

Short Course Directory 2011

Short Courses
Seminars
Industry Briefings

*Providing support for people in manufacturing, from
product design through to production.*

*Plastics & elastomeric materials technology, processing,
applications and legislative changes affecting polymers.*



www.rapratraining.com

Smithers Rapra Short Courses, Seminars and Web Seminars

Smithers Rapra Technology Limited is an international organization which provides information, advice and testing facilities for companies which use plastic and rubber materials in their products or processes. Smithers Rapra Short Courses, Seminars and Web Seminars have developed out of this expertise in industrial problem solving.

Smithers Rapra courses are structured to support time-pressured professionals, by providing them with relevant, unbiased information, to enable them to work effectively and confidently when developing products that include polymer materials or components.

This information may relate to the materials themselves, their properties and behaviour in use and under certain conditions, the technologies by which they are processed or the regulations which govern their use in, for example, food packaging or medical applications, or the wider environment.

Delivered by experienced practitioners, courses are usually limited to one or two days to reduce the time spent out of the workplace. While they can all be taken as stand-alone courses, some provide a pathway to an MSc in Polymer Engineering Design through our collaboration with the University of Wolverhampton's school of Engineering and Technology, for more details on this see page 34.

As a new addition to our educational services, our web seminars provide a short (typically 90 minute) real-time presentation with question and answer sessions to enable participants to learn at their own place of work, without having to take time out to travel.

To get regular up-to-date information on current courses and web seminars visit our website at www.rapratraining.com

How to contact us...

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- ◆ *By e-mail to:* training@rapra.net

- ◆ *By post:* to: The Training Business Manager,
Smithers Rapra, Shawbury, Shrewsbury,
Shropshire, SY4 4NR, UK

Register on the Web... It is possible to register for 'open courses' on our secure website:
visit our website: www.rapratraining.com

2011

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Calendar 2011

February

22nd-23rd Introduction to Plastics Technology

March

1st-2nd Introduction to Rubber Technology

15th-16th Plastics Injection Moulding Technology

17th Introduction to Silicone Elastomers

22nd-23rd Exploring Plastics Extrusion

29th Co-Extrusion and Multilayer Structures, Pipe and Blow Moulding

30th Co-Extrusion and Multilayer Structures, Sheet and Film

April

7th Protecting Innovation Using Patents

May

10th-11th Polyurethanes: An Introduction. Science, Applications, Technology

12th Introduction to Food Contact Materials

19th Introduction to Extractables & Leachables Testing

24th-25th Introduction to Plastics Injection Mould Design

June

7th-8th Plastics Materials and Products

14th-15th Medical Device Regulation

21st-22nd Plastic Product Design

September

20th-21st Introduction to Plastics Technology

20th-21st Understanding Thermoplastic Elastomers

Calendar 2011

October

4 th -6 th	SEMINAR: Understanding Polyurethanes - Formulations and Applications
11 th -12 th	Plastics Materials and Products
18 th -19 th	Introduction to Rubber Technology
20 th	Introduction to Silicone Elastomers
25 th -26 th	Plastic Product Design
27 th	Protecting Innovation Using Patents

November

1 st -2 nd	Plastics Injection Moulding Technology
1 st -2 nd	Polyurethanes: An Introduction
8 th -9 th	Exploring Plastics Extrusion
15 th -16 th	Medical Device Regulation
17 th	Introduction to Extractables & Leachables Testing
24 th	Introduction to Food Contact Materials
29 th -30 th	Plastics Injection Mould Design
29 th	Co-Extrusion and Multilayer Structures, Pipe and Blow Moulding
30 th	Co-Extrusion and Multilayer Structures, Sheet and Film

Notes

Introduction to Plastics Technology

22nd-23rd February 2011
20th-21st September 2011

Course duration -
Starts: Day One 09.30
Finishes: Day Two, 16.00

This 2-day course has been developed to support people with little or no knowledge of plastics, whether newcomers or those with no previous formal training, and will introduce participants to the fundamentals of plastics technology.

Course Objectives:

The objective of this course is to give participants sufficient understanding of plastics technology to be able to communicate effectively and confidently with industry colleagues, customers and suppliers. The course will also provide a basis for further training in more detailed aspects of plastics technology.

Who Will Benefit:

- ◆ People working in plastics production, materials supply and other industries which supply to or purchase from plastics manufacturers
- ◆ Newcomers to these industries, or those who have had no formal technical training
- ◆ Managers and professionals in areas such as sales, marketing and other roles where a knowledge of plastics materials and processing technologies would improve confidence and communication with customers, suppliers and colleagues

Attendees Will Learn:

- ◆ Basic polymer science relative to understanding plastics
- ◆ The properties of plastics materials and their relation to other materials
- ◆ The role of additives
- ◆ The technologies by which plastics are processed into finished products
- ◆ Why certain plastics are used in various applications

Course Content:

Basic polymer science: The structure of plastics (thermoplastics and thermosetting plastics) relative to properties and processing: characterisation tests.

Plastics materials: Properties: The physical and chemical properties of commodity and engineering thermoplastics and thermosetting plastics, compared with other materials.

Additives: The function of additives: stabilisers, plasticizers, fillers, flame retardants, pigments and others, together with the major suppliers.

Applications: The plastics used for packaging, construction, household, automotive, electrical and electronic, agriculture and other sectors.

Processing: The principles of processes for thermoplastics and thermosetting plastics: thermoplastics: injection, blow and rotational moulding, extrusion, film, pipe, profile, wire and cable, coating, thermoforming;

Continued...

Introduction to Plastics Technology

other processes: calendering, dip coating; thermosetting plastics: compression and injection moulding, foam processes, fibre reinforced plastics processes and others.

Plastics and the environment: The positive case for plastics. Addresses the current 'unfashionable' image of plastics and seeks to dispel the myths.

Future developments: new materials and processes.

Presenter:

Joy Harrison, BSc (Eng), FIMMM - Consultant Smithers Rapra

Andrew Hulme, BEng, PhD, AMIMMM - Consultant Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

The cost of this 2-day training course is £550.00 + VAT per person and includes course manual, lunch and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Plastics Materials and Products

7th-8th June 2011
11th-12th October 2011

Course duration -
Starts: Day One 09.30
Finishes: Day Two, 16.00

This course concentrates on developing better understanding of plastics materials and processing therefore avoiding the common causes of product failure as a result of lack of material knowledge (it is designs that fail not the material). Engineers will be happy to note that the course does not dwell on the chemical structure or synthesis of plastics.

As an additional feature delegates will be invited to bring in examples of problem mouldings or product failures for general discussion or private consultation.

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

As a result of attending this course, participants will be able to:

- ◆ Distinguish between the different generic and sub-generic types of plastic and have a basic knowledge of their relative advantages and disadvantages
- ◆ Understand the methodology associated with the effective selection of plastics for specific applications
- ◆ Understand the physical characteristics of plastics, the effects of time, temperature and stress and the implications of those characteristics on the design process
- ◆ Identify and rectify existing or potential product failure regions
- ◆ Identify and rectify potential or existing processing problems
- ◆ Identify and rectify potential or existing joining problems
- ◆ Understand how to better use material data for more effective design through the use of relevant testing and software tools

Who Will Benefit:

People involved in the product development process, e.g. designers and product development engineers and other functional areas such as technical services, quality assurance, component procurement, who need an overview of the engineering capabilities of plastics. Little or no knowledge of plastics materials and processes is assumed.

Attendees Will Learn:

- ◆ The history and classification of common plastics
- ◆ The advantages and disadvantages associated with different generic types of common plastic
- ◆ The methodology associated with the effective selection of plastics for specific applications
- ◆ The effects of time, temperature and stress on the physical characteristics of plastics
- ◆ The common causes of failure of plastics products
- ◆ How to identify and correct injection moulding problems
- ◆ How to select and apply the most appropriate plastic joining technique

Continued...

Plastics Materials and Products

Course Content:

Plastics Materials: History, classification (thermosets, thermoplastics, semi-crystalline, amorphous), major modifications (fibre reinforced, impact modified, etc.). Properties, characteristics, advantages and disadvantages of common plastics.

Materials Selection: The barriers to structured selection include many plastics types and thousands of grades. Numerous options and variants will be presented to facilitate 'decoding the data sheet'. Equally important there will be advice on drawing up the specification; the hidden requirements, often overlooked, resulting in failure. Finally, there is a participative case study using computer software.

Design for Performance: The structural performance of plastics (creep, stress relaxation, fatigue, effect of temperature, ageing, chemical attack), allowable design stresses and strains.

The differences between short and long term mechanical properties and their impact on application. Introduction of methodologies to use long term materials data to improve the confidence in the performance of a design and minimise the risk of product failure in the long term.

Failure Diagnosis: Common causes of failure: brittle fracture (stress cracking, embrittlement, effect of notches, uv degradation, hydrolysis), impact, fatigue.

Injection Moulding: Many common faults including short shots, flashing, weld lines, sinking and voiding, thermal and hydrolytic degradation etc. are discussed. Causes and remedies are suggested. How the part design contributes to the problems will be explained such that design can be optimised for manufacture as well as function.

Use of software simulation tools to optimise the moulded part in terms of processing quality, final part dimensions & residual stress.

Testing: Tensile stress-strain and creep tests, impact tests and stress relaxation.

Presenters:

Joy Harrison BSc.(Eng) (Hons) FIMMM - Smithers Rapra

Andrew Hulme B.Eng., PhD., AMIMMM - Smithers Rapra

Tim Hulme BSc., MSc., CSci., CChem., MRSC, FRMS - Principal Consultant - Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 plus VAT per person and includes course manual, lunch and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Plastic Product Design

21st-22nd June 2011
25th-26th October 2011

Course duration -
Starts: Day One 09.30
Finishes: Day Two, 17.00

This 2-day course assumes no prior knowledge and is suitable for those new to the subject. The course would also benefit those who wish to extend their existing knowledge of plastic product design or who are working in a polymer product design related area.

Course Objectives and Learning Outcomes:

Upon completion of the course a candidate will be able to:

- ◆ Construct a basic polymer product design specification
- ◆ Design a basic polymer product from first principles
- ◆ Understand the influence of polymer processing upon product design and final properties
- ◆ Understand the influence of specific polymer properties upon product design
- ◆ Undertake basic quality appraisal of new polymer products
- ◆ Differentiate between a polymer processing, tool design or product design defect

Who Will Benefit:

Designer makers, product designers, production engineers and those involved in:

- ◆ Polymer product supply & sourcing,
- ◆ QA assessment of polymer products,
- ◆ Management of polymer product development projects,
- ◆ Processors and manufactures of polymer products, etc.

Course Content:

- ◆ Introduction to Polymers - Comparison with Traditional Materials
Basic Review of polymer property ranges comparing with traditional materials including metals, ceramics etc
- ◆ Influence of Polymeric Materials on Product Design
Specific polymer properties / product design solutions
- ◆ Influence of Processing method on Product Design
Review of processing methods and their influence on design including:
Thermoforming
Extrusion
Blow Moulding (Extrusion and injection)

Continued...

Plastic Product Design

Compression moulding and DST technologies

Injection Moulding

◆ Product Property based Design

Required property and resultant design features

◆ Rapid Manufacturing Techniques

Covering prototyping, short run manufacture, and rapid tooling techniques.

How to choose the right method.

◆ Polymer Design Requirement Specification

Covering developing specifications for mechanical, electrical, thermal use, environmental impact

◆ Quality in Plastics Processing

Inspection methods, time dependency of size, methods of measurement, use of statistics.

◆ Fabrication and Assembly with Polymers

Review of methods and uses, including welding, mechanical assembly, decoration methods.

◆ Costing and Project Analysis

Part cost based on material, process method and number of parts required.

Product Development methodology and tools.

Presenter:

John Rackley

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 plus VAT, to include course manual, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering, 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Plastics Injection Moulding Technology: Theory and Practice



15th-16th March 2011
1st-2nd November 2011
Course duration -
Starts: Day One 09.15
Finishes: Day Two, 16.30

A thorough appreciation of Injection Moulding is important for personnel involved with the design and development of products manufactured in this way and for those involved with the purchase and utilisation of injection moulded products and components.

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

- ◆ To understand the operation of the injection moulding machine
- ◆ To gain practical experience of the process and machine functions and controls
- ◆ To gain awareness of the different mould types
- ◆ To understand the dependence of quality on machine setting
- ◆ To recognise common moulding faults and their causes
- ◆ To recognise good moulding practice
- ◆ To gain awareness of different plastics materials, types, fillers, additives, the reasons for their choice
- ◆ To understand some of the key criteria affecting part design, mould design and material selection
- ◆ To gain awareness of 'added value' techniques such as in mould labelling, two/multi-material moulding, insert and outsert moulding
- ◆ To gain awareness of the additional capabilities of today's machines: closed loop, machine based QC/SPC and process control systems
- ◆ To become familiar with the industry's terminology
- ◆ To communicate better with suppliers as well as internal and external technical staff

Who Will Benefit:

- ◆ Management and Sales Personnel
- ◆ Product Designers
- ◆ Purchasing and Procurement Personnel

Course Content:

- ◆ Injection moulding machine - Practical introduction to injection moulding machine cycle and functions.
- ◆ Machine selection criteria, control types, clamp mechanisms, automation, statistics and quality monitoring
- ◆ Moulds -Types of moulds - Their uses, benefits and construction – Gates and runners - Ejection cooling

Continued...

Plastics Injection Moulding Technology: Theory and Practice

systems - Design objectives and quality implications

- ◆ Computer based assistance - Material selection (IDES, Campus) flow analysis (Sigma, Moldflow) and C.A.D.
- ◆ Materials –Types and grades, additives, interpreting data, storage and drying, relating test methods to finished products, industry terminology.
- ◆ Processing -Material behaviour during processing, the effects of moulding parameters on economics and product quality. Standard machine controls and new control methods.

Presenter:

John R. Hind BSc MSc

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 plus VAT for 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Plastics Injection Mould Design

24th-25th May 2011
29th-30th November 2011

Course duration -
Starts: Day One 09.15
Finishes: Day Two, 16.15

An awareness of the technicalities of mould design will improve communications between product designers and mould designers and reduce costly errors and delays.

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

The objectives of this course are to improve communication with mould designers and tool makers enabling plastic product manufacturers to know the right questions to ask and understanding the answers, avoid mistakes and shorten lead times.

Who Will Benefit:

- ◆ Product Designers
- ◆ Purchasing and Procurement personnel
- ◆ Quality Assurance and Technical Services personnel

Attendees Will Learn:

- ◆ How moulds are made, the effect on cost and timing
- ◆ How moulds are constructed; the elements and terminology used
- ◆ How component design can affect mould cost, lead time and mould maintenance
- ◆ How mould design can influence product quality
- ◆ The importance of mould cooling; gate and runner design etc
- ◆ How to identify faults relating to mould design/manufacture
- ◆ How to make mould design improvements

Course Content:

Methods of Mould Manufacture: Machine tools, die sinking, spark erosion, hobbing, castings etc.

General Mould Construction: Terminology, mould cavities and cores, bolsters, use of inserts, parting line, line of draw, draft angle. Prototype moulds.

The Two Plate Mould: Runner and gate design, ejector systems, venting mould shrinkage, methods of location and aligning each half, mould venting.

Multiplate Moulds: Three plate tools, stack moulds.

Continued...

Plastics Injection Mould Design

Undercut Moulds: Internal and external undercuts, splits, side cores/cavities, hydraulics, internal threads, etc.

Runnerless Moulds: Basic types, advantages and limitations.

Mould Materials and Heat Treatment: Low carbon, pretoughened, fully hardening and stainless steels. Non ferrous materials, case hardening, nitriding etc. Materials for prototype moulds.

Mould Cooling: Methods of cooling various core/cavity shapes.

Mould Finishes: Polishing, texturing, etc.

Standard Mould Parts: Why used, some applications, examples and suppliers.

Presenter:

John R. Hind BSc MSc

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 plus VAT for 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Exploring Plastics Extrusion

22nd-23rd March 2011
8th-9th November 2011

**Course duration -
Starts: Day One 09.15
Finishes: Day Two, 16.00**

Participants will gain an appreciation of the whole extrusion process enabling them to optimize their processes, troubleshoot and avoid problems.

Please note: This course will concentrate on the single screw extrusion process, both within the extruder and downstream. Areas such as compounding (single and twin screw) rheology; pipe extrusion, film; sheet; cable and PVC profiles will be addressed in short modules.

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

As a result of attending this course delegates will be able to:

- ◆ Identify the most common faults to be found in extrusion
- ◆ Design improved laboratory (R&D) projects with a view to scaling up to production
- ◆ Understand why different polymers perform differently during extrusion.
- ◆ Make informed choices when purchasing equipment

Who Will Benefit:

- ◆ Production and process managers and engineers

Attendees Will Learn:

- ◆ The Basic Extrusion Process - What are we aiming to achieve?
- ◆ The various elements of the extrusion process
- ◆ The theory behind feeding, melting and pumping
- ◆ Critical aspects of design, choice and purchase of equipment
- ◆ The essential differences between single and twin screw extrusion
- ◆ Important elements of mixing in theory and practice
- ◆ How to scale up both single and twin screw extrusion processes
- ◆ How different end products are produced
- ◆ An approach to trouble shooting with solutions to common problems

Course Content:

- ◆ The Basic Extrusion Process: Densification, mixing, compounding, reinforcement, reactive processing, or the production of a particular shape.
- ◆ Extrusion Theory - Feeding, melting, and pumping processes in single and twin screw machines, and the energy balance of the process.

Continued...

Exploring Plastics Extrusion

- ◆ Rheology- its influence on the extrusion process.
- ◆ Extrusion Design - Aspects of design, choice and purchase of equipment.
- ◆ Twin Screw Extrusion - Different types of twin screw, their uses and compounding optimisation
- ◆ Mixing - Various mixing techniques exist, add on mixing heads, barrier screws and modular kneading elements.
- ◆ Scale-up - Sizing of a machine from laboratory trials, scale-up, and choice of equipment.
- ◆ Downstream- Compound, pipe, film, sheet, cable sheathing, profiles.
- ◆ Trouble shooting - Fault finding, practical solutions to common problems, i.e. probable causes of surging, melt fracture, etc., difficulties encountered in handling rework
- ◆ Materials, feeding systems,etc.
- ◆ Practical demonstrations will be used to illustrate aspects of the course.

Presenter:

John Colbert BSc (Eng), AMI MechE, MSPE - Consultant - Smithers Rapra

Jon Lea - Consultant, Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 plus VAT for 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Co-Extrusion and Multilayer Structures - Pipe and Blow Moulding



29th March 2011

29th November 2011 **Course duration - 09.00 to 17.00**

Co-Extrusion and Multilayer Structures - Sheet and Film



30th March 2011

30th November 2011 **Course duration - 09.00 to 17.00**

Products containing multiple layers of polymers are becoming more common especially in applications where barrier properties; strength; weight or cost are an issue.

These courses will look at the wide range of properties that can be obtained, the production processes to achieve them and the practical extrusion technologies used.

Each of the two courses on Co-Extrusion and Multilayer Structures will have the same core subjects but will then concentrate on the applications for either Pipe and Blow Moulding or Sheet and Film. Delegates are invited to choose the course which is most relevant to their end use application.

Course Objectives:

As a result of attending the course delegates will be able to:

- ◆ Understand the benefits and cost implications for having multilayer structures
- ◆ Understand the polymer properties needed to provide desired properties or barrier resistance and be aware of the latest developments
- ◆ Make informed choices when purchasing equipment
- ◆ Identify the equipment required to produce multilayer structures
- ◆ Recognise the faults in multilayer products from extrusion processes

Who Will Benefit:

Technical Managers; Production Managers/Engineers; Process Managers/Engineers; Quality and Technical Services Personnel; Technical Sales Personnel and those responsible for design and development of products who wish to gain a greater understanding of the properties and processing methods of multilayer structures.

Attendees Will Learn:

- ◆ Reasons for having multilayer structures
- ◆ The range of materials that can be used in coextruded structures
- ◆ Properties of various barrier polymers
- ◆ Product design and material properties needed for desired properties
- ◆ How to form multilayer polymer melts
- ◆ Line layouts required to achieve products

Continued...

Co-Extrusion and Multilayer Structures

Core Course Content:

Processing Technologies: A review of all the polymer processing technologies and their capability to produce enhanced properties through combining different polymers.

Polymer Selection: A review of the current and novel polymers available for the use in co extruded and multilayer structures.

Product Design: How a structure can be designed for packaging, construction, automotive and medical applications.

Properties of Various Barrier Polymers: A comparison of the properties for various barrier polymers with an extended evaluation of the properties of EVOH for different applications.

Forming Multilayer Polymer Melts: The many types of extrusion dieheads are reviewed and the possibility of forming multilayer structures examined. The rheology of different materials is reviewed in relation to the principles of die design. Examples of theoretical modelling are provided.

Line Layouts: The implications of using multiple extruders is examined and the requirements made for control and ancillary equipment.

Quality and Process Control: How to be in control of the process and product for multilayer structures with practical SPC examples demonstrated. Start up and shut down procedures are given.

Possible Faults and Troubleshooting: The instabilities due to using multiple layers are considered. Potential defects in products are examined and linked to the end physical properties and quality control.

Time is given to delegates in the final session of the course to discuss their own specific application areas with Dr. Peter Cox.

Specific Applications

The Pipes and Blowmoulding course will concentrate on structures and processes for blowmoulding and manufacturing pipes/tubes from 1 mm in diameter, for medical applications, to large bore pipes. A practical case study is given for obtaining multilayer pipe to customer standards.

The Sheet and Film course will concentrate on products for packaging and medical applications including the use of films for MAP. Specific quality control methods for films are included.

Presenter: Dr. Peter Cox B.Sc. (Eng), DIC., C.Eng., MIMech.E., FIM

Venue: Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

Fee: £375.00 + VAT for each one day course, to include training manual, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Introduction to Rubber Technology

1st-2nd March 2011
18th-19th October 2011
Course duration -
Starts: Day One 08.45
Finishes: Day Two, 16.00

This course will provide a sound introduction to rubber materials and their properties. It covers the fundamental aspects of rubber technology in a logical manner, from Material Selection, Compounding, Vulcanisation, Processing (conversion of raw materials into finished products), through to Mechanical Properties, Environmental Resistance, Testing and Specifications, Evaluation of product failure and finally interactive case study exercises.

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

The objectives of the course are to increase the delegate's awareness of the important aspects of the technology, to appreciate, for example, how the properties of the products are influenced by material selection, compounding and processing.

At the end of the training course the delegate will be better equipped to:

- ◆ Ask the appropriate questions of suppliers, processors and end-users.
- ◆ Assess material specifications for suitability to an application.
- ◆ Estimate how differences in service environment may affect product performance.
- ◆ Have an appreciation of the range of elastomers and their uses and limitations

Who Will Benefit:

People who need a fundamental knowledge of rubber materials, for example

- ◆ Staff working in the rubber industry (e.g. for companies which mould rubber products or material suppliers) both newcomers and those who have no formal training.
- ◆ People from companies whose core business activities are outside the rubber industry, i.e. downstream users of rubber materials and components, who need an appreciation of rubber materials and how they are formed to be able to communicate confidently with their suppliers.

Course Content:

History of Rubber: A brief synopsis of events in the history of rubber.

Material Properties and Selection: How the molecular structure of natural and synthetic rubbers affect their properties and ultimate selection.

Compounding and Vulcanisation: The role of additives. The importance of vulcanisation. Optimising properties, processibility and costs. Getting the best from rubber.

Conversion: The processes involved in converting the raw materials into finished products including mixing

Continued...

Introduction to Rubber Technology

technology, extrusion, moulding and other processes. The processes are described and the important central parameters highlighted.

Environmental and Chemical Resistance: The environmental factors that have the potential to cause degradation of rubber compounds and the effects that heat agency has on the network and finished properties. Methods of protection are described.

Key Mechanical Properties: An appreciation of the static and dynamic behaviour of elastomers and the influence of service parameters such as temperature, strain rates and environment, viscoelasticity is described and its consequences on product performance examined.

Case Studies: Syndicate sessions on a range of problems designed to reinforce the core topics and give opportunity for discussion and debate.

Notes: All of the lectures are covered by comprehensive notes.

Benefits:

This will enable participating companies to:

- ◆ Liaise more effectively with suppliers and customer companies.
- ◆ Identify effective quality control procedures for materials and products.
- ◆ Look more effectively at optimising in-house processing methods.
- ◆ Identify areas of investigation for further product development programmes.

Companies can therefore evaluate the R & D, production, and purchasing activities to identify potential savings and guard against in-service failure. Furthermore, companies gain in-house skills that can be directed to developing products more competitively.

Presenters:

John Manley - Principal Rubber Consultant - Smithers Rapra

Gary Crutchley - Principal Rubber Consultant - Smithers Rapra

Fred Ngolemasango - Senior Consultant - Smithers Rapra

Mark Bentham - Polymer Processing Development Engineer - Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, UK SY4 4NR

Course Fee:

£550.00 plus VAT for 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Introduction to Silicone Elastomers

17th March 2011
20th October 2011

Course duration -
Starts: 09.30
Finishes: 16.30

The properties and processing of silicone elastomers are often very different from other elastomers.

This course is structured to provide an understanding and overview of the main types of silicone elastomer currently available and will give a comparison of chemical structure, manufacturers, grades, properties, compounding, processing and applications between each type.

Enough basic polymer science is included to understand these topics, and extensive use will be made of samples and other visual aids to assist. Reference is made to the place of silicone elastomers relative to other commercial polymers.

Course Objectives:

Delegates will gain a better understanding of the main types of silicone elastomer and will be able to compare structure, grades, properties, compounding, processes and applications of each type.

Who Will Benefit:

- ◆ Product designers, engineers, quality and technical support personnel, sales/marketing personnel
- ◆ Material suppliers, processors and manufacturers of finished and semi-finished products/components
- ◆ Anyone with an interest in Silicone Elastomers wishing to gain a better understanding of this material

Course Content:

Forward market trends, the impact of new material and process technology. Major types (HVs, RTVs, LSRs).

Modifications to basic MQ (VMQ, PMQ, PVMQ, FMQ, FVMQ), structure and properties.

Compounding and additives.

Processing (moulding, extrusion, coating, fabrication, curing), concentrating on aspects peculiar to silicone elastomers.

Commercial materials and grades.

Applications.

Future potential.

Presenters:

John Manley - Principal Rubber Consultant - Smithers Rapra

Gary Crutchley - Principal Rubber Consultant - Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£375 + VAT per person, to include extensive lecture notes, lunch and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Understanding Thermoplastic Elastomers

12th-13th April 2011
20th-21st September 2011

**Course duration -
Starts: Day One 09.15
Finishes: Day Two, 15.00**

The selection of the right TPE for a particular application can be difficult, with a wide range of materials to choose from. The move from vulcanised rubber or thermoplastic to TPE can also be a difficult decision in the first place.

This course is designed to provide an understanding of the main types of thermoplastic elastomer (TPE) available and will give a comparison of chemical structure, manufacturers, grades, properties, compounding, processing and applications between each type. Reference is made to the place of TPEs relative to vulcanised rubber and thermoplastics and the future potential for these materials.

Enough basic polymer science is included to understand these topics and extensive use is made of visual aids to assist.

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

Delegates will gain a better understanding of the main types of TPE available and will be able to compare the chemical structure, grades, properties, compounding, processes and applications of each type.

Who Will Benefit:

- ◆ Product designers, engineers, quality and technical support personnel, sales/marketing personnel
- ◆ Material suppliers, processors and manufacturers of finished and semi-finished products/components
- ◆ Manufacturers considering TPEs as a replacement for vulcanised rubber
- ◆ Anyone with an interest in TPEs wishing to gain a better understanding of the subject

Course Content:

The place of TPEs relative to vulcanised rubber and thermoplastics.

Basic polymer science, relevant to understanding TPE structures, properties and processing.

Styrenic block copolymers: SBS, SIS, and SEBS, and functionalized SEBS.

Thermoplastic polyurethanes (TPU).

Copolyesters.

Olefinic rubber/ thermoplastic blends: EPR/PP and EPDM/PP (TPO).

TPE blends with a dynamically vulcanised phase: EPDM/PP, NBR/PP, and NR/PP (TPV).

Copolyamides.

Future developments and potential for TPEs.

Summary and course review

Presenter:

Dr Roger Morgan, Roger Morgan Consulting

Venue: Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 plus VAT for 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Polyurethanes: An Introduction - Science, Applications, Technology



This course will provide a simplified explanation of the manufacture of polyurethanes, the generic chemistry by which they are all formed and how additives are used to achieve the modifications that give us the wide range of properties that make these materials so versatile.

The unique structure of the polyurethanes supply chain will also be explained in relation to the process stage and application.

The course is intended as an introduction for people who are either newcomers to the PU industry or whose core business lies outside PU manufacture who supply into or purchase from PU manufacturers and require a reasonable technical appreciation of the industry.

This course can also be used as a preparation for people intending to join the higher level 'Understanding Polyurethanes' seminar.

10th - 11th May 2011

1st-2nd November 2011

Course duration -

Starts: Day One 09.00

Finishes: Day Two, 16.00

Attendance on this course can also contribute credits towards an MSc in Polymer Engineering Design

Course Objectives:

As a result of attending the course, participants will gain:

- ◆ An appreciation of versatility of Polyurethane materials
- ◆ A grounding in the basic chemical building blocks used to produce the PU product range
- ◆ An appreciation of the major role that additives play in determining product characteristics
- ◆ An insight into the various technologies required to produce the final end-user products
- ◆ An overview of the environmental impact of PU processing and materials

Who Will Benefit:

- ◆ Newcomers to the PU industry or those who have had no formal technical training in, or prior knowledge of, PU – typical positions include:
 - Junior processing technicians
 - Analysts
 - Quality control / quality assurance technicians
 - EHS practitioners
- ◆ Managers and professionals in areas such as sales, marketing, purchasing and other roles where a knowledge of PU materials and processing technologies would improve confidence and communication with customers, suppliers and colleagues.
- ◆ Suppliers to the PU industry themselves, whether it be raw materials or engineering or machinery.
- ◆ PU Systems end-users (foamers, extruders): production managers, engineers.
- ◆ Non-PU polymer industries: technical/ business managers who want a basic insight into the technical practicalities of PU Manufacture.

Course Content:

What is a polymer? A generic introduction.

What are Polyurethanes? An overview of this highly versatile polymer, its products and applications.

Continued...

Polyurethanes: An Introduction

- Science, Applications, Technology

The basic science that makes the applications work!

- ◆ A very concise but important overview of the (complex) chemistry involved and the various basic building blocks that are required to produce the wide range of products, both thermosetting and thermoplastic.
- ◆ How molecular structure affects the properties of these materials.

Quality Control Techniques: for measuring consistency of these products

The Structure of the PU Supply Chain – Chemical Packages, Systems Houses and Customers: an explanation of the structure of the PU Supply Chain: e.g. the chemical manufacturer, the systems house, the manufacturer or the end user and the economic and logistical factors that impact upon the ‘chemical package’ that the customer purchases.

Additives: The function of additives: blowing agents (including water), catalysts, surfactants, UV stabilizers and antioxidants, cell modifiers, flame retardants and others which help to determine and control the properties of PU materials.

Processing & Quality Control Techniques:

- ◆ Key processing criteria
- ◆ Machines
- ◆ Selected applications

Thermoplastic polyurethane elastomers

Adhesives, Coatings, Sealants, Elastomers

PU and the environment:

- ◆ Environmental Agencies, considerations
- ◆ Recycling (end of use) opportunities

Presenters:

Martyn Bentley CChem MRSC, MIOM - Cromar Solutions Ltd

Colin Tweedale MSc, CChem, MRSC – Associate PU Consultant to Cromar Solutions Ltd

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 + VAT per delegate for 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

BRRPA Members receive 20% discount.

Medical Device Regulation - Essential Requirements and Material Selection

14th-15th June 2011
15th-16th November 2011
Course duration -
Starts: Day One 09.00
Finishes: Day Two, 15.30

This Course is provided to give product designers and developers an understanding of the underlying principles of medical device regulations and their requirements for medical device design and to then apply these requirements when identifying plastics materials that are suitable for use with medical devices. A detailed overview of the EU Medical Device Directive 93/42/EEC is given and the technicalities of its compliance explained. The use of polymers as medical devices is considered in terms of design and material selection. The course modules also focus on material testing requirements and look to the developments in ISO 10993 Biological Evaluation of Medical Devices where new standards are provided which allow alternatives to traditional animal testing.

Course Objectives:

To enable delegates to apply the requirements of medical device regulation to plastics materials selection.

Who Will Benefit:

This course is intended for technical, design, research or engineering personnel who conduct, or have responsibility for, the design and material selection for medical devices and/or have responsibility or input into Medical Device CE marking.

This course is equally applicable to Regulatory and Quality personnel who have a responsibility for product regulatory submissions and require an understanding of the technical aspects of material selection and proof of function and safety.

Course Content:

History and Overview of the EU Medical Devices Directive (MDD)

An introduction to the European New Approach Directives and a brief history of the Healthcare and specifically the Medical Devices Directive introduction.

Structure of the MDD, Key Annexes and Articles

A description of the 3 main sectors within the Directive, explaining differences and relation between Recitals, Articles and Annexes, and how Conformity Assessment can be achieved for a device depending upon its intended use. The Conformity Assessment process will introduce the requirements for Technical Aspects of the device.

Annex 1 - Essential Requirements

A review of all the Essential Requirements - Annex I - which may be applicable to the medical device, and how the Essential Requirements can be used as a designers checklist.

Material Specific Essential Requirements

A focus of a selection of the Essential Requirements which are specifically aimed at medical device material selection, proof of function and proof of safety when used in contact with a patient.

Classification and Conformity Assessment

Describes the rules for classifying medical devices, which can significantly affect the amount of design work required in respect of the product. The Conformity Assessment Route results from the device classification and impacts on the amount of data, including design data, which has to be provided to and reviewed by the Notified Body for certification and ultimately CE Marking.

Plastics in Medical Device Design

An overview of the main plastics materials types and their properties and how these are affected by:

- ◆ The structural design of the device the required duration of the device

Continued...

Medical Device Regulation - Essential Requirements and Materials Selection

- ◆ The chemical resistance issues associated with its intended use.
- ◆ Sterilization methods
- ◆ Solvent bonding of like and dissimilar plastics and the toxicological issues associated with this.

Assembly of Medical Devices

A review of modern assembly techniques that are suitable in the design of medical devices. Emphasis is given to minimizing part count and reducing assembly costs.

Sterilization and Material Selection

Matching a plastic medical device to a suitable sterilization technique is important to ensure the long term durability of the device. The influence of different sterilization techniques on plastics is explored and the implications explained for material selection.

Structure and Key Clauses of ISO 14971 - Medical Devices Risk Management

A detailed review of the updated standard - ISO 14971 - Medical Device Risk Management - and how Risk Management is a key aspect of both the Technical Review by the Regulatory Authorities and Quality System.

Key Steps in Conducting Risk Analysis

A detailed insight into the structure of the risk management standard, how to conduct a risk analysis and how risk management should be conducted throughout the lifetime of the device.

Assessing Toxicological Risk - Introduction to Biological Evaluation of Medical Devices - ISO 10993-1 & US FDA requirements

An overview of the recognized standards for biological evaluation of medical devices - ISO 10993 - demonstrating how the standards should be used, and also highlighting differences between EU and US requirements.

Harmonized Standards

An understanding of the Technical Standards that have been developed to assist Medical Device Designers to demonstrate compliance to the medical device directives and provide an understanding of the hierarchy of the standards which should be considered.

ISO 10993 Part 18 and its Part in the Process of Materials Selection

How to use chemical analysis to establish biological safety data.

Technical Documentation Compilation

A summary of how to compile all the Technical Documentation / Design Dossier into a format that will be expected by the Regulatory Authorities for review and approval.

Presenters:

Tom Donnelly - Medicom Consulting

Paul Shipton - BSc., Phd.

Venue: Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£550.00 + VAT for the 2 day course, to include lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Introduction to Extractables & Leachables Testing



19th May 2011
17th November 2011

Course duration -
Starts: Day One 09.00
Finishes: Day One, 17.00

This course will give participants an understanding of how polymeric materials are used in pharmaceutical products and how additives and other materials related to those polymers i.e. the extractables and leachables, may be of concern or risk to the patient.

The course will also cover the regulatory aspects and requirements relating to E & L, and will highlight some of the guidelines developed to assist medical companies in defining strategy and limits for testing.

Analytical methodology, instrumentation and sample preparation will be discussed and the basic steps required for performing an E & L study will be described, including stability plans and method validation. Case studies will be used to demonstrate the processes involved.

Course Objectives:

Participants will receive the information to be able to:

- ◆ Understand exactly what information can be gained from the various tests
- ◆ Decide whether E & L tests are necessary for their products, in consideration of legislation and best practice guidelines
- ◆ Make the best use of the information obtained from test results

Who Will Benefit:

People involved in or with medical device manufacture who require an understanding of why and when extractables and leachables testing is required and how this can be achieved, for example:

- ◆ Project Managers
- ◆ Production Management
- ◆ Component Device Engineers
- ◆ Quality Assurance/Regulatory Affairs Managers
- ◆ Purchasing

Course Content:

Background to Polymers

- ◆ Discussion of polymeric and elastomeric materials available for use, and where and why the various polymers are used.
- ◆ Polymer additives, potential impurities and the reasons for their presence.
- ◆ Review of polymer processing

Regulations and Guidelines

- ◆ Why we are interested in extractable and leachables
- ◆ Why we have to test for extractable and leachables
- ◆ Regulatory standpoints and requirements
- ◆ Working groups and guidance documents

Introduction to Extractable and Leachables

- ◆ Definition of extractables and leachables
- ◆ How extractable compounds become leachables

Continued...

Introduction to Extractables & Leachables Testing

- ◆ Factors affecting the migration of compounds

Analytical Techniques & Approaches:

- ◆ Component review & selection of critical parts
- ◆ Aim of extractable study
- ◆ Extraction methods, including solvent choice and sample preparation techniques.
- ◆ Analytical techniques overview:
 - o Gas chromatography mass spectrometry (GC-MS)
 - o Liquid chromatography mass spectrometry (LC-MS/UV)
 - o Non volatile residue (NVR)
 - o Fourier transform infra spectroscopy (FT-IR)
 - o Inductively coupled plasma atomic emission spectroscopy (ICP-AES).
 - o Extractable study case studies
 - o Laboratory tour

Leachable Method Development & Validation

- ◆ Leachable method development:
 - o Selection of extractable / leachable compounds
 - o Development of leachable analytical methods
- ◆ Leachable method validation:
 - o Aim
 - o Guidance / standard review
 - o Validation parameters discussion
 - o How to execute validation
 - o Validation case studies
- ◆ Leachable studies:
 - o Stability storage overview
 - o Leachable time point analysis

Course Presenters:

Tim Hulme, Principal Pharmaceutical Consultant, Smithers Rapra; Michael Creese, Senior Consultant, Smithers Rapra; Donna Howells, Principal Consultant, Smithers Rapra; Helen Lewis, Principal Consultant, Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£375.00 plus VAT, includes lecture notes, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering, 15% discount.

Rapra Limited Members receive standard Membership Discounts.

An Introduction to Protecting Innovation Using Patents

7th April 2011

27th October 2011

Course duration -

Starts: 08.45

Finishes: 16.30

A patent is an intellectual property right (IPR) which protects an invention. A patent can provide a legally enforceable monopoly over a new product or process for up to 20 years. Thus it is potentially of enormous value to your business. A patent owned by a competitor can pose a threat to exploitation of new products or processes developed by your company.

Companies face many hurdles in identifying inventions that they have developed, obtaining patents on those inventions and making efficient use of those patents in order to maximise the competitive advantage they can provide. They also face many hurdles in identifying and avoiding third party patents that can threaten their business.

This course will provide participants with a good understanding of the value of patents, their ownership, how to get them, how to make best use of them and how to avoid or attack them.

Course Objectives:

After attending the course, participants will have a good understanding of:

- ◆ The value of patents and how they enhance the competitive advantage of innovation
- ◆ How to identify inventions that might be patentable
- ◆ How to get a patent
- ◆ Who owns an invention and who owns the patent
- ◆ The scope of a patent and what patent infringement is
- ◆ Threats posed by third party patents
- ◆ Who to go to for help and advice

Who Will Benefit:

This course is intended for people who want to improve their understanding of patents as intellectual property rights (IPRs).

It is particularly relevant to those involved in improving the competitiveness of businesses through new product or process development, those responsible for managing research or new product/process development or those directly involved in researching or developing new products and processes.

Course Content:

Types of intellectual property: patents, trade marks, designs, copyright, trade secrets.

Definition of a patent as monopoly, the nature of the patent bargain.

Value of patents (to companies and stakeholders) case studies.

Continued...

An Introduction to Protecting Innovation Using Patents

How to read a patent document (sections, as technical reference, or legal document). Examples of real patents.

Inventions and patentable inventions.

How to recognise an invention, features of an invention, novel and inventive features.

Patentability, exclusions from patentability, other requirements of an invention.

How to get advice and help. How to keep costs down.

How to get a patent (procedure, drafting applications, important points to consider).

International patent protection.

Patent protection in depth and breadth: patent strategies and patent portfolios.

Third party patents and how to attack a patent.

Scope of a patent and infringement.

Making patents work for your company: selling, enforcing, policing, licensing, transfer of technology.

Presenters:

James A. Knowles BSc., PhD. - Chartered Patent Agent, European Patent Attorney and European Trade Mark Agent

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£375.00 + VAT, to include course manual, lunches and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

Introduction to Food Contact Materials - Products, Regulations and Testing



12th May 2011

24th November 2011

Course duration - 1 day

Starts: 09.00

Finishes: 17.00

This course will give participants an understanding of how polymeric materials are used in a wide range of food contact products (e.g. packaging, processing equipment, cooking utensils etc) and which additives, monomers and other constituents from these materials need to be considered with respect to migration into food.

The course will also provide an overview of the food contact regulations that are in place in both Europe and the USA, how these regulations impact on the various classes of food contact materials and what regulatory changes are to be expected in the future.

Migration testing is vital to ensure compliance with the regulations and the analytical methodology, instrumentation and sample preparation for the range of specific and global migration testing that is necessary to assess the safety of food contact materials will be described to assist attendees' understanding of why specific tests are undertaken and what they can achieve.

Food contact materials is an area where many technological developments are taking place to improve food safety (e.g. active and intelligent packaging). Some of these developments will be highlighted along with possible future trends in the industry.

Course Objectives:

Participants will receive the information to be able to:

- ◆ Appreciate the roles and functions that polymeric materials play in food contact materials.
- ◆ Target the regulations required for their products
- ◆ Understand the role that migration testing plays in regulatory approval
- ◆ Make informed decisions when developing new products
- ◆ Make the best use of the information obtained from test results

Who Will Benefit:

Products based on polymeric materials (plastics, rubbers, resins etc) are used in all areas of the food industry and people in various sectors (manufacture, packaging, retailing and catering etc.) need to have an understanding of the roles and functions that they have, the regulations that apply and the testing that needs to be conducted to ensure regulatory compliance. For example:

- ◆ Packaging Product Designers
- ◆ Food Scientists and Technologists
- ◆ Food Processing Engineers
- ◆ Product Development Technologists
- ◆ Technical Service Managers
- ◆ Purchasing and procurement personnel

Course Content:

Background to Polymers and Polymer Processing

- ◆ Nature of polymers - thermoplastics, rubbers and thermosets
- ◆ Additives used in food contact polymers and polymer compounding
- ◆ Review of polymer processing and compounding
- ◆ Review of manufacturing techniques for food contact articles

Continued...

Introduction to Food Contact Materials - Products, Regulations and Testing

- ◆ **Classes of Food Contact Polymers and their Potential Migrants**
 - Overview of polymers and polymer products
 - Overview of potential migrants
 - Materials covered: *Plastics, Rubbers and Thermosets; Thermoplastic elastomers; Silicone materials - rubbers, resins, fluids and pastes; inks and coatings; adhesives; other polymers, e.g. regenerated cellulose, recycled plastics; ion exchange resins; paper and board; other non-polymeric materials, e.g. metals, ceramics, glass; laminate materials; active and intelligent materials and articles.*
- ◆ **Food Contact Regulations**
 - EU Regulations
 - Council of Europe Regulations
 - FDA Regulations
 - National Regulations
 - Other relevant documents, e.g. Water regulations in the UK
 - Future direction of regulations
- ◆ **Assessing the Safety of Food Contact Materials**
 - Global migration tests - *Fatty food stimulants; Aqueous food stimulants*
 - Specific migration tests 1 - *Analytical approaches and techniques*
 - Techniques used for the fingerprinting of potential migrants
 - Determination of specific species in food stimulants and food products - *Analysis of food stimulants; Analysis of food products*
 - Quality control of testing regimes
 - Toxicological assessment of migrants
 - Computer modelling of migration
- ◆ **Improving the Safety of Food Contact Materials and Future Trends in Food Contact Materials**
 - Active packaging
 - Intelligent packaging
 - Nanotechnology
 - Barrier coatings
 - Developments in additives, including: *Antibacterial additives, non-or low migratory additives, additives that give non-toxic breakdown/reaction products*

Presenters:

Tim Hulme BSc., MSc., CSci, CChem, MRSC, FRMS, - Principal Consultant, Smithers Rapra
Martin Forrest MSc., PhD., AMMMI - Principal Consultant, Smithers Rapra
Michael Creese BSc., MRSC - Senior Consultant, Smithers Rapra

Venue:

Smithers Rapra, Shawbury, Shropshire, SY4 4NR, UK.

Course Fee:

£375.00 + VAT per person, to include extensive lecture notes, lunch and refreshments.

Discounts given for multiple registrations: 2 delegates registering 10% discount, 3 or more delegates registering 15% discount.

Rapra Limited Members receive standard Membership Discounts.

SEMINAR: Understanding Polyurethanes - Formulations and Applications



4th-6th October 2011

This seminar has been developed for both newcomers to the industry and specialists wishing to enhance their understanding of other application areas of PU. Now an annual event, the seminar attracts a wide audience from Europe and beyond. In addition it provides a forum for interaction between materials manufacturers, converters and end-users.

Programme Structure:

The seminar programme is arranged to allow delegates whose interest lies in a particular production sector to attend for that day only, if they choose, or for any combination of days.

Days one and three are dedicated to the applications of polyurethanes and their respective general formulations. Flexible and Rigid foams will be discussed on day one and Coatings, Adhesives, Sealants & Elastomers on day three.

Day two will describe in more detail the different major components, what constitutes all the other possible components used to formulate the polyurethane, how they are produced and why one (or different combinations) would be used rather than another.

Attend all 3 days to get a full overview of all aspects of polyurethane raw materials, chemistry formulations and applications and why they are used.

Attend Day One to get an up-to-date overview of the flexible and rigid foam market and technology and general formulations for the different types of foams.

Attend Day Two to get a full understanding of the chemistry and production of the major urethane raw 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.

Attend Day Three to get an understanding of the relatively smaller but much more complex CASE (Coatings, Adhesives, Sealants and Elastomers) urethane market and technologies and the formulations utilised for many of the different CASE applications.

Course Leader:

Dr Jim O'Connor, SynUthane International Inc.

Prior to joining 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 PhD 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.

Seminar Venue:

Smithers Rapra, Shawbury, Shropshire, UK SY4 4NR

Seminar Fees:

Early Bird discount - there will be a discount of 10% off the basic delegate fee, for any registrations received before: 12th August, 2011. Fee includes lecture notes, lunches and refreshments, accommodation not included.

	Fee before 12 August	Fee from 12 August
Attendance fee for single day	£270	£300
Attendance for 2 days	£450	£500
Attendance for 3 days	£585	£650

Discounts given for multiple registrations: 2 or more delegates registering, 10% discount.

MSc Polymer Engineering Design

As a result of Smithers Rapra's longstanding collaboration with Wolverhampton University's Department of Engineering and Technology in the School of Technology (STECH), many of our courses now provide a direct pathway to an MSc in Polymer Engineering Design.

Courses have developed out of Smithers Rapra's expertise in industrial problem-solving and are structured to meet the needs of people involved in the design, development or production of products made from plastics or rubber. Underpinned by the University of Wolverhampton's state-of-the-art facilities for rapid manufacturing and prototyping at its Telford Campus, the MSc in Polymer Engineering Design is a must for anyone seeking professional development in this sector. Offering a flexible and convenient mode of study, the programme has been designed to support people who wish to study full or part-time; the exact course content is based on relevance to your working environment and/or future career.

The MSc will be achieved by completion of a programme of study which includes Smithers Rapra courses, together with further study units provided by the University at its Telford Campus. Part time study of an MSc would normally take 2-3 years to complete.

What are the aims of this award?

- ◆ Participants gain an in-depth and up-to-date understanding of the technologies and techniques used by today's most successful manufacturers of polymer-based products
- ◆ Participants will be able to critically evaluate how a modern manufacturing organisation (such as their own) could exploit these technologies
- ◆ Participants will pick up knowledge, skills and expertise that will contribute to their Continuing Professional Development (CPD)

The Smithers Rapra courses that contribute to an MSc in Polymer Engineering Design:

Each of the courses below can be taken as a 2-day 'stand alone' short course, or, for people wishing to enroll for the MSc and undertake further study and examination with Wolverhampton University, attendance can count towards an MSc in Polymer Engineering Design.

- ◆ Plastics Materials and Products
- ◆ Plastic Product Design
- ◆ Understanding Thermoplastic Elastomers
- ◆ Plastics Injection Moulding Technology
- ◆ Plastics Injection Mould Design
- ◆ Exploring Plastics Extrusion
- ◆ Introduction to Rubber Technology
- ◆ Polyurethanes: An Introduction, Science, Applications, Technology

Continued...

MSc Polymer Engineering Design

What are the entry requirements?

Participants should be educated to Honours degree level (minimum of 2.2) in an engineering, technology or science related subject.

Consideration will be given to non-standard applications based on qualifications and relevant industrial experience on an individual basis.

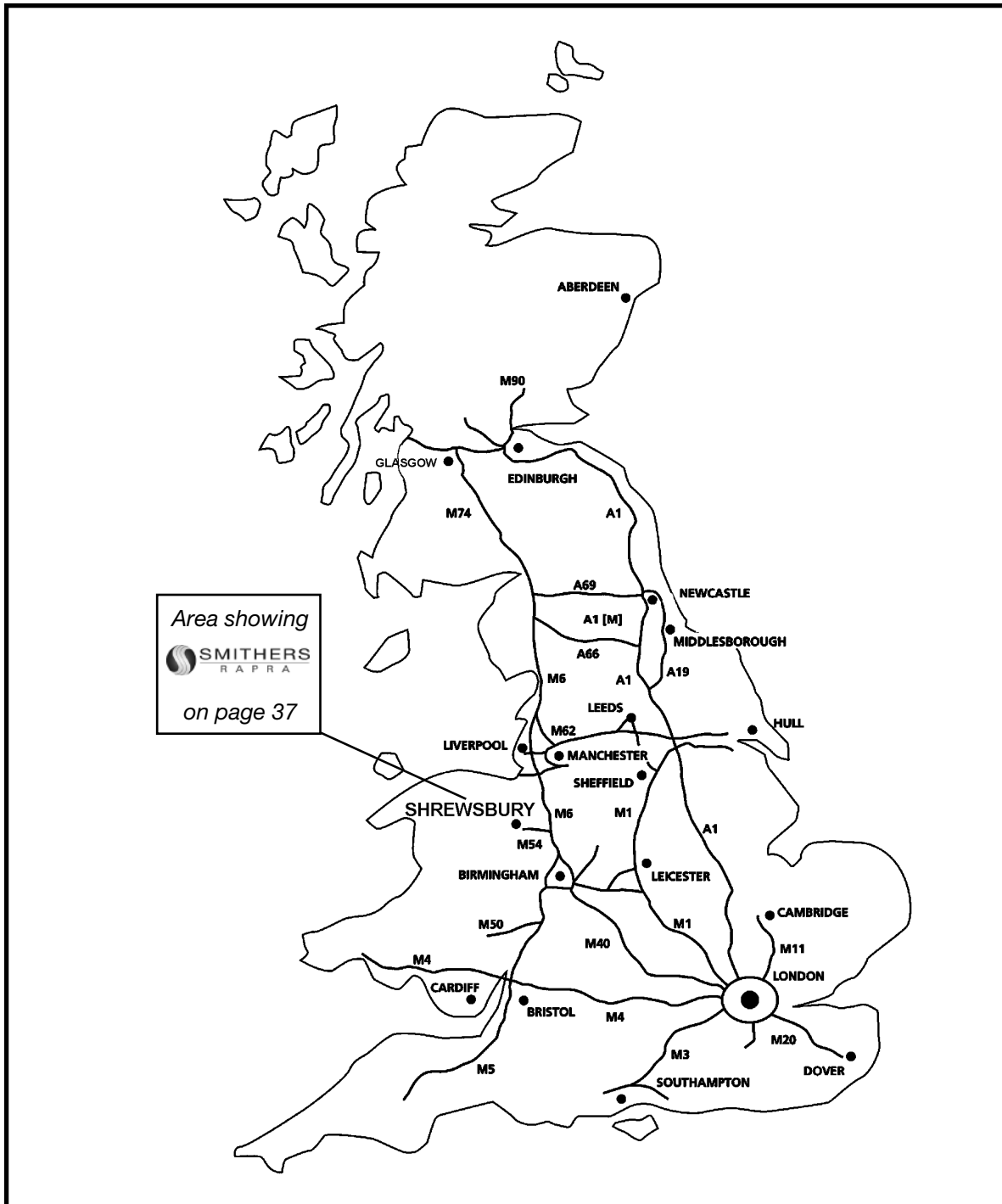
In particular, non-standard entrants must be able to prove that they are in, or have held, a position within an organisation where they are, or were, operating at a level expected of an experienced professional manager or technologist, i.e. in a technical or managerial role, where key decision-making and/or analytical judgements are made concerning the operations of the organisation.

People wishing to make their short course study count towards the MSc in Polymer Engineering Design should contact Wolverhampton University to register for the MSc programme.

Intermediate Awards will also be available for those who do not wish to complete a full programme of study to MSc., i.e. a Postgraduate Certificate (PgC) or Postgraduate Diploma (PgD).

For further information contact: **sebe-enquiries@wlv.ac.uk** or view **<http://www.wlv.ac.uk/sebe>**

Location of Smithers Rapra, Shawbury, Shropshire



Shawbury, Shrewsbury, Shropshire SY4 4NR, UK
Telephone: +44 (0)1939 250383
Fax: +44 (0)1939 251118
<http://www.rapra.net>

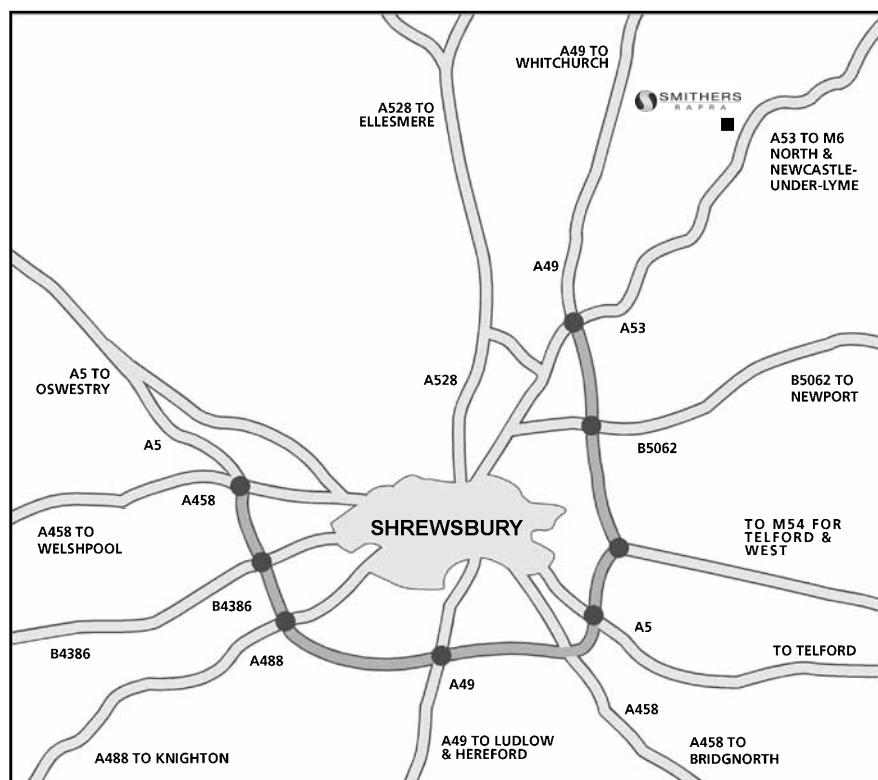
How to get to Smithers Rapra, Shawbury, Shropshire

By Road Travelling from London or Birmingham, leave the M6 at junction 10A to join the M54. Follow the M54 to a roundabout which joins the A49 and take the right turn signed A49 Whitchurch. Go straight over the next roundabout, and at the second roundabout turn right for A53 signed Newcastle-Under-Lyme. Follow the A53 to Shawbury. You will see Smithers Rapra clearly on the left as you approach the village.

Travelling from Manchester or the North, leave the M6 at junction 15 and follow the A53 to Shawbury. Go through the village following the signs for Shrewsbury. You will see Smithers Rapra on the right as you leave the village.

By Rail Shawbury is approximately 7 miles from Shrewsbury Station and 15 miles from Telford station. Regular rail services run from Birmingham (hourly intervals) and London Euston (3 hourly intervals) but passengers are required to change trains at Wolverhampton. There are services from most other parts of the country, usually via Crewe, but these are not as frequent or direct. Taxis are available at both stations.

By Air Shawbury is less than one and a half hours drive from Birmingham International and Manchester airports, or Liverpool (John Lennon) airport. Those arriving at London Heathrow or Gatwick may travel by underground to Euston Station and then by rail to Shrewsbury or fly to Manchester and then travel by rail.



Registration Conditions

Registrations can only be accepted if made in writing, by fax, post or on our secure website www.rapratraining.com

Provisional Bookings Please contact the Training Administrator to make a provisional booking. To secure your place written confirmation must be received within 10 days of the provisional booking being made.

Payment must be received prior to attending the course. The course fee includes lecture notes, lunches and refreshments.

Accommodation is not included in the course fee, Smithers Rapra has negotiated special rates with several hotels in the vicinity. Details will be sent on confirmation of booking. Delegates are requested to make their own reservation

Joining instructions i.e. letter of confirmation, directions to Smithers Rapra, and hotel information will be sent on receipt of your registration. Please contact the training administrator if you have not received these within 7 days of your registration.

Cancellations and Transfers Please note, we endeavour to accommodate our delegates' requests, however, most of our courses have limited numbers to maximise the interactivity between delegates and tutors. Cancellations or transfers at late notice may jeopardise the commercial viability of the course. For this reason we are obliged to charge the following administration fees or surcharges:

Cancellations made up to 14 days or more before the requested course date will be refunded less a 20% administration fee.

Requests to transfer made up to 14 days or more before the requested course date will be accommodated, *subject to availability of places on the new course date and transfer conditions, see below.*

Cancellations and requests to transfer made within 14 days of the course date will be subject to the FULL course fee and no refund will be given.

Transfer Conditions

All requests to transfer must be confirmed in writing by the delegate requesting the transfer, or their booking representative.

The option to transfer can be used only once, after which non-attendance will be treated as a cancellation and all outstanding invoices will be due.

Smithers Rapra cannot automatically guarantee a place on the next scheduled course date.

Delegate Substitutions can be made at any time without incurring penalty.

Amendments to Programmes Smithers Rapra reserves the right to cancel or modify any training event in its programme. In the event of a cancellation where an alternative cannot be provided, payment received in respect of that course will be refunded in full. The liability of Smithers Rapra is limited to reimbursement of the course fee.

Registration Form

Fax to

+44 (0)1939 251118

Please Print, Complete, Scan and email to: **training@rapra.net**

Please reserve a place on the Course:

Course Date:

Surname.....Title

Forename

Job Title/Position

Company

Contact Address

Address.....

.....

.....

.....

Telephone.....

Fax.....

Email.....

Invoice Address (if different)

Company.....

Address.....

.....

.....

Telephone.....

Fax.....

Email.....

Payment Information

Payment must be received prior to attending the course and can be made in £ Sterling, € Euro or \$US.

Please indicate in which currency you wish to pay. If no box has been ticked the default currency will be £ Sterling.

- £ Sterling
- € Euro (This will be applicable at the prevailing rate)
- \$US (This will be applicable at the prevailing rate)
- Please invoice my company - Purchase Order Number (if required)
- Cheque/Bank Transfer

- Credit Card Payment:
- MasterCard
- Visa
- American Express (please indicate)

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Expiry Date:

Signature

Name on Credit Card (in CAPITALS)

Security Number (as printed in signature box on reverse of card)

Return to:
Gill Tunncliffe, Training Dept, Smithers Rapra Technology Limited, Shawbury, Shrewsbury, Shropshire, SY4 4NR, United Kingdom.
Tel: +44 (0) 1939 250383 Fax: +44 (0) 1939 251118
e-mail: gtunncliffe@ismithers.net

www.rapratraining.com

Registration Terms: By completing and returning this form delegates are agreeing to be bound by conditions of registration. **NB. The Registration terms refer to the conditions on page 38.**



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 **SMITHERS**
iSmithers

Registration Form

Please Print, Complete, Scan and email to: training@rapra.net

Fax to

+44 (0)1939 251118

Please reserve a place on the Course:

Course Date:

Surname..... Title

Forename

Job Title/Position

Company

Contact Address

Address.....

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Telephone.....

Fax.....

Email.....

Invoice Address (if different)

Company.....

Address.....

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Telephone.....

Fax.....

Email.....

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- £ Sterling
- € Euro (This will be applicable at the prevailing rate)
- \$US (This will be applicable at the prevailing rate)
- Please invoice my company - Purchase Order Number (if required)
- Cheque/Bank Transfer

- Credit Card Payment: MasterCard Visa American Express (please indicate)

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