58th International
Intensive Short Course
on

POLYMER RHEOLOGY AND EXTRUSION

A Problem Solving Approach

FEBRUARY 23-24, 2006

BRUSSELS

BELGIUM

Special Rate for SPE Members

LECTURER

JOHN VLACHOPOULOS

POLYDYNAMICS INC.

REGISTRATION FORM

RHEOLOGY AND EXTRUSION

FEBRUARY 23-24, 2006

(Please photocopy for additional registrations)

Name _____

Company Name & Mailing Address:

_____

_____

_____

Telephone _____

Fax _____

Email _____

Highest Degree Earned _____
(B.Sc., M.Sc., Ph.D. and year earned)

Number of years experience
in polymer processing _____

Fees per person: 965 EURO

SPE Members: enter your
membership number here _____
and reduce fees by 100 EURO, to 865 EURO.

Payment by bank transfer ❑ VISA ❑
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Send me an invoice ❑

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CARDHOLDER NAME _____

SIGNATURE _____

Mail cheque and registration form to:

➥ POLYDYNAMICS INC.
34 Plaza Drive, P.O. Box 63067
Dundas, Ontario, Canada L9H 6Y3
Phone (905) 521-8815
Fax (905) 522-5004
Email pdisupport@polydynamics.com

Payment may also be made by bank transfer to: The Bank of Nova Scotia, University Plaza, 24 Plaza Drive, Dundas, ON, Canada L9H 4H4
Transit No. 90332 - Bank 002 - Account 00397-13

58th International Intensive Short Course on POLYMER RHEOLOGY and EXTRUSION

FEBRUARY 23-24, 2006

BRUSSELS, BELGIUM

WHO SHOULD ATTEND

Engineers, chemists, physicists, and managerial personnel involved with plastics extrusion, applied rheology, 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 behaviour 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.

PROGRAM OUTLINE

THURSDAY, FEBRUARY 23, 2006

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 structure. The role of temperature, pressure, additives and fillers. The Dow Rheology Index for Insite technology polyolefins. Rheology of metallocene polymers.

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

14:00 - 17:30 **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, such as LLDPE and LDPE. Determination of MWD from rheological measurements. Predicting processability from rheology. Problem solving using rheology.

FRIDAY, FEBRUARY 24, 2006

9:00 -12:30 **Melt Flow Through Dies, Extrudate Swell, Die Lip Build-up, Sharkskin and Melt Fracture**
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. Relation to molecular structure. Causes for the onset of sharkskin and gross melt fracture. The effects of adhesion and slip. The role of additives and processing aids. Recent theories and their application to process improvement.

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

14:00 - 17:30 **Extrusion and Troubleshooting**
Principles of solids conveying, melting, mixing and melt pumping in single screw extrusion. Simple formulas for calculation of Throughput, Power and Torque. Screw design considerations and review of modern designs. Conventional versus barrier screws. Screws with mixing elements. Dies for extrusion and coextrusion. Surging, gels, screw and barrel wear, the role of moisture, interfacial instabilities, weldlines, MD Flow lines, and thickness non-unifomities. Systematic fault diagnosis and troubleshooting.

LECTURE NOTES

Each participant will receive a copy of the annually updated book of lecture notes on POLYMER RHEOLOGY AND EXTRUSION. This fact-filled book includes copies of the presentation slides, theory, detailed derivations of several important equations and numerous worked out problems. It is highly recommended for follow-up reading either as a quick 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. It shows how to do simple calculations of shear rate, shear stress, pressure drop, temperature rise due to viscous dissipation, Rabinowitsch and Bagley corrections in capillary viscometry, wall slip velocity, flow throughput in extruders and much more. Whether you want practical problem solving information and troubleshooting tips or you want to understand the importance of recent developments, you will find this book indispensable.

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

Questions, however, may be asked in German, French, Spanish or Greek. Dr. Vlachopoulos will translate the questions and will give the answers in English for the benefit of everyone.

For further information contact:

Dr. John Vlachopoulos,
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Email: pdisupport@polydynamics.com

HISTORY OF THE INTENSIVE SHORT COURSE

Versions of the intensive short course on Polymer Rheology and Processing have been presented by Dr. J. Vlachopoulos and his co-workers in Canada, Greece, Sweden, Venezuela, Mexico, USA , Finland, Czechoslovakia, Belgium, Brazil, Australia, Japan, Germany, Italy, Luxembourg and Netherlands. Over 1,600 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

Dr. JOHN VLACHOPOULOS started teaching at McMaster University after receiving his doctorate from Washingon University, St. Louis, Mo., USA in 1968. He served as department Chairman (1985-88) and he is currently Professor of Chemical Engineering and Director of the Centre for Advanced Polymer Processing And Design (CAPPA-D). He was on sabbatical research leave at I.K.T. Stuttgart, Germany (1975) and CEMEF, Ecole des Mines de Paris, Sophia Antipolis, France (1981-82, 1988-89). He is the author of more than 200 publications on polymer processing, rheology and computer aided methods. Over the years he has served as consultant to several hundred corporations. With his co-workers, he has developed the commercially available POLYCAD®, SPIRALCAD, CALENDERCAD, FLATCAD, PROFILECAD, EXTRUCAD (renamed NEXTRUCAD), LAYERCAD,T-FORMCAD, B-FILMCAD, RHEO-MWD and XTRU-XPERT software packages and founded POLYDYNAMICS, INC. He has lectured in USA, Canada, South America, throughout Europe, Japan and Australia. He received the 2001 Education Award of the Soc. Plast. Eng. (SPE) during the ANTEC in Dallas, Texas and the 2004 Distinguished Achievement Award of the Extrusion Division of SPE in Chicago.

John Vlachopoulos is also coeditor of the "SPE Guide on Extrusion Technology and Troubleshooting" (2001). This book is available from SPE (www.4SPE.org)

The software packages have been licensed to several Fortune 500 corporations in the USA and many other large, medium and small companies in 27 countries around the world.

www.polydynamics.com

GENERAL INFORMATION

REGISTRATION

- Tuition fee: 965 EURO includes registration, lecture notes, coffee and refreshments and two lunches.
- The number of participants is limited 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 SPE members the tuition fee is 865 EURO.
- Non-members will receive one year SPE membership.

CANCELLATION

An administration fee of 100 EURO will be charged for cancellations received one week 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 in 2006 or 2007. SUBSTITUTIONS MAY BE MADE AT ANY TIME.

ACCOMMODATION

The lectures will be held at HOLIDAY INN BRUSSELS CITY CENTRE, Chaussée de Charleroi 38, 1060 Brussels, Belgium. Phone (+32) 2.533.66.66, (reservations phone (+32).2.533.67.36, Fax (+32).2.538.90.14). A block of rooms has been booked at 140 EURO per room per night, including breakfast. Occasionally, better rates might be obtained by Internet booking through www.ichotelsgroup.com. There are a lot of other hotels in Brussels city centre and Polydynamics can make alternate sugggestions. All participants requiring accommodation must do their own reservations with Holiday Inn directly and quote "Polydynamics booking" to receive the above mentioned reduced rate.

PREVIOUS COMPANY REGISTRATIONS FROM EUROPE AND MIDDLE EAST (Partial Listing:)

AUSTRIA:	EREMA
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 TEEPAK, 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, CERTECH, MILLIKEN, ORFIT, NITTO, ALKOR DRAKA, PLASTIFLEX, BP HDPE, ETERNIT, LEUVEN HGSCH, NITTO EUROPE, CABOT, COMMSCOPE
CZECHOSLOVAKIA:	VUGPT, S.P. PLASTIKA, CHEMOSVIT, CHEMOPETROL
CZECH REPUBLIC:	BARLO PLASTICS, ARROW INTERNATIONAL
DENMARK:	NKT ELEKTRONIK, GRINDSTED PRODUCTS, OTTO NIELSEN EMBAL., DTI, BANG & OLUFSEN, FIBERVISIONS
FINLAND:	NESTE CHEMICALS, NOKIA, BOREALIS, OPTINOVA, NEXTROM OY
FRANCE:	S.F. EXXON CHEMICAL, S.N. POUDRES ET EXPLOSIFS, MICHELIN, UNIV. ST. ETIENNE, PECHINEY, ELIOKEM, GOODYEAR CHEMICALS, LINPAC, ARCELOR, CLARIANT
GERMANY:	BASF, HOECHST, HENKEL, COROVIN, H. REINECKE GMBH, DOW, RÖHM GMBH, KRAILBURG TPE, FELIX SCHOELLER, CLARIANT, BORSIG, BBA, FIBERWEB, RED, BASELL
GREECE:	EKO-CHIMICA, VOMVYKRYL A.E., COLGATE, MACEDONIAN PLASTICS, CIBA-GEIGY, PETZETAKIS, PLASTIKA KRITIS, NTU, CARINA
IRELAND:	HOLFELD PLASTICS
ISRAEL:	POLYON BARKAI, TAMA PLASTIC
ITALY:	MONTEDISON, HIMONT ITALIA, SNIA TECNOPOLIMERI, MONTEFLUOS S.P.A., MONTEDIPE S.P.A., ENICHEM, ELF ATOCHEM, VIADELO, POLIMERI EURO., MOBIL, CENTROCUL ING. MAT., BAUSANO, BARILLA ALIMENTARI, EVC ITALIA, ELECTROLUX, ZANUSSI, ICMA SAN GIORGIO, METZELER, PIRELLI, PONTELAMBRO, SEALED AIR, SACMI, SIPA, SOCIETA DEL GRES, TECNOMATIC, UNILOY MILACRON, AUSIMONT, SOLVAY-SOLEXID, TECHINT POMINI, SOLVAY-SOLEXIS, CEAST, COOP BOX, PROPLAST
LUXEMBOURG:	DUPONT TEIJIN FILMS
NETHERLANDS:	GENERAL ELECTRIC B.V., PHILIPS RESEARCH, DOW CHEMICAL B.V., DSM RESEARCH, FUJI PHOTO FILM BV., AKZO, ELOCOAT, OCE NEDERLAND, TNO, MOBIL, ACORDIS, W&R PLASTICS, NV ORGANON, NB ETERNIT, NOVA CHEMICALS, DIOLEN, CORUS
NORWAY:	STATOIL, SENTER FOR INDUSTRIFORSKNING, SINTEF, NORSK HYDRO A/S, BOREALIS, ELOPAK, NEXANS
PORTUGAL:	INST. NAT. ENG. TECN. IND., BAQUELITE LIZ
ROMANIA:	PRODPLAST
SAUDI ARABIA:	YANBU PETROCHEMICAL CO., SABIC, AL-JUBAIL PETRO, KING SAUD UNIVERSITY
SLOVAKIA:	BARLO PLASTICS
SLOVENIA:	UNIV. LJUBLJANA
SPAIN:	REPSOL, MERQUINSA MERC. CHIM, INST. CIE. TECH POL, AIMPLAS.
SWEDEN:	ERICSSON TELECOM, LUND INST. TECH, ROYAL INST. TECH. (KTH), NESTE POLYETEN AB, BOHLIN REOLOGI, PGI, TETRA PAK, NOKIA, KABI PHARMACIA, ABB, FERRING AB, DYNO NOBEL, BOREALIS
SWITZERLAND:	EMS-CHEMIE AG., BP, NOKIA MAILLEFER, BUHLER AG, DOW EUROPE
TURKEY:	GENTUG TEKSTIL
U.K.:	BATTENFELD GLOENCO, GOUGH ASSOC., SYMBOLIC SYSTEMS, ICI, STEWARTS & LLOYDS, RAYCHEM, BP SOLVAY PE, DUPONT TEIJIN FILMS, IMERYS MINERALS, LONDON METRO U., MICROPOL LTD., TOTAL PETROCHEMICALS