

Understanding Polyurethanes

Their Formulations and Applications

Training Seminar – May 12-14, 2009

The Hyatt Regency at the Arcade Hotel, Cleveland, Ohio, USA

Presented by:

Dr. James (Jim) M. O'Connor,
SynUthane International Inc.

Dave Russell
Akron BioMaterials Inc.

Organisers



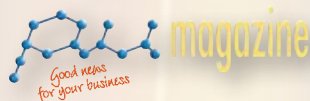
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Understanding Polyurethanes

- Their Formulations and Applications

**Training Seminar to be held at the Hyatt Regency at the Arcade Hotel, Cleveland, Ohio on:
May 12-14, 2009**

Overview

The 'Understanding Polyurethanes, Formulations and Applications' seminar provides a comprehensive overview of polyurethane formulations and processing technologies, applications and markets.

Who will benefit from attending?

The seminar will be useful for both newcomers to the industry and specialists wishing to enhance their understanding of other application areas of PU. Delegates will typically be involved in functional areas such as:

- Technologists in application development
 - Materials technologists engaged in materials development
 - Technical, production and quality managers
 - Technical sales and marketing personnel wishing to gain a greater understanding of PU
 - Anyone wishing to gain an update or knowledge base on the chemistry and formulations of PU Material
-within companies involved in materials production, systems production or end-use application of PU

Program structure

The seminar program is modular and has been arranged to allow delegates to attend for any one, two, or three days. Session 1 covers general PU chemistry and will provide a sound base for Sessions 2 and 3. Session 2 is specific to the application areas of Foams (rigid and flexible) and Session 3 covers Coatings, Adhesives, Sealants and Elastomers (CASE). Each Session is of one day's duration and are arranged so delegates can attend both sessions on separate days if they wish.

Expert Seminar Presenters:

Dr. Jim O'Connor, SynUthane International Inc.
Prior to founding SynUthane, Jim has managed research and development in the polyurethane and chemical industry for nearly 30 years. His experience and research background covers all segments of the polyurethane industry from polyols to isocyanates; TPUs to coatings as well as surfactants, polymers and other speciality chemicals. After gaining his Ph.D from Purdue University, Jim worked for Goodyear, NDM Corp, Olin Corporation, Olin Hunt (Electronics) and ARCO Chemical Company and authored over 50 US patents and publications.

Dave Russell, Akron BioMaterials Inc.
Dave is Managing Director of Akron BioMaterials Inc. and Director of Motion Preservation Engineering for Theken Spine. Dave has 40 years of experience in the polymer industry with extensive experience in synthesis, manufacturing, compounding, testing and analyzing a broad range of elastomeric polyurethanes including: castable and thermoplastic elastomers, polyurethane sponges and gels, and polyurethane and polyurea coatings.

Dave was previously Director of Polymer Services for Smithers Scientific Services Inc, Engineering Manager for Eaton Corporation's Engineered Polymer Products Division, and CEO of Akron Polymer Laboratory Inc. Dave received a BA in Natural Sciences from the University of Akron in 1972 and returned to the University of Akron from 1984-1988 for graduate studies in Polymer Science where he achieved the rank of Doctoral candidate. Dave has numerous patents and publications in the polyurethane field.

Smithers Rapra

Smithers Rapra is an international organization providing industry with technical support on all aspects of rubber and plastics.

For more information visit: www.rapra.net

iSmithers is the information business within Smithers Rapra providing technical publications, conferences and training seminars.

For more information visit: www.ismithers.net

iSmithers, working alongside Smithers Rapra, is part of the **Smithers Group**, based in Akron, Ohio.

Seminar Venue

The Seminar will be held at:
Hyatt Regency at the Arcade Hotel,
420 Superior Avenue,
Cleveland, OH 44114
Tel: (216) 575-1234,
Fax: (216) 575-1690

For further information about the hotel visit:
www.cleveland.hyatt.com

Hotel Reservations: Please send reservation enquiries to: Cal Parkinson, Seminar Organizer, email: cparkinson@rapra.net. A booking form will be sent with your joining instructions on receipt of your completed registration form. Or you can complete our Hotel booking form online at: www.understandingpolyurethanes.com

Seminar Registration Fee

Early registration offers - Register before March 22nd and get a 10% discount off your seminar fee.

Attendance at One Session

Until March 21st = \$540

From March 22nd = \$600

Attendance at Two Sessions

Until March 21st = \$810

From March 22nd = \$900

Attendance at Three Sessions

Until March 21st = \$1125

From March 22nd = \$1250

Multiple Registration Discounts:

Companies registering 2 or more delegates will receive a further 10% off the advertised seminar fee.

How to Register - complete the registration form on the reverse of this leaflet and fax back, or use our secure online registration at www.understandingpolyurethanes.com. Registration includes copy of the presentation, lunches and refreshments during the day.

Session One - May 12 2009, 9am-5pm

Fundamental Chemistry and Additives, Testing and Processing Technology - Presented by Jim O'Conner

This day should also be attended by those people attending either Session 2 or Session 3, wishing to develop a full understanding of the chemistry and production of the major urethane materials, polyols and isocyanates, a detailed description of all the other typical and not so typical ingredients used in the production of a polyurethane and recommendations on when to use and why.

A basic understanding of chemistry is desirable for a better appreciation of this section.

Polyurethane Market Overview and Introduction to the Chemistry

- Basic polyurethane chemistry – how do you make a polyurethane polymer?
- What are the major components?
Polyol;
Isocyanate
- Major market segments: USA, Europe and Global
- Global market for polyurethane products
Flexible foam;
Rigid foam;
CASE
- Polyurethane nomenclature and calculations

Polyol Details

- Structure, basic production technology, initiators, functionality, reactivity, unsaturation, reaction process and catalysis, OH#
Polyether (different types);
Polyester;
Polymer polyols
POP; PIPA; Dendrimers
Acrylic;
Mannich;
Natural Oil and other Hydrophobic polyols

Isocyanate Details

- Structure, functionality, FNCO%, phosgene/nonphosgene process, adducts
TDI;
MDI/Pure MDI/polymeric MDI/Liquid MDI Variants;
Pre-polymers;
Aliphatic light stable isocyanates;
Aliphatic isocyanate adducts

This section will cover the many other components with which Polyurethanes can be formulated.

Key Chemistries for Polyurethane Formation

- Primary reactions: Isocyanate/polyol; Isocyanate/water: Isocyanate/amine
- Secondary reactions: Biuret, Allophanate, Trimer
- Other less common reactions

Other key components in a polyurethane

- Polymer structure modifiers
Chain extenders;
Cross-linkers
- Catalysts – the different types and mechanism of action
Blowing reaction;
Gel reaction;
Trimerization;
Other;
- Surfactants
Types;
Activity
- Blowing Agents (a brief history and all the newest developments)
Chemical BA;
Physical BA
- Other Additives
Antioxidants;
UV Stabilizers;
Flame Retardants;
Fillers
- Environmental, Health and Safety (a brief discussion)
Handling Isocyanates;
Handling Polyols;
Catalysts, Surfactants etc.;
Product stewardship

An overview of the different equipment available to process polyurethane.

- Polyurethane Manufacturing Equipment
Flexible Foam;
Rigid foam;
CASE

Session Two - May 13 and May 14

2009, 9am-5pm (choose your preferred date for this one-day session)

Rigid and Flexible Foams

- Presented by Jim O'Conner

This session is intended as a follow-on for those attending Session One. Session Two will give an up to date overview of the flexible and rigid foam market and technology and general formulations for the different types of foams.

A basic understanding of chemistry would be helpful for a better appreciation of the content of this session.

Flexible Foam

- Market Overview
- Mechanism of Foam Formation
Balancing blowing versus gellation;
Role of Catalysts;
Role of Surfactants
- Flexible Foam Processing Equipment – this section describes the different processes and equipment utilized in the preparation of flexible foam.
Conventional;
Flat top;
CO₂ Blowing;
Variable Pressure Foaming;
Molded Foam
- Test Methods – this section describes the key methods and equipment for flexible foams
Density;
Surface Firmness;
Deep Firmness;
Support; Feel;
Durability
- Types of Foam; Basic Formulations: Polyols, TDI versus MDI, Slab versus Moulded - this section describes the different types of foam, how they are formulated and why these different grades are chosen for specific applications)
Standard foams;
High resilience (HR) foams;
Combustion modified HR foams (CMHR);
High load bearing foams;
Soft/supersoft foams;
Viscoelastic (Dead) foam;
Speciality foams i.e. packaging, flame laminatable etc.
- Flame Retardants
Common flame retardants;
Small scale verses large scale testing;
Testing by country

Rigid Foam

- Market Overview
- Mechanism of Foam Formation
Balancing blowing versus gellation;
Role of catalysts;
Role of surfactants
- Test Methods – description of the key methods and equipment for rigid foams
Density;
Compressive strength;
Open/closed cells;
K-factor;
Flame retardancy
Common flame retardants; Test methods;
Testing by country

Blowing Agents

- Advantages and Disadvantages, Industry Trends
New HFC's;
Pentanes;
H₂O;
Other (methyl formate, methylal)
- Types of Foam – basic formulations/polyols/PIR versus PUR/processing equipment – this section describes the different types of foam, how they are formulated and why these different grades are chosen for specific applications.
Pour/injection of refrigeration appliances, water heaters; Pour/injection of discontinuous panels; Pour for continuous panels; Pour-in-place packaging, shock protection; Pour/injection of structural foam, wood imitation; Spray foam; Pour for bun and block foam

Session Three - May 13 and May 14

2009, 9am-5pm (choose your preferred date for this one-day session)

Coatings, Adhesives, Sealants & Elastomers (CASE)

- Presented by Dave Russell

This session is intended as a follow-on for those attending Session One and covers the CASE urethane market overview, technologies and examples of formularies utilized for many of the different CASE applications.

The CASE area tends to have many more choices for the 'more exotic' raw materials. A 'basic understanding' of chemistry is desirable to get the most from this day.

What is CASE (Coatings, Adhesives, Sealants and Elastomers)

- Examples of Types and Uses
- What are the Common Characteristics Between the Different Applications

Polyurethane Market Overview and Major Market Segments: USA, Europe and Global Polyurethane Structure/Property Relationships:

- Review of Relevant Functional Group Chemistry
- Basic Polymer Morphology Fundamentals (soft and hard segments)
- Effect of Polyol, Iso, Curative Type, Molecular Weight and/or Functionality
- Review of Common Elastomer Test Methods

Types of Urethane Elastomers, Formulary for Various Applications:

- Thermoplastic Polyurethanes
- Cast Elastomers
- RIM
- Spray Elastomers
- Microcellular Elastomers

Types of Urethane Elastomers, Formulary for Various Applications (Cont'd):

- Types of Polyurethane Sealants and Typical Formulary
One and two component;
Moisture cure;
Hybrid sealants
- Adhesive Types and Typical Formulary:
Hot melts;
Two component;
Moisture cure;
Hybrids
- Urethane Binders: Types and Typical Formulary
Metal foundry;
Carpeting;
Wood laminates, and
Miscellaneous
- Polyurethane Coating Types and Typical Formulary:
Solvent;
Waterborne;
Moisture cure;
One and two component

Seminar Registration Form

Understanding Polyurethanes

May 12-14, 2009

- Their Formulations and Applications



Please use one form per delegate - photocopies are acceptable

Application form: Please Register me for (please tick the box for each day that you wish to attend)

- Session One, May 12 2009 - Fundamental Chemistry
- Session Two*, May 13 2009 - Flexible and Rigid Foams
- Session Two*, May 14 2009 - Flexible and Rigid Foams
- Session Three*, May 13 2009 - Coatings, Adhesives, Sealants and Elastomers
- Session Three*, May 14 2009 - Coatings, Adhesives, Sealants and Elastomers

**Sessions Two and Three are parallel sessions, each of one days' duration, make sure you choose your preferred date.*

Last Name First Name Dr/Prof/Mr/Mrs/Ms

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Payment Information

Payment must be received prior to attending the seminar and can be made in \$US.

- \$US (This will be applicable at the prevailing rate)
- Please invoice my company - Purchase Order Number (if required)
- Check/Bank Transfer
- Payment enclosed (please make checks payable to Smithers Rapra Technology Limited)
- Credit Card Payment: MasterCard Visa American Express (please indicate)

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Registration Terms: by completing and returning this form delegates are agreeing to be bound by the cancellation terms and conditions of registration. Substitutions can be made at any time, please inform us in writing. If you wish to cancel your registration please do so in writing. A full refund less 20% administration fee will be applicable 28 days before the event. Cancellations received after this time will be liable for the full registration fee.

Amendment to Program: Smithers reserves the right to cancel or modify the program for this event. In the event of cancellation, where an alternative cannot be provided, payments received in respect of the event will be refunded in full. The liability of Smithers is limited to reimbursement of the event fee.

Return to:

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Enrol online at:

www.understandingpolyurethanes.com