

*soft*EXTRUSION 2004

Workshop

National Science Foundation, NSF
Luso-American Development Foundation, FLAD

October 14-18,

Hotel D. João II, Alvor (Algarve) PORTUGAL

Programme & Abstracts

SCIENTIFIC PROGRAMME

<p><i>Thursday</i> October 14th P.M.</p>	15:00-17:45	Registration
		<i>Coffee</i>
	17:45-17:55	Welcome (<i>C. Buchanan</i>)
	17:55-18:05	Presentation of the programme (<i>J. A. Covas</i>)
	18:05-18:25	NSF Partnership for innovation (<i>C. Hill-Herndon</i>)
	18:25-19:00	Innovation and technology transfer (<i>C. Bernardo/J. Kennedy</i>)
		<i>Dinner</i>
<p><i>Friday</i> October 15th A.M.</p>		State-of-the-art on extruder modeling
	09:00-09:50	Fundamentals of polymer melt flow in single screw extruders - from analytical modeling to computer simulations (<i>Ica Manas Zloczower, Case Western Reserve University, USA</i>)
	09:50-10:40	Modeling and simulation of plasticating single screw extrusion, state of the art and remaining challenges (<i>C. Rauwendaal, Rauwendaal Extrusion Engineering, USA</i>)
		<i>Coffee break</i>
	11:00-11:50	Modeling of flow and chemistry in twin screw extruders (<i>B. Vergnes, Cemef, France</i>)
	11:50-12:40	Modeling of polymer flow in forming tools (<i>J. M. Nóbrega, University of Minho, Portugal</i>)
		<i>Lunch</i>
<p><i>Friday</i> October 15th P.M.</p>	14:30-15:20	Quantitative analysis of mixing in extrusion processes (<i>Ica Manas Zloczower, Case Western Reserve University, USA</i>)
	15:20-16:10	Stress, velocity and temperature field measurements in polymer melt flows (<i>P. D. Coates, University of Bradford, UK</i>)
		<i>Coffee break</i>
	16:30-17:20	Optimization-based design of extruders (<i>J. A. Covas, University of Minho, Portugal</i>)
	17:20-18:10	Recent developments in die design (<i>O. S. Carneiro, University of Minho, Portugal</i>)
		<i>Dinner</i>
	21:00-22:30	POSTER SESSION

<p><i>Saturday</i> October 16th A.M.</p>	09:00-09:50	Numerical methods for modeling fiber and film formation (<i>S.D. Phillips, Massachusetts Institute of Technology, USA</i>)
	09:50-10:40	Real-time monitoring of microstructure during film processing (<i>A. Ogale, Clemson University, USA</i>)
	<i>Coffee break</i>	
	11:00-11:50	Modeling flow-enhanced crystallization in fiber spinning and film blowing (<i>A. McHugh, Lehigh University, USA</i>)
	11:50-12:40	Molecular simulation of polymer crystallization during processing (<i>R. Rutledge, Massachusetts Institute of Technology, USA</i>)
	<i>Lunch</i>	
<p><i>Monday</i> October 18th A.M.</p>	Presentation of modeling packages	
	09:00-09:30	BEMflow (<i>C. Rauwendaal, Rauwendaal Extrusion Engineering, USA</i>)
	09:30-10:00	Polyflow - Getting the right balance in extrusion (<i>T. Marchal, Fluent Benelux, Belgium</i>)
	10:00-10:30	Presentation of Ludovic [®] software (<i>B. Vergnes, Cemef, France</i>)
	<i>Coffee break</i>	
	10:50-11:40	ITXtrude, REEflow (<i>C. Rauwendaal, Rauwendaal Extrusion Engineering, USA</i>)
	11:40-12:10	FISIM (<i>C. Cox, Clemson University, USA</i>)
	12:10-12:40	Flow 2000 (<i>J. Perdikoulis, COMPUPLAST, USA</i>)
	<i>Lunch</i>	
<p><i>Monday</i> October 18th P.M.</p>	Successful application of software to solve industrial problems	
	14:30-16:10	<i>C. Rauwendaal, Rauwendaal Extrusion Engineering, USA</i> <i>T. Marchal, Fluent Benelux, Belgium</i> <i>J. Perdikoulis, COMPUPLAST, USA</i>
	<i>Coffee break</i>	
	16:30-18:00	Discussion Panel: the requirements for the optimal use of modelling packages (<i>software providers, lecturers, participants</i>)
	18:00-18:10	Closure (<i>C. Bernardo / J. Kennedy</i>)
	<i>Dinner</i>	

Recent developments in die design

O. S. Carneiro⁽¹⁾, J. M. Nóbrega⁽¹⁾, F. T. Pinho⁽²⁾, P. J. Oliveira⁽³⁾,

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In the past, the design of profile extrusion dies was essentially based on experimental trial-and-error procedures, relying essentially on the designers experience and usually being very time, material and equipment consuming. During the last decades, the development of software packages for the mathematical modelling of the flow of polymer melts transformed this trial-and-error procedure from an experimental to a numerical based operation, being the generation of the successive solutions still committed to the designer. More recently, the goal is the automatic die design, i.e., to perform the optimization of the tool design without any user intervention.

This work focuses essentially on the recent contributions towards the automatic extrusion die design concept, particularly that developed by the authors. It describes the methodology developed to automatically balance the flow in profile extrusion dies, the scheme implemented to carry out the automatic search of the final solution and the integration of the different routines required (pre-processor, computational rheology code and optimisation algorithm). The optimization methodology is then applied to a particular case study, using different design strategies. The performance and sensitivity of the resulting dies is also discussed.

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