

Innoplast Solutions presents 28th 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

OCT 6 (Tue) – OCT 7 (Wed), 2026

Munich Airport Marriott Hotel

Freising, Germany

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.....

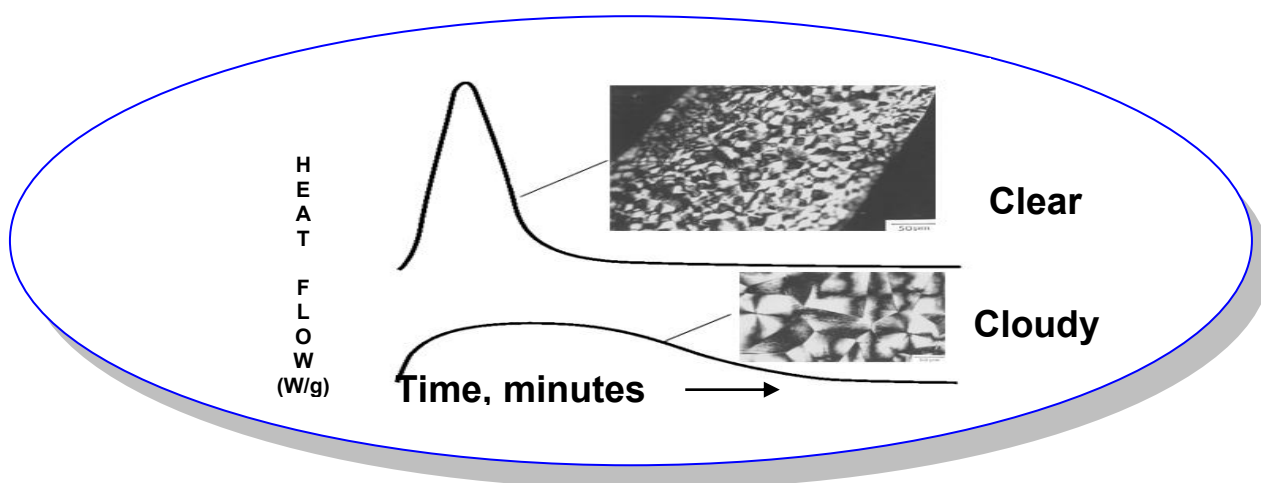
Dr. Kenneth O. MacFadden, VP-Honeywell Laboratories (1996-2002), Morristown, NJ, USA

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



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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.

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

Quantitative Polymer Characterization Using DSC and Machine Learning

Reliable quantification of polymer composition is essential for QC, material verification, and the increasing use of recycled polymers. While differential scanning calorimetry is widely used for polymer identification, quantitative analysis of complex polymer blends remains challenging due to overlapping thermal transitions. This talk introduces Proteus® Now Quantify, a tool which combines standardized DSC measurements with machine learning to identify and quantify unknown polymer blends using characteristic thermal fingerprints and a curated reference database. The complete workflow will be presented, highlighting the importance of standardized testing conditions and demonstrating how quantitative composition data can support incoming material verification, QC, sorting evaluation, batch-to-batch consistency, and the generation of material certificates for both virgin and recycled polymers.

Dr. Sara Simon, *Netzsch*, Germany

4:30-5:00

Practical Curing Kinetics for Optimizing Composite Manufacturing

Curing kinetics strongly influence manufacturing time, product quality, and process efficiency in thermoset composites. This presentation demonstrates how NETZSCH Kinetics Neo, implementing all ICTAC-recommended approaches for kinetic analysis, can be used to characterize curing reactions and optimize industrial curing processes. The complete workflow—from DSC measurements and kinetic modeling to industrial process simulation—will be presented, including diffusion-controlled reactions near the glass transition temperature. Termica Neo will be used to simulate temperature distribution, degree of cure, curing rate, and glass transition during curing. Industrial case studies will demonstrate how this approach can reduce curing time by more than 40% while maintaining the same final degree of cure.

Dr. Elena Moukhina, *Netzsch*, Germany

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 **Rheology that Matters – Solving Real-World Polymer Challenges with Rotational and Capillary Rheometry**

Rheometry of polymers can be used as a problem-solving tool in industry. The talk will highlight industrial case studies to describe typical processing issues, like elastic flow instabilities or thermal degradation in extrusion or injection moulding, and explains, how to determine these effects by using both rotational and capillary rheometers. With shear and extensional measurements, macroscopic mechanical properties of polymers can be related to structural properties such as molecular weight and monitor its changes at processing conditions. In addition, examples for oscillatory shear experiments will be presented to use viscoelastic properties as a structural fingerprint or determine curing kinetics and crosslink density of chemically reactive polymers
Torsten Remmler, *Netzsch*, Germany

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.

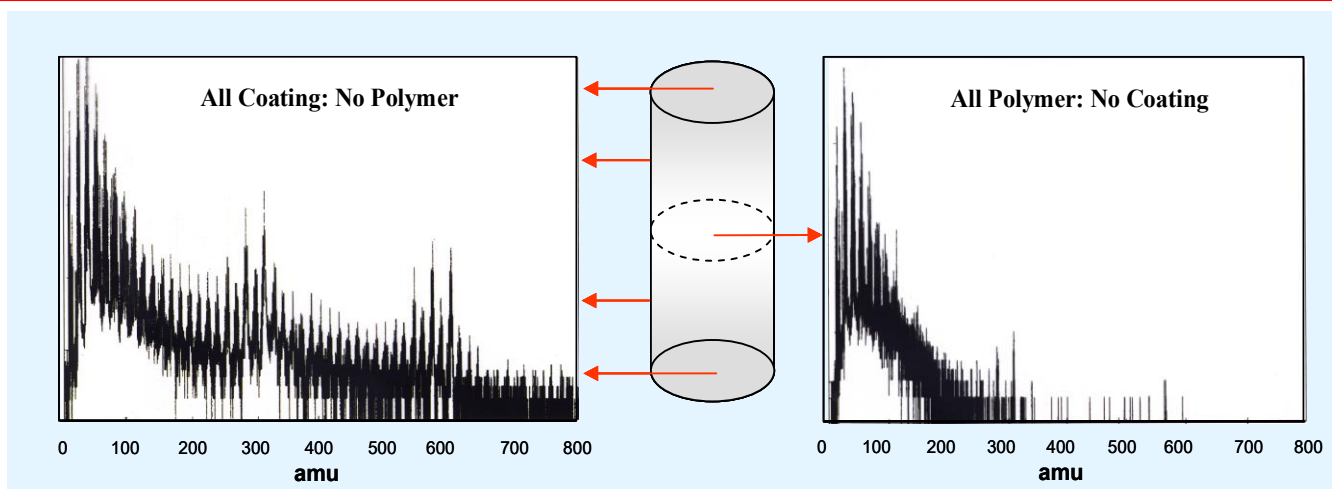
12:00-1:00 Lunch

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