

● **Highlights from the 24<sup>th</sup> Nordic Rheology Conference (NRC 2015) Karlstad, Sweden, August 19 – 20, 2015**

The NRC 2015 was organised by Karlstad University, Sweden, attracted ca. 80 delegates and eight exhibitors, and was sponsored by The Paper Province and Applied Rheology. Since Karlstad University is located in a part of Sweden where the forest product industries are very active, and in particular the pulp and paper industries, several of the presentations were selected to be relevant to this industry. However, the program covered both fundamental and applied aspects and presentations of uppermost relevance to other industrial branches were presented, such as food & pharmaceutical and oil-drilling just to mention two examples. The program covered different aspects of rheology and flow of matter and was divided into four sessions:

- General rheology and rheometry
- Non-Newtonian fluid mechanics and flow simulations
- Particulate and fibrous dispersions
- Food and pharmaceutical rheology

During the two days the attendees had the opportunity to get the latest information from in total 29 oral and 10 poster presentations, whereof three invited speakers. All presentations are published in the Annual Transactions of the Nordic Rheology Society, Vol. 23, 2015, ISBN 978-91-637-9104-8. A total number of eight exhibitors presented their products at NRC2015.

The conference was formally opened on August 18<sup>th</sup> by Maria Hollander (CEO, The Paper Province) at the welcome reception at the Lars Lerin Art Museum, Karlstad. The welcome address on the 19<sup>th</sup> of August was given by Anna Jonhed (R & D Manager, BillerudKorsnäs Group). This company is a leading international producer of packaging material based on the cellulose fibre. Jonhed holds

a Ph.D. from Karlstad University and published several papers on gel transition in polymer solutions studied by rheology during her period of time as doctoral student. The first of the invited speakers to present his paper was Norbert Willenbacher from Karlsruhe Institute for Technology, Germany. He presented results about structural heterogeneity in polymer solutions and in colloidal dispersions obtained by multi particle tracking (MPT) optical microrheometry. The next invited speaker to present was Francisco Chinesta from GeM Institute, Ecole Centrale de Nantes, France who talked about modelling and simulations of concentrated fibrous suspensions. His talk was focused on short-fibres and nano-fibres and covered the effects of shear on flow-induced fibre-orientation and aggregation. Michal Hummel from Aalto University, Espoo, Finland gave his talk on August 20<sup>th</sup> as the last of the three invited speakers. He talked about continuous filament spinning of solutions of cellulose in ionic liquids (IL). Different experiments to characterize the cellulose-IL solutions were discussed and it was shown that the processability of cellulose-IL solutions was strongly dependent on the visco-elastic properties.

In brief, the programme of NRC2015 consisted of four sessions as mentioned above. The following ten papers were presented in the session about “General Rheology and Rheometry”: O.-V Laukkanen, H. Soenen (Aalto), and H.H. Winter (UMass Amherst) presented rheology of bitumens at low temperatures extended frequency range by time-temperature superposition. M. Larsson and J. Duffy (Malven) talked about size exclusion and rheometry used in characterization of hyaluronic acid solutions. D. Treffer, J. Khinast and A. Troiss (Graz) talked about melt rheology and vacuum compressing



Figure 1: Invited speaker Norbert Willenbacher presents his paper.



Figure 2: Marcus Schmidt (Volvo Car Corporation) and Anna Jonhed (Billerud Korsnäs) during one of the coffee breaks.

This is an extract of the complete reprint-pdf, available at the Applied Rheology website <http://www.appliedrheology.org>

moulding. H. Hossein, H. Tenhu, and S. Hietala (Helsinki) presented a paper about oscillatory and compression measurements of thermosensitive hydrogels. E. Schuster and A. Ström (Chalmers) presented results about alginate gels. D. Assembayev (NTNU) and V. Myrseth (SINTEF) presented an experimental procedure including pre-conditioning for oil-based drilling fluids. Myrseth gave also a second presentation on oil-based drilling fluids addressed to fluids at High Pressure High Temperature (HPHT) conditions, written together with A. Torsvik and H. Linga (SINTEF). T. Floch, B. Bingöl, and O. Hassager (Denmark) presented a paper about the importance of rheological properties and water adsorption of pressure sensitive adhesives. J. Läger (Anton Paar) presented a rotational rheometer with two air bearing supported motors. M. Stading, W. Qazi, M. Nyström, M. Berta, (SP), M. Bülow, and O. Ekberg (Skåne University Hospital) talked about shear and extensional flow rheology in the swallowing process when eating food.

The session about "Non-Newtonian Fluid Mechanics and Flow Simulations" consisted of four papers. R.W. Time and A.H. Rabenjafimanantsoa (Stavanger) presented three papers. The first paper dealt with dynamics of gas bubbles captured by a Venturi restriction measured a different flow rates in Newtonian and non-Newtonian fluids. Their second paper was about microscopic drainage and breaking mechanisms in water-oil emulsions. Their third paper was about jet impingement flow of Newtonian and non-Newtonian fluids and the effects on the erosion pattern on a flat bed (glass beads were used as a model for the bed). The fourth paper in this session was given by R. Kádár (Chalmers). This paper was about the method of reconstructed nonlinear dynamics and exemplified by flow instabilities in flow of polymer melts during extrusion. Seven papers were presented in the session about "Particulate and Fibrous Dispersions". P. Singh, N. Musunuri, and I.S. Fischer (New Jersey) used Particle Image Velocimetry (PIV) in order to study spontaneous dispersion of particles on a fluid-liquid interface. These three authors presented also a second paper written together with K. Shah, S.K. Gurupatham, E. Amah (New Jersey) and M. Hossain (CUNY New York) about modelling of self-assembly of particles on fluid-liquid interfaces. A. Oko, A. Swerin (SP), J. Mackenzie, and F. Lundell (KTH) presented a model of the effects of flocculation in cellulose fibre suspension, produced in a decelerating-turning flow, on shear modulus and yield stress. Y. Petkova-Olsson, H. Ullsten, and L. Järnström, L. (Karlstad Univ.) presented a paper about the effects of Pluronic F127 tribloc copolymer adsorption on the rheological properties of particulate dispersions. V. Kumar, M. Toivakka (Åbo Akademi Univ.), and D. Bousfield (Maine) presented results from measurements of rheological characterization of microfibrillated cellu-

lose suspensions in a slot flow. S. Carrà, F. Chiozza, F. Curto, and M. Ferraioli (Mapei) presented a method to use rheology in order to optimize the performance of adhesives used in the packaging industries. E. Olsson, C. Johansson, and L. Järnström (Karlstad Univ.) presented the effects of dispersing agents on the state of dispersion, flow properties and dewatering rate of montmorillonite-starch paper coating formulations.

The session about "Food and Pharmaceutical Rheology" consisted of five papers. C. Salas-Bringas, A.M. Catargiu, D. Miladinovic, R.B. Schüller, and N. Mišljenovic, N. (NMBU Norway) presented a paper on water swelling, strength properties, and surface hydration of microalgae pellets as effects of addition of enzymes and lignosulfonate during the pelleting process. J. Aho and S. Baldursdottir (Copenhagen) presented a paper about rheological characterisation of animal soft tissues. J. Schjoerring-Thyssen, J.R. Christensen, C.G. Madsen, and S. Baldursdottir (Copenhagen) presented a paper about release of lysozyme from tablets coated with poly(vinyl acetate). They measured the release in different solvents with different solubility of poly(vinyl acetate) indicated as intrinsic viscosity. C. Taylor Nordgård, K.I. Draget (NTNU), and T. Seternes (Univ. of Tromsø) presented a paper about rheology of salmon skin mucus. I.A. Ketto, R.B. Schüller, E.-O. Rukke, A.G. Johansen, and SB. Skeie (NMBU Norway) presented a paper where they used low-amplitude oscillation rheometry to monitor acid-induced gel formation in bovine milk. Ten highly appreciated posters were presented at two poster sessions. The poster presented by Daniel Treffer (Graz) "Melt rheology of selected pharmaceutical polymers for hot melt extrusion" was acknowledged the Best Poster Award.

The official conference dinner took place at Restaurant Terrassen. A guided boat tour through Karlstad on the river Klarälven, via two locks, brought the conference participants from downtown Karlstad to the restaurant. The weather was warm and sunny and the boat trip for about one hour gave the participants an excellent opportunity to discuss and relax. The Organizing Committee had six members: Lars Järnström, Magnus Lestelius, Henrik Ullsten, Helena Persson, Martin Sundqvist (all from Karlstad University) and Maria Hildén (The Paper Province). In connection to NRC2015, Karlstad University, in cooperation with Åbo Akademi University and Forest Products Industry Research College (FPIRC), organized a two-day rheology course.

Lars Järnström  
Karlstad University  
Dept. of Engineering and Chemical Sciences  
651 88 Karlstad, Sweden  
Lars.Jarnstrom@kau.se

This is an extract of the complete reprint-pdf, available at the Applied Rheology website  
<http://www.appliedrheology.org>