Innoplast Solutions presents 27th Course on…..

Polymer Failure & Defects: Problem Solving Case-Histories

Award Winning Interpretations & Solutions "

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

Day 1-2: ***Thermal-Mechanical-Rheological*** *Techniques*

Day 3 : ***Failure Analysis*** *via* ***All-Analytical*** *Techniques*

MAY 19 (Tue) – MAY 21 (Thu), 2026

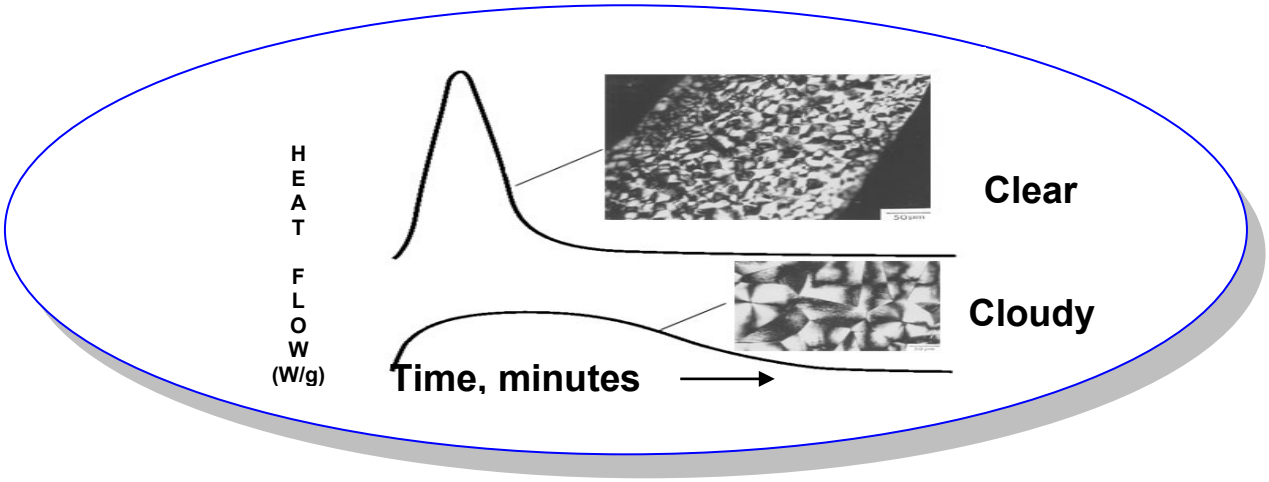
Peachtree-Midtown Hotel by Marriott

Atlanta, GA 30308, USA

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 <u>both</u> 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



<u>Course Organizer</u>: **InnoPlast Solutions, Inc., 735 Aran Drive, Roswell, GA 30076, USA**
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E-mail:<u>www.InnoPlastSolutions.com</u>

Day 1-2: Who Should Attend & Why ?

This course is ideal for professionals involved in Analytical Services and new Technology development.

- As an **Analytical** professional, you will learn interpretive skills & tips to help you provide worldclass services and consultation to your internal customers.
- If responsible for **Product** / **Process** / **Technology** development programs, you will realize that most often the modifications, if effective, appear in the thermal-rheology data which can then help guide the projects, more effectively. What is more interesting is that such analytical data reveal time / temperature / mechanical / production history and sometimes even, present unexpected (accidental) information, that can form the basis of new technologies. When **Marketing** technology to manufacturing based customers, relatively inexpensive but fairly common thermal-rheology techniques, are often brought in to discussions and so, can prove to be very powerful in communicating product / process improvements.

So join us and explore the ***hidden powers*** of thermal, mechanical & rheological techniques !

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.

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*"

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).

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.

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).

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.

4:00-4:30 **Life-Time Prediction of Materials Using Thermal based Kinetics**
Benefits vs pitfalls of predictions. Improving the reliability of predictions. **5 Case-Histories** include, prediction of material life due to time dependent diffusion, time-temperature effects on the processes affecting material performance such as crystallization, decomposition, and gelation.

4:30-5:30 **Brainstorm Your Problems for a Private / Group Discussion**

5:30-7:00 Cocktail Mixer

DAY - 2

Case Histories of Industrial Problem Solving: Thermal-Mechanical-Rheological Techniques

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 **Rheology of Moisture, Heat, and Shear Sensitive Polymers**
Most effective strategies for handling Nylons, Polyesters, EVOH, PVC, and the presentation of "*Tricks & Tips of the Trade*"

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

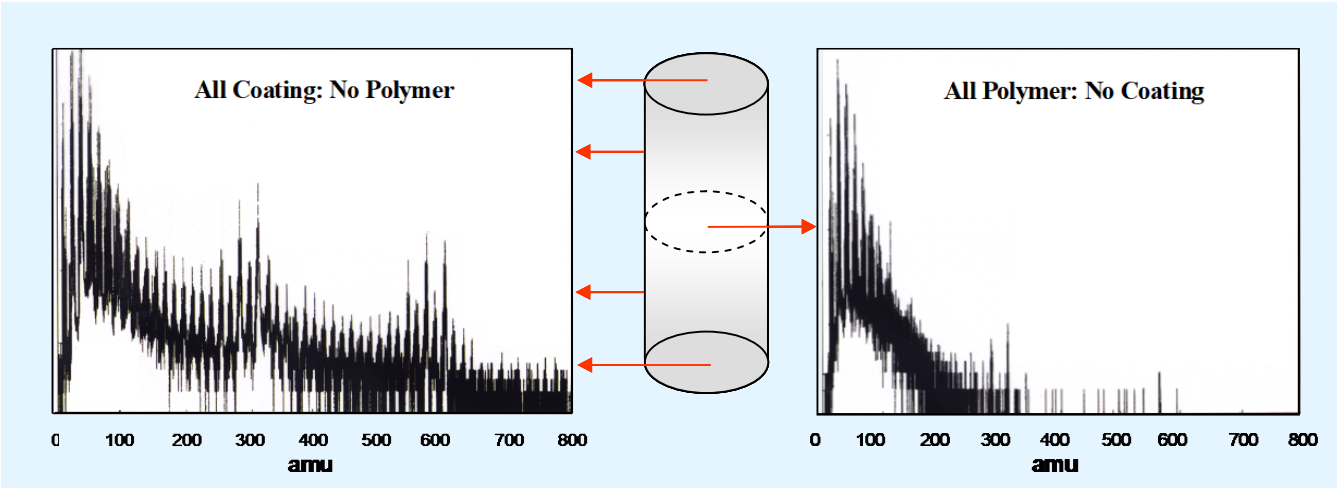
2:30-4:00 **Brainstorm Your Problems for a Private / Group Discussion**

DAY - 3

Failure Analysis via All-Analytical Techniques

8:00-8:30 Continental Breakfast

This course is particularly designed for professionals associated with functions such as ***analytical*** services / sciences, ***product-process*** R&D, ***manufacturing***, and ***technical service***. Theme is to solve complex problems and create a unique value for your organization with minimal time/capital/human resources.



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

8:00-12:00 **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

12:00-1:00 Lunch

1:00-2:30 **Brainstorm Your Problems for a Private / Group Discussion**