across the Polymer Industry**
Breadth of technological information from thermal / mechanical techniques for specific polymer products. **Thermoplastics** (identification, branching, cross-link density, molecular weight effects, crystallinity). **Thermosets** (network structures, time-temperature dependence and characterization of gelation & curing). **Composites** (characterization of matrix/reinforcement, detection and quantification of anisotropy). **Elastomers** (characterization and deformation). **Copolymers** (types, separation of physical effects to reveal composition). **Blends** & **Alloys** (compatibility vs miscibility, exchange reactions, interpretation of subtle changes).
Dr. Yash Khanna, ***Innoplast Solutions***, USA

1:45-2:15 **Polyolefins: Structure-Property-Processing Probed via Transition Phenomenon**
Molecular relaxations/transitions in various polyethylenes (LDPE, LLDPE, HDPE, Copolymers, Ionomers, Waxes) and polypropylene. Crystallization rates of PP vs Nucleating agents studied by DSC and compared to more sensitive rheological technique.
Dr. Yash Khanna, ***Innoplast Solutions***, USA

2:15-2:30 Coffee Break

2:30-3:30 **Applications to Oriented / Unoriented Systems: FIBER & Plastic FILM Industries**
Applicability of thermal / mechanical techniques in Fiber and Film industries. **FILMS** (finest differentiation of multilayer components vs complementary techniques such as IR, IR-OM and GC, measurement & control of crystallinity & its role in thermoforming, relationships between nucleation and processing rates and achieving high clarity at high crystallinities, differentiation of fractional draw-ratios and balanced vs unbalanced orientation processes, determining orientational and dimensional heat stabilization histories. **FIBERS** (orientation, extent, and production history, drying/annealing/ mechanical history).
Dr. Yash Khanna, ***Innoplast Solutions***, USA

3:30-4:00 **Applications in Polymer ADDITIVES Industries: BEST PRACTICES**
Best practices in selecting the additives for thermal & thermo-oxidative stabilization, flame retardancy, crystallization rate enhancement & morphology control via nucleation, simulation & control of melt viscosity.
Dr. Yash Khanna, ***Innoplast Solutions***, USA

4:00-4:30 **Advances in Instrumentation - I**
Details to be available soon……

4:30-5:00 **Advances in Instrumentation - II**
Details to be available soon……

5:00-7:00 Cocktail Mixer

DAY - 2

Rheology & All-Complimentary Techniques
&
Case Histories of Industrial Problem Solving

8:00-8:30 Continental Breakfast

8:30-10:15 **Rheology Techniques: Theory, Principle, & Molecular Architecture for Polymer Fluids**
Science of rheology, characteristics of various fluids, origin and manifestation of viscoelasticity in polymer melts, discussion of rheology measurement techniques – oscillatory, steady state shear, and elongational flow, information on physico-chemical structural features, relevance to polymer processing, and key applications

10:15-10:30 Coffee Break

10:30-11:00 **Advances in Instrumentation - III**
Details to be available soon……

11:00-12:00 **How to Identify Opportunities in Thermal-Mechanical-Rheological Data ?**
Impact on Science / Technology / Business Development

7 Case-Histories will be presented wherein opportunities for problem solving and innovative concepts were identified during the course of routine thermal-mechanical-rheological characterization. Strategies will be discussed on creating such opportunities more frequently.

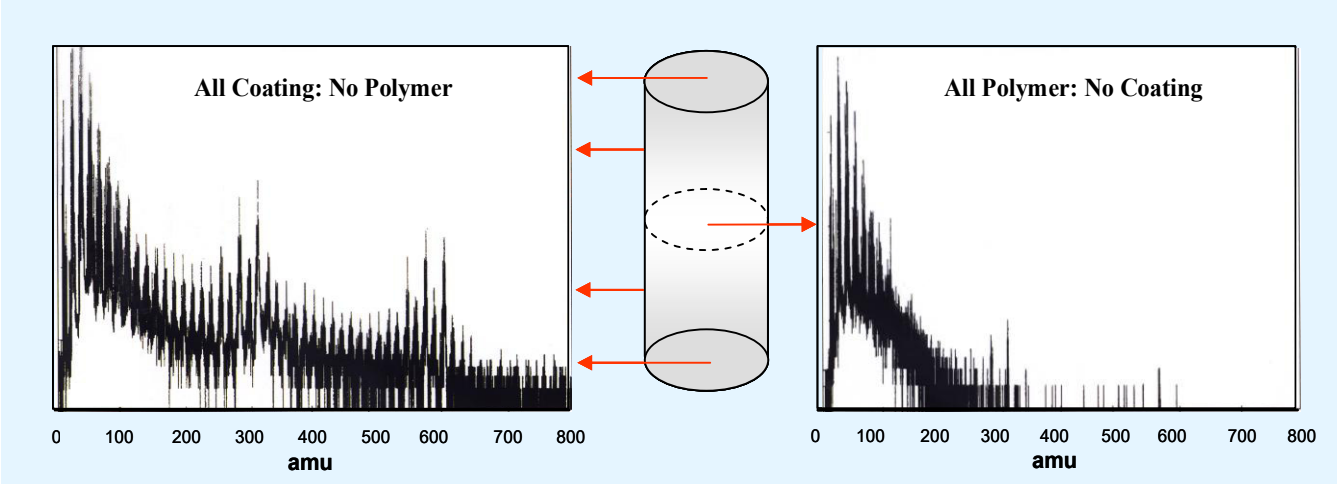
12:00-1:00 Lunch

1:00-2:00 **Industrial Problem Solving with Thermal-Mechanical-Rheological Techniques**

15-20 Case-Histories will be presented where Thermal-Mechanical-Rheological Techniques played a key role in resolving customer issues.

2:00-2:30 Coffee Break

Failure Analysis via All-Analytical Techniques



Quiz: *Was the Additive on These Polymer Chips Put-On Before or After Manufacturing ?*
What was the Coating Technology ?

2:30-4:30 **Surface & Microscopy Techniques: Theory, Principle, & Basic Concepts**

Root cause identification of a problem often involves multiple analytical techniques. In this presentation, the role of surface analysis techniques (XPS, AFM, ToF-SIMS, SAM) in conjunction with microscopy (OM, SEM, TEM, FIB) and complementary techniques will be discussed with emphasis on ***root cause failure analysis***, for example, fracture analysis in engineered ***plastics***, reinforced plastic composites used in ***automotive*** industry, defects in ***microelectronics.***

Presentation of Case Studies – Part 1

- Low peel strengths and improved metal/polymer adhesion levels in electronic packaging
- Brittle Fracture in PET Automotive Battery Tray
- Automotive Door Checker Arm Fracture - "Whose problem is it anyway?"

Case Studies Continued – Part 2

- Identification of Metals in Polymer Pellets
- Identification of Inorganic Gel Defects in Halocarbon Films
- Electrical short circuits in multilayer circuit board laminates
- Polymer/ Filler Interactions

Surface defects in Injection Molded Parts

Case Studies Continued – Parts 3-4

De-Lamination Cases in Packaging Films
Compounding / Manufacturing Related Defects in Medical Tubing

Dr. Edgar Leone, ***Exel Laboratories***, USA