

HISTORY OF THE INTENSIVE SHORT COURSE

Starting in 1987, versions of the intensive short course on Polymer Rheology and Processing have been presented by Prof. J. Vlachopoulos in Canada, Greece, Sweden, Venezuela, Mexico, USA, Finland, Czechoslovakia, Belgium, Brazil, Australia, Japan, Germany, Italy, Luxembourg, Spain, Netherlands, New Zealand and Abu Dhabi. Over 2000 polymer professionals have attended the lectures and provided their suggestions for improvement of the course content and the presentation style. The present international intensive short course will cover fundamentals, recent developments and will show how to use rheology to solve practical problems in the polymer industry.

LECTURER

Professor JOHN VLACHOPOULOS started teaching at McMaster University after receiving his doctorate from Washington University, St. Louis, Mo., USA. He served as department Chairman (1985-88) and he is currently Professor Emeritus of Chemical Engineering. He was on sabbatical research leave at I.K.T. Stuttgart, Germany (1975) and CEMEF, Ecole des Mines de Paris (now PARISTECH), Sophia Antipolis, France (1981-82, 1988-89). He is the author of more than 300 publications on polymer processing, rheology and computer aided methods. Over the years he has served as consultant to several hundred corporations. With his coworkers, he has developed commercially available software packages, including NEXTRUCAD and founded POLYDYNAMICS, INC. He has lectured in all five continents of the world. He received the 2001 Education Award of the Soc. Plast. Eng. (SPE) during the ANTEC in Dallas, Texas, the 2004 Distinguished Achievement Award of the Extrusion Division of SPE in Chicago, the Stanley G. Mason Award of the Canadian Society of Rheology (2007) and the Bruce Maddock Award of the Extrusion Division of SPE in Las Vegas (2014). He was the president of the Polymer Processing Society (PPS) 2005-2007. He is Fellow of the Canadian Academy of Engineering (FCAE) and member of several other professional associations (VDI, PEO, AICHE, CIC-CSChE, HSR, CSR-SCR).

Professor Vlachopoulos will be assisted by Dr. NICKOLAS D. POLYCHRONOPOULOS. Dr. Polychronopoulos has been working for Polydynamics Inc since 2007. He completed his PhD at the Univ. of Thessaly, Greece in 2016, in the area of polymers and composites. He is the author of 20 publications in peer-reviewed journals and conference proceedings and 4 book chapters. He is also co-author with J. Vlachopoulos of the recently published textbook "Understanding Rheology and Technology of Polymer Extrusion". He has presented lectures in Greece, Canada, Germany, Austria, France and Belgium.

For more information

www.polydynamics.com

GENERAL INFORMATION

REGISTRATION

- ❖ Tuition fee: 1295.00 EURO includes registration, book (paper) of lecture notes (over 400 pages), a new book (electronic and searchable) on polymer rheology and technology, the CALCUTRUDE LITE software, coffee and refreshments and two lunches.
- ❖ The number of participants is limited (maximum of 23) and it is therefore recommended that you register as early as possible.
- ❖ Companies may substitute a registered participant without notification, however, an advance notice would be greatly appreciated.
- ❖ For multiple registrations from the same corporation the tuition fee is reduced by 200 EURO per person. e.g. For 2 persons the fee will be: $2 \times 1295 - 2 \times 200 = 2590 - 400 = 2190$ EURO

CANCELLATION

An administration fee of 200 EURO will be charged for cancellations received two weeks before the course starts. After this date there will be no refunding of registration fees but full credit can be given for another person from the same company or full credit for the next international course. SUBSTITUTIONS MAY BE MADE AT ANY TIME.

VENUE & ACCOMMODATION

The short course lectures will be held at Hotel **NH BRUSSELS BLOOM**

Rue Royale 250-Koningsstraat 250, 1210, Brussels, Belgium.

Telephone: +32 2 220 66 11

www.nh-hotels.com/hotel/nh-brussels-bloom

For reservations call +34 91 398 46 64. All participants requiring accommodation must do their own reservations directly with the hotel. At printing time of this brochure, the rate per room was € 226 for June 10 and € 176 for June 11. Rates and availability may vary depending on the date of advance reservation. There are several other hotels within walking distance from NH Brussels Bloom and Polydynamics will provide recommendations, if requested.

PREVIOUS COMPANY REGISTRATIONS FROM EUROPE AND MIDDLE EAST (partial listing)

AUSTRIA: EREMA, BOREALIS, SENOPLAST KLEPSH & Co GmbH
BELGIUM: EXXON CHEMICAL, FINA RESEARCH, TESSENDERLO CHEMIE, ACE, HYPLAST, SOLVAY, VERBRUGGEN BOREALIS, SHELL RESEARCH, DSM, DPI, DECEUNINCK N.V., ETERNIT, MOBIL PLASTICS, LIMBURGSE VINYL, DEVRO TEEPAP, GUNZEPLASTICS, MONTELL, BASELL, BAXTER, EVAL, KHLIM, ATOFINA, DUPONT TEIJIN, CERTECH, BP SOLVAY, A. SCHULMAN PLASTICS, DUPONT DE NEMOURS, EXXONMOBIL, ATOFINA ELASTOMERS, SOLVAY ADVANCED POLYMERS, TOTAL, MILLIKEN, ORGIT, NITTO, ALKOR, DRAKA, PLASTIFLEX, BP HDPE, LEUVEN HGSCH, CABOT, COMMSCOPE, KABEL WERK EUPEN, INBEV COBREW, CLARIANT, TOTAL PETROCHEMICALS, POLYONE, NV BEKAERT SA, CLEAN POWER INVESTMENTS BVBA, UNIV. GHENT, NORDSON EDI, VECTOR PACKAGING
CZECHOSLOVAKIA: VUGPT, S.P. PLASTIKA, CHEMOSVIT CHEMOPETROL
CZECH REPUBLIC: BARLO PLASTICS, ARROW INTERNATIONAL
DENMARK: NKT ELECTRONIK, GRINDSTED PRODUCTS, OTTO NIELSEN, EMBAL, DTI, BANG & OLUFSEN, FIBERVISIONS, NOVO NORDISK, COLOPLAST, AALBORG UNIV
FINLAND: NESTE CHEMICALS, NOKIA, BOREALIS, OPTINOVA, NETROM OY, PREMIX OY
FRANCE: SF EXXON CHEMICAL, S.N. POUDES ET EXPROSIFS, MICHELIN, UNIV. ST. ETIENNE, PECHINEY, ELIOKEM, GOODYEAR CHEMICALS, LINPAC, ARCELOR, CLARIANT, TORAY PLASTICS, ARKEMA, AMN DPI, ECOLE MINES DE DOUAI, NEXANS RESEARCH, SOCIETE ROQUETTE, FAURECIA.
GERMANY: BASF, HOECHST, HENKEL, COROVIN, H. REINECKE GmbH, DOW, ROHM GmbH, KRAILBURG TPE, FELIX SCHOELLER, CLARIANT, BORSIG, BBA, FIBERWEB, BASELL, POLYPLAST MUELLER, ALBIS PLASTIC, EUROPEAN PATENT OFFICE, TESA SE, LUMNUS NOVOLEN
GREECE: EKO-CHEMICA, VOMVYKRYL A.E., COLGATE, MACEDONIAN PLASTICS, CIBA-GEIGY, PETZETAKIS, PLASTIKA KRITIS, NTUA, CARINA, M.P. EXTRUDERS
HUNGARY: MOL PLC
IRELAND: HOLFELD PLASTICS, CREGANNA MED. DEV
ISRAEL: POLYON BARKAI, TAMA PLASTIC, SHENKAR COLLEGE
ITALY: MONTEDISON, HIMONT ITALIA, SNIA TECHNOLIMERI, MONTEFLUOS SPA, MONTEDIPE SPA, ENICHEM, ELF ATOCHEM, VIADELO, POLIMERI EURO, MOBIL, CENTROCLULING MAT., BAUSANO, BARILLA ALIMENTARI, EVC ITALIA, ELECTROLUX, ZANUSSI, ICMA SAN GIORGIO, METZELER, PIRELLI, PONTELABRO, SEALED AIR, SACMI, SIPA, SOCIETA DEL GRES, TECNOMATIC, UNILROY MILACRON, AUSIMONT, SOLVAY-SOLEXID, TECHINT POMINI, SOLVAY-SOLEXIS, CEAST, COOP BOX, PROPLAST, INEOW FILMS, TECHNE, HABASIT ITALIANA, SOIJTZ, MAZER MATERIE PLASTICHE, EURONIL, MACCHI, API, RAPISARDA INDUSTRIES, AGRIPAK SRL, CHIORINO SpA, VERSALIS, SOLVAY SPECIALTY POLYMERS
LUXEMBOURG: DUPONT TEIJIN FILMS
NETHERLANDS: GENERAL ELECTRIC B.V., PHILIPS RESEARCH, DOW CHEMICAL B.V., DSM RESEARCH, FUJI PHOTO FILM B.V., AKZO, ELOCOAT, OCE NEDERLAND, TNO, MOBIL, ACORDIS, W&R PLASTICS, NV ORGANON, NB ETERNIT, NOVA CHEMICALS, DIOLEN, CORUS, COLBOND, SABIC EUROPE, PURAC BIOCHEM, TU DELFT, DEPRON NV, TOTAL CORBION, XPLORE INSTRUMENTS
NORWAY: STATOIL, SENTER FOR INDUSTRI FORSKNING, SINTEF, NORSK HYDRO A/S, BOREALIS, ELOPAK, NEXANS
PORTUGAL: INST. NAT. ENG. TECN. IND. BAQUELITE LIZ
QATAR: QATAR PETRO
ROMANIA: PRODPLAST
SAUDI ARABIA: YANBU PETROCHEMICAL CO, SABIC, AL JUBAIL PETRO, KING SAUD UNIVERSITY, TASNEE
SLOVENIA: UNIV. LJUBLJANA
SPAIN: REPSOL, MERQUINSA MERC, CHIM. INST. CIE TECH POL, AIMPLAS, GRUPO ANTOLIN, UBE ENGINEERING PLASTICS, FERRO PLASTICS, MAXAMCORP HOLDING
SWEDEN: ERICSSON TELECOM, LUND INST. TECH., ROYAL INST. TECH. (KTH), NESTE POLYETEN AB, BOHLIN REOLOGI, PGI, TETRAPAK, NOKIA, KABI PHARMACIA, ABB FERRING AB, DYNO NOBEL, BOREALIS
SWITZERLAND: EMS-CHEMICA AG, BP, NOKIA, MAILLEFER, BUHLER AG, DOW EUROPE, CIBA, OB ENTERPRIZE, BASF LIST AG,
TURKEY: GENTUG TEKSTIL, MIKROSAN
UAE: BOROUGE
U.K.: BATTENFELD GLOENCO, GOUGH ASSOC., SYMBOLIC SYSTEMS, ICI, STEWARTS & LLOYDS, RAYCHEM, BP SOLVAY PE, DUPONT TEIJIN FILMS, IMERYS MINERALS, LONDON METRO, MIRCOPOL LTD, TOTAL PETROCHEMICALS, CHEMIX, EASTMAN

81st International Intensive Short Course on POLYMER RHEOLOGY AND EXTRUSION

A Problem Solving Approach

JUNE 11-12, 2020

BRUSSELS BELGIUM

LECTURER JOHN VLACHOPOULOS POLYDYNAMICS INC.

REGISTRATION FORM
RHEOLOGY AND EXTRUSION
JUNE 11-12, 2020

(Please photocopy for additional registrations)

Name _____

Company Name & Mailing Address: _____

Telephone _____

Email _____

Highest Degree Earned _____

(B.Sc., M.Sc., Ph.D. and year earned)

Number of years experience
in polymer processing _____

Fees per person: 1295.00 EURO

MULTIPLE REGISTRATIONS from same corporation: reduce fees by 200 EURO per person

Cheque enclosed VISA

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Send by Post, Fax or Email as attachment to:
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For Bank Transfers, the account number etc.
will be included in the invoice.

**81st International
Intensive Short Course
on
POLYMER RHEOLOGY
and
EXTRUSION
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Brussels, Belgium**

WHO SHOULD ATTEND

Engineers, chemists, physicists, and managerial personnel involved with plastics extrusion, applied rheology, injection molding, blow molding, mixing and compounding, reactive processing, production of synthetic polymers, recycling and process equipment design and manufacturing will find this course beneficial. Engineers will gain an increased understanding of rheological behavior including the role of molecular structure and will learn some of the unique engineering problems associated with polymer extrusion. Chemists will learn about fluid flow and heat transfer involving polymers and troubleshooting of extrusion equipment. Managers will obtain an overview of the technical problems associated with plastics extrusion.

Everyone will benefit from learning problem solving techniques based on rheological characterization and polymer flow considerations.

**FOR INFORMATION ABOUT
POLYDYNAMICS, INC.
VISIT OUR SITE ON THE INTERNET
www.polydynamics.com**

PROGRAM OUTLINE

THURSDAY, JUNE 11, 2020

9:00 - 9:30 **Welcome & Registration**

9:30 - 12:30 **Introduction to Rheology**

Unusual rheological phenomena exhibited by polymer solutions and melts. The importance of rheology in polymer processing. Viscosity, melt flow index and melt strength and their relation to molecular weight distribution (MWD) and long chain branching (LCB). The role of temperature, pressure additives and fillers. Rheology of metallocene and biodegradable polymers.

12:30 - 14:00 **Lunch**

14:00 - 17:00 **Rheology for Process Optimization**

Shear and normal stresses. Viscoelasticity. Stress relaxation. Extensional viscosity. G' and G'' measurement and significance in polymer characterization. The role of rheology in mixing and blending. Rheological modifications by blending certain polymers. Determination of MWD from rheological measurements. Predicting processability from rheology. Viscosity of suspensions and composites. Rheology of nanocomposites. The role of rheology in additive manufacturing. Problem solving using rheology.

FRIDAY, JUNE 12, 2020

9:00 - 12:30 **Melt Flow Through Dies, Extrudate Swell, Die Lip Build-Up, Sharkskin/ Melt Fracture, Fountain Flow**

Unidirectional and multidimensional flows. Pressure drop and frictional heating (viscous dissipation). The mechanisms responsible for extrudate swell. Die lip build-up (drool) causes and remedies. Causes for the onset of sharkskin and gross melt fracture. The effects of adhesion and slip. The role of additives and processing aids. Flow through various types of extrusion dies (flat, spiral, pipe, profile). Flow in an injection mold cavity and fountain effect.

12:30 - 14:00 **Lunch**

14:00 - 17:00 **Extrusion and Troubleshooting**

Principles of solids conveying, melting, mixing and melt pumping in single screw extrusion (SSE). Simple formulas for calculation of output, power and torque. Screw design considerations and review of modern designs. Conventional versus barrier screws. Screws with mixing elements. Grooved feed extruders. Co-rotating and Counter-rotating twin screw extruders (TSEs). Mixing in TSEs. Problems associated with die extrusion and coextrusion. Surging, gels, screw and barrel wear, the role of moisture, interfacial instabilities, weldlines, MD flow lines and thickness non-uniformities. Systematic fault diagnosis and troubleshooting.

LECTURE NOTES AND SOFTWARE

Each participant will receive a paper copy of the annually updated book of LECTURES on POLYMER RHEOLOGY AND EXTRUSION. This book includes copies of all the presentation slides. Theory, detailed derivations of several important equations and numerous worked out problems, are included in a new book entitled "UNDERSTANDING RHEOLOGY AND TECHNOLOGY OF POLYMER EXTRUSION". A searchable electronic copy of the most recent edition of this book will also be provided to the participants. The book starts off with some basic concepts on polymers, followed by viscosity, flow analysis, viscoelasticity, rheological measurements and concludes with special flow considerations in single and twin screw extruders and extrusion dies. It is highly recommended for follow-up reading either as information sourcebook or for in-depth study. It is easy to follow with the mathematical level kept to a minimum. Several key references are also given for persons wishing to continue upgrading their knowledge and understanding. Whether you want practical problem solving information and trouble-shooting tips or you want to understand the importance of recent developments, you will find the above two books indispensable.

Each participant will also receive a copy of the CALCUTRUDE LITE software package which enables quick calculations of important polymer flow quantities, such as pressures, shear rates, shear stresses etc. in simple flow geometries. In the opinion of the lecturer Prof John Vlachopoulos, the best way to learn rheology is by doing calculations. But, calculations can be very tedious. CALCUTRUDE LITE takes the tedium out of the calculation process.

Question sheets will be distributed to the participants for self-evaluation of their learning progress during this intensive short course.

**Note: ENGLISH WILL BE USED IN ALL
LECTURES AND COURSE NOTES**

Questions, however, may be asked in German, French, Spanish, Italian or Greek.

Dr. Vlachopoulos will translate the questions and will give the answers in English for the benefit of everyone.

For course registration or other questions contact:

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