



Polymer Problem Solving via Excellence in Polymer-Analytical Sciences

“ 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*

March 20-22, 2012

Polymers Center of Excellence

Charlotte, NC 28262, 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.....

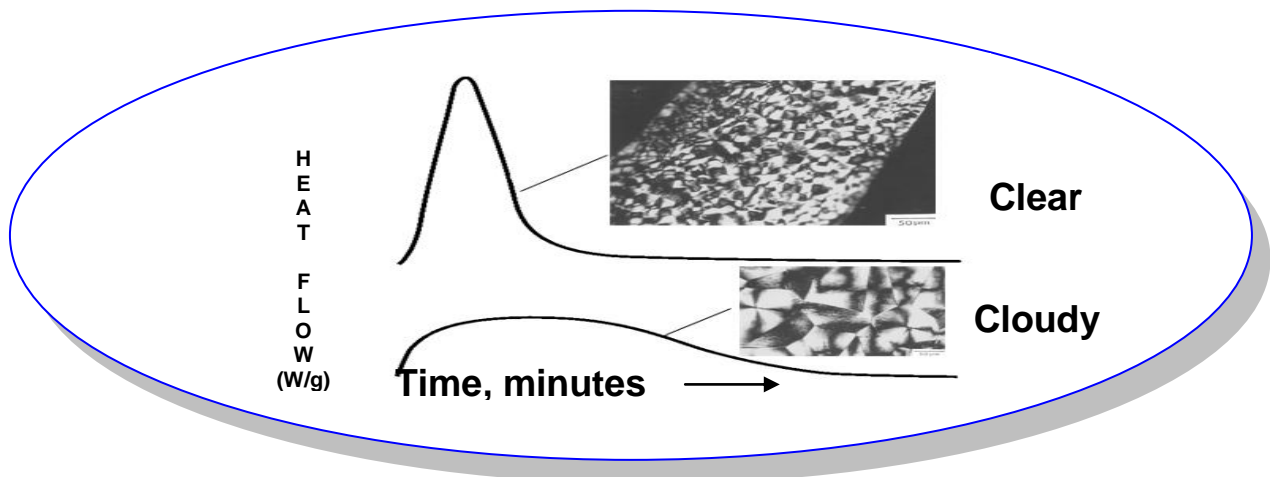
Dr. Kenneth O. MacFadden, VP-Honeywell Laboratories (1996-2002), Morristown, NJ, USA

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

These types of courses are hard to find; it fills a need for relating hands-on experience of industrial experts on real-life problems. I was very pleased with the course and will strongly recommend to those looking for innovative solutions.....

Bill DeGroot, Attendee-2004, Masonite Corporation, Chicago, IL, USA



Course Organizer: InnoPlast Solutions, Inc., 735 Aran Drive, Roswell, GA 30076, USA

Phones: (888) 696-5632 (TollFree) (973) 446-9531 (973) 801-6212 (Cell) Fax: (973) 795-1030

E-mail: Info@InnoPlastSolutions.com

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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 had a 27 years tenure at AlliedSignal's (now Honeywell) corporate research & technology center in Morristown, NJ. He joined AlliedSignal in 1975 with MS degrees in Analytical Sciences / Chemical Analysis & Process Control and then obtained, on a part-time basis, another MS and a Ph.D. in Polymer Science & Engineering from the Polytechnic of New York University. During the 1985-2001 period, Dr. Khanna was a Research Group Leader / Senior Principal Scientist responsible for Thermal Analysis & Polymer Melt Rheology. His 27 years career is credited with over 120 research publications, 21 US 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 in identifying several new phenomena in 40-60 years old polymers during the course of routine analytical characterization. During 1990-2001, Dr. Khanna also held positions such as Business Unit Liaison to Specialty Films division and the key technologist for Packaging Resins business where the fundamental knowledge from Thermal / Rheology formed the basis of new product / process development as well as technology marketing in **North America** and **Europe**. These contributions to AlliedSignal's businesses were recognized through 5 Special Recognition awards (1991-1998) and 3 business awards namely, "**Growth**", "**Sale of the Year**", and "**Save of the Year**" (1997-1998).

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

8:00-8:15 Registration & Continental Breakfast

8:15 Day 1: **Getting to Know the Family of Thermal Techniques and What They Can Do For Your Company**

8:15-10:15 **Fundamentals for Mastering Polymers via Thermal / Mechanical Techniques**

Polymer science & engineering fundamentals as related to structure vs stability, transitions such as Glass (T_g), Melting (T_m), solid and molten-state crystallization (T_{ch} and T_{cc}); viscoelasticity as related to solids and its impact on processing-property relationships.

10:15–10:30 Coffee Break

10:30-12:00 **Thermal Analysis Techniques: Principle, Scope & Best Operating Conditions**

Thermogravimetric analysis (TGA), differential thermal analysis (DTA), simultaneous TGA/DTA, differential scanning calorimetry (DSC), thermomechanical analysis (TMA) and, dynamic mechanical analysis (DMA). Measurement in simple and complex systems with confidence, quantification & separation of the impact of various physical-chemical factors.

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).

1:45-2:00 Coffee Break

2:00-3:00 **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).

3:00-3:15 Coffee Break

3:15-4:00 **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.

4:30-5:00 **Advances in Thermal / Mechanical Analysis Instrumentation**
TBD

5:00-6:30 Cocktail Mixer.....Sponsored

DAY - 2

Day 2: **Case Histories of Industrial Problem Solving with Thermal-Mechanical-Rheological Techniques**

- 8:30-10:30 **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 – capillary, oscillatory, constant stress, and elongational rheometers, information on physico-chemical structural features, relevance to polymer processing, and key applications.
- 10:30-10:45 Coffee Break
- 10:45-11:45 **Rheology of Moisture, Heat, and Shear Sensitive Polymers**
Most effective strategies for handling Nylons, Polyesters, EVOH, PVC, and the like
- 11:45-1:00 Lunch
- 1:00-2:30 **How to Identify Opportunities in Thermal-Mechanical-Rheological Data ? Impact on Science / Technology / Business Development**
6 Case-Histories will be presented wherein opportunities for problem solving and innovative concepts were identified during the course of routine thermal-rheological characterization. Strategies will be discussed on creating such opportunities more frequently.
- 2:30-2:45 Coffee Break
- 2:45-4:00 **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.
- 4:00-5:00 **Using Rheology to Solve Problems in the Plastics Industry**
TBD

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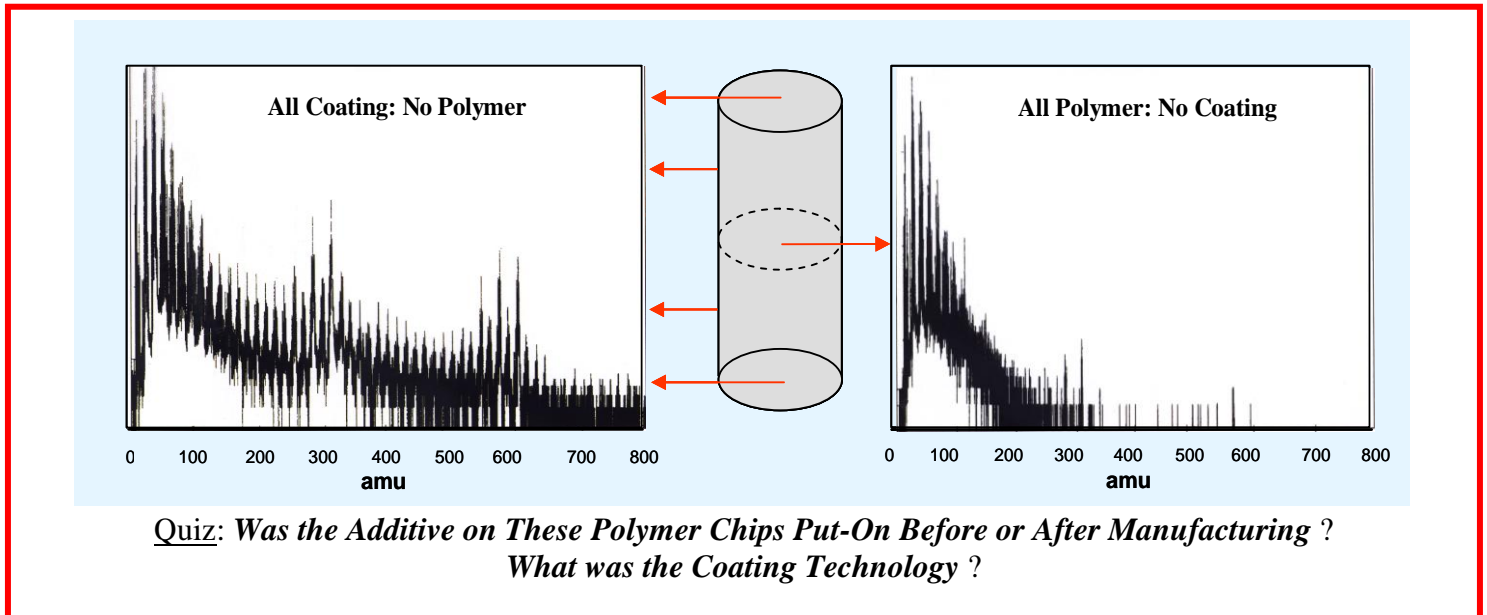
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DAY - 3

Day 3: Failure Analysis via All-Analytical Techniques

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.



- 8:30-10:00 **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*.
- 10:00-10:30 Coffee Break
- 10:30-12:00 **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?”
- 12:00-1:00 Lunch
- 1:00-2:30 **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
- 2:30-3:00 Coffee Break
- 3:00-4:00 **Consultation with Speakers**

Registration

Registration fee includes breakfast, lunch, coffee breaks and the Course Proceedings.

Register Now by phone, preferably via Scan & E-mail or FAX

InnoPlast Solutions Inc.

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Roswell, GA 30076

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E-Mail: Info@InnoPlastSolutions.com

Registrant Name: _____

Company: _____

Street Address: _____

City, State, Zip: _____

Phone: _____

E-Mail: _____

- Day 1-2-3: 3-Days Analytical Problem Solving Course (\$1795)*
 Day 1-2: 2-Days Thermal / Rheology Course (\$1495)*
 Day 3: 1-Day Surface Analysis/Microscopy (\$995)*
 20% Discount for Registrations before **JANUARY 31**

TOTAL = _____

Select method of payment:

- AMEX MasterCard VISA Check (Payable to InnoPlast Solutions, Inc.)

Card Number: _____

Expiration Date (mm/yy): _____

Signature: _____ Date: _____

***Important Notes:**

Any Cancellations **MUST** be done 4-Weeks before the Course Starts