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 online 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. He 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 more than 35 publications in peer-reviewed journals and conference proceedings and 5 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, Belgium and Netherlands.

For more information
www.polydynamics.com

GENERAL INFORMATION

REGISTRATION

- Tuition fee: US $ 745.00 includes registration, a PDF of lecture notes (over 300 pages), a new book (electronic and searchable) on polymer rheology and technology and the CALCUTRUDE LITE software.
- 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 multiple registrations from the same corporation the tuition fee is reduced by US $ 145.00 per person. e.g. For 2 persons the fee will be: 2 x 745 - 2 x 145 = US $ 1200

CANCELLATION

An administration fee of $ 200 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.

ONLINE ACCESS

- A **ZOOM** link will be sent a week prior to the start of the first lecture. Each participant is expected to test his/her computer and notify Polydynamics whether the test was successful or if any problems were encountered.
- After each lecture a **recorded** copy will be sent to each registered participant.

PREVIOUS COMPANY REGISTRATIONS FROM SELECTED COUNTRIES (partial listing)

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, 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

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 FILM, PETROMONT, T.J-MANUFACTURING, LAVERGE GROUP, AIR LIQUIDE, IMPERIAL OIL

FRANCE: SF EXXON CHEMICAL, S.N. POUDRES 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

ITALY: MONTEDISON, HIMONT ITALIA, SNIA TECHNOPOLIMERI, MONTEFLUOS SPA, MONTEDIPE SPA, ENICHEM, ELF ATOCHEM, VIADELO, POLIMERI EURO, MOBIL, CENTROCULING MAT., BAUSANO, BARILLA ALIMENTARI, EVC ITALIA, ELECTROLUX, ZANUSSI, ICMA SAN GIORGIO, METZELER, PIRELLI, PONTELABRO, SEALED AIR, SACMI, SIPA, SOCIETA DEL GRES, TECNOMATIC, UNILOY MILACRON, AUSIMONT, SOLVAY-SOLEXID, TECHINT POMINI, SOLVAY-SOLEXIS, CEAST, COOP BOX, PROPLAST, INEOW FILMS, TECHNE, HABASIT ITALIANA, SOJITZ, MAZER MATERIE PLASTICHE, EURONIL, MACCHI, API, RAPISARDA INDUSTRIES, AGRIPAK SRL, CHIORINO SpA, VERSALIS, SOLVAY SPECIALTY POLYMERS

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, ELOPAK, SENBIS POLYMER INNOVATIONS

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-DAVIS STANDARD, CONAIR JETRO, GEON, VELCRO, RJF INTNTL, JAMES RIVER CORP, ADEPT, ALLIED SIGNAL, HOLD INDUSTRIES, M.A. HANNA, MASLAND INDUSTRIES, MEDTRONIC, ORAL-B, PRESTO PRODUCTS, UNIROYAL, 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, CAPLUGS LLC, CRAFTED PLASTICS, PRINSCO, LYONDELL CHEMICAL, TYXO HEALTHCARE, R.I.T. UNITED TECHNOLOGIES, ARKEMA, W.L. GORE, THERMO-FISCHER, LYONDELL BASELL, CARGILL, CHEVRON PHILLIPS CHEMICAL COMPANY LP, BIOLOGIQ, CHEVRON PHILLIPS CHEMICAL, LUBRIZOL ADVANCED MATERIALS, TRELLEBORG COATED SYSTEMS, SPRINGFIELD PLASTICS, WL PLASTICS, TORAY PLASTICS, PANDUIT, TEXAS A&M UNIVERSITY, FLORIDA STATE UNIVERSITY, FORMOSA PLASTICS

87th International Intensive Online Course on POLYMER RHEOLOGY AND EXTRUSION

including weekly homework assignments

Five 2-hour-lectures
November 13,20,27
December 4,11, 2024

ONLINE via ZOOM

LECTURER
JOHN VLACHOPOULOS
POLYDYNAMICS INC.

REGISTRATION FORM

RHEOLOGY AND EXTRUSION

November 13,20,27 December 4,11, 2024

(Please photocopy for additional registrations)

Name_____

Company Name & Mailing Address:

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_____

Telephone _____

Email _____

Highest Degree Earned_____

(B.Sc., M.Sc., Ph.D. and year earned)
Number of years of experience
in polymer processing_____

Fees per person: US $ 745.00

MULTIPLE REGISTRATIONS from same corporation: reduce fees by US $ 145 per person (e.g. 2x600, 3x600 etc)

❑ Cheque enclosed ❑ VISA
❑ Send me an invoice ❑ MasterCard

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102 Plaza Drive, P.O. Box 63067
Dundas, ON, Canada L9H 6Y3
Phone: +1-905-333-0157
Fax: +1-647-436-7847
Email1: pdisupport@polydynamics.com
Email2: vlachopj@mcmaster.ca
For electronic Bank Transfers, the account number etc. will be included in the invoice.

87th International Intensive Short Course on POLYMER RHEOLOGY and EXTRUSION

November 13,20,27 December 4,11, 2024

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

WEDNESDAY, November 13
7:00 - 9:00 New York time (13:00 - 15:00 Brussels time)
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.

WEDNESDAY, November 20
7:00 - 9:00 New York time (13:00 - 15:00 Brussels time)
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. Problem solving using rheology.

WEDNESDAY, November 27
7:00 - 9:00 New York time (13:00 - 15:00 Brussels time)
Melt Flow Through Dies, Extrudate Swell, Die Lip Build-Up, Sharkskin/ 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. 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). Coextrusion dies.

WEDNESDAY, December 4
7:00 - 9:00 New York time (13:00 - 15:00 Brussels time)
Single and Twin Screw Extrusion
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. SSE scaleup. Co-rotating and Counter-rotating twin screw extruders (TSEs). Mixing in TSEs.

WEDNESDAY, December 11
7:00 - 9:00 New York time (13:00 - 15:00 Brussels time)
Overview, Troubleshooting and AI
How to use rheology, simulations and machine learning for problem solving.

LECTURE NOTES AND SOFTWARE

Each participant will receive a PDF of LECTURES on POLYMER RHEOLOGY AND EXTRUSION a week prior to the start of the course. 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 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.

HOMEWORK ASSIGNMENTS

At the end of each 2-hour lecture, homework assignments will be e-mailed to each participant. It is expected that the answers be returned to the lecturer 24 hours prior to the start of the next lecture.

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:

Dr. John Vlachopoulos POLYDYNAMICS, INC.
102 Plaza Drive, P.O. Box 63067 Dundas, ON
Canada L9H 6Y3
Phone +1-905-333-0157
Fax +1-647-436-7847
Email1: pdisupport@polydynamics.com
Email2: vlachopj@mcmaster.ca