

HISTORY OF THE INTENSIVE SHORT COURSE

Versions of the intensive short course on Polymer Rheology and Processing have been presented (since 1987) by Prof. J. Vlachopoulos in Canada, Greece, Sweden, Venezuela, Mexico, USA, Finland, Czechoslovakia, Belgium, Brazil, Australia, Japan, Germany, Italy, Luxembourg, Spain and Netherlands. Over 1,800 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 Washington University, St. Louis, Mo., USA. He served as department Chairman (1985-88) and he is currently Professor Emeritus of Chemical Engineering and Past Director of the Centre for Advanced Polymer Processing And Design (CAPP-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 250 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, XTRU-XPRT and CALCUTRUDE 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 and the Stanley G. Mason award of the Canadian Society of Rheology (2007). He was the President of the Polymer Processing Society (PPS) 2005-2007, and member of several professional associations. Prof. Vlachopoulos' research work and expertise includes computer simulation of several processes, extrusion instabilities and defects, calendaring, die design, coextrusion, injection molding, thermoforming, rotational molding, powder particle coalescence, film blowing, plastic wood composites (WPC) extrusion and rheology of bioplastics.

The software packages have been licensed to several Fortune 500 corporations in the USA and many other large, medium and small companies in 29 countries around the world.
(NEXTRUCAD, FLATCAD, SPIRALCAD)
ADVANCE will be released in late 2012
www.polydynamics.com

GENERAL INFORMATION

REGISTRATION

- Total fee: US \$1243.00 includes registration, lecture notes, the CALCUTRUDE LITE software, coffee and refreshments and two lunches and 13% Harmonized Sales Tax (US \$ 143.00)
- 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.

CANCELLATION

An administration fee of US \$150.00 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 ANYTIME.

ACCOMMODATION AND VENUE

The lectures will be held at the WATERFRONT HOTEL, 2020 Lakeshore Road, Burlington, Ontario L7R 4G8. Phone 1-905-6815400 Fax 1-905-6815410, EMAIL: reservations@thewaterfrontdowntown.com WEBSITE: www.thewaterfrontdowntown.com. A block of rooms has been reserved, till one month before the course starts, at the WATERFRONT HOTEL, at a special rate of CAD \$121.00 plus 13% HST. The hotel is located on the shores of Lake Ontario with panoramic views. Facilities include a saltwater pool, a whirlpool and a fitness centre. The hotel offers complimentary daily breakfast buffet for all overnight guests and free parking. Participants wishing to stay overnight must make their own reservations, directly with the hotel, and mention group code "P2012" to obtain the above special rate. At printing time the exchange rate was approximately CAD \$1 = US \$0.98.

HOW TO GET THERE

The WATERFRONT HOTEL is a lakefront property located at 2020 Lakeshore Road at the foot of Brant Street in Burlington, Ontario, Canada approximately 50 KM west of (Pearson) Toronto International Airport (YYZ). If you are driving from Toronto along QEW/403 take the Brant Street exit south. If you are driving from Buffalo N.Y. (approximately 100 KM) take the North Shore Blvd/ Eastport Drive exit, turn right on North Shore and the hotel will be on the right about 1km away.

PREVIOUS COMPANY REGISTRATIONS

From North and South America (Partial Listing:)

- BRAZIL: POLISUL, RHODJA S/A, BHASPOL, ACEL, POLO, CIPLA, POLIBRASIL, RHODIA-STER, MU LTIBRAS, POLIOLEFINAS, ABPOL, ROBERT BOSCH, JOHNSON, FADEMAC, DIXIE
- CANADA: DUPONT CANADA, DOW CANADA, ORTECH, CANADIAN GENERAL TOWER, U. TORONTO, HUSKY I.M. POLYSAR, XEROX RESEARCH, WEDTECH, TREMCO, SCHLEGEL CANADA, HERCULES CANADA, MACRO ENGINEERING, MOBIL, PLASTMO, WINPAK, CRYOVAC, TWINPAK, AMERICAN BILTRITE, BAYFORM, INTERTAPE, NOVA CHEMICALS, SHAW INDUSTRIES, CO-EX-TEC, GEOPLAST, DECOMA, CRILA, AT PLASTICS, POLY EXPERT INC., ASTRA PHARMA, POLY PLUS, SONIPLASTICS, BENLAN, BTR, ENGINEERED PROFILES, IND. REHAU, RTICA, SPRUNG.BRETT, SIGNATURE PLASTICS, ALCAN INTERNATIONAL, ATLANTIC PACKAGING PRODUCTS, ENHANCE PACKAGING, EXXON MOBIL, IPEX, PLASTEX EXTRUDERS, ASTRAZENECA, COOPER STANDARD, PMC GILM, PETROMONT, T.J. MANUFACTURING, LAVERGE GROUP, AIR LIQUIDE, IMPERIAL OIL
- MEXICO: ULTRAPOL, NOVACEL, PEMEX PETROQUIMICA
- USA: HOECHST CELANESE, AMERICAN NATIONAL CAN, E.I. DUPONT, 3M COMPANY, AMTX, NABISCO, GENERAL ELECTRIC, B.F. GOODRICH, DOW CHEMICAL, EXXON, QUANTUM, USI, UNION CARBIDE, MOBIL CHEMICAL, EASTMAN KODAK, HERCULES, WELDING ENGINEERS, BAYCHEM, EASTMAN CHEMICAL, ARISTECH, VISKASE, LINEAR FILMS, EGAN DAVISSTANDARD, CONAIR JETRO, GEON, VELCRO, RJF INTNTL, JAMES RIVER CORP., ADEPT, ALLIED SIGNAL, HOLD INDUSTRIES, M.A. HANNA, MASLAND INDUSTRIES, MEDTRONIC, ORAL-8, PRESTO PRODUCTS, UNIROVAL, LEAR CORP., ALLIED DIES, TENNECO, FERRO, DYNEON, WITT PLASTICS, ESSEX GROUP, DELPHI AUTOMOTIVE, EXTRUSION DIES, SOLUTIA, DUPONT DOW ELASTOMERS, ATLANTECH INTERN., LIFETIME PLASTICS, KANSAS STATE U., TREDEGAR, OWENS-ILLINOIS, AIRTECH INTERN., N.S. WARFARE CENTER, GEMCO, EQUISTAR, GENERAL CABLE, INTERTAPE POLYMER GROUP, ATOFINA PETROCHEMICALS, BOSTON RETAIL PRODUCTS, CAPPLUGS LLC, CRAFTED PLASTICS, PRINSCO, LYONDELL CHEMICAL, TYCO HEALTHCARE, R.I.T., UNITED TECHNOLOGIES
- VENEZUELA: INDESCA, PLASTILAGO, U.SIMON BOLIVAR, INTEPEV, PEQUIVEN, PROPILVEN, RESILIN

69th International Intensive Short Course on POLYMER RHEOLOGY AND EXTRUSION

A Problem Solving Approach

NOVEMBER 8-9, 2012

**Burlington
(near TORONTO)
CANADA**

LECTURER

**JOHN VLACHOPOULOS
POLYDYNAMICS INC.**

**REGISTRATION FORM
RHEOLOGY AND EXTRUSION
NOVEMBER 8-9, 2012**

(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: US \$1100.00 plus H.S.T. US\$ 143.00
TOTAL: US \$ 1243.00

Cheque enclosed VISA
 Send me an invoice MasterCard

CARD NUMBER _____

EXPIRATION DATE _____

CARDHOLDER NAME _____

SIGNATURE _____

Send by Post, Fax or Email as attachment to:

POLYDYNAMICS, INC..
102 Plaza Drive, P.O. Box 63067
Dundas, ON, Canada L9H 4H0
Phone 1-905-592-3507
Fax 1-647-436-7847
Email1 pdisupport@polydynamics.com
Email2 vlachopj@mcmaster.ca

For Bank Transfers, the account number etc. will be included in the invoice.

**69th International
Intensive Short Course
on
POLYMER RHEOLOGY
and
EXTRUSION**

NOVEMBER 8-9, 2012

Burlington (near Toronto), CANADA

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.

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

PROGRAM OUTLINE

THURSDAY, NOVEMBER 8, 2012

9:00 - 9:30 a.m. **Welcome & Registration**

9:30 a.m. - 12:30 p.m. **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 - 2:00 p.m. **Lunch**

2:00 - 5:30 p.m. **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. Viscosity of suspensions. Rheology of wood plastic composites (WPC). Rheology of some nanocomposites. Problem solving using rheology.

FRIDAY, NOVEMBER 9, 2012

9:00 a.m. - 12:30 p.m. **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 - 2:00 p.m. **Lunch**

2:00 - 5:30 p.m. **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-uniformities. Systematic fault diagnosis and troubleshooting.

LECTURE NOTES AND SOFTWARE

• 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, rheology of composites, 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.

• 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.

For course registration or other questions contact:

Dr. John Vlachopoulos
POLYDYNAMICS, INC..
102 Plaza Drive, P.O. Box 63067
Dundas, ON, Canada L9H 4H0
Phone +1-905-592-3507
Fax +1-647-436-7847
Email1 pdisupport@polydynamics.com
Email2 vlachopj@mcmaster.ca