VIPP VALUES CREATED IN
FIBRE-BASED PROCESSES
AND PRODUCTS

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CHRISTER GUSTAVSSON
DOCTORAL THESIS DECEMBER 08, 2016

ADDED VALUE FROM BIOMASS BY BROADER UTILIZATION OF FUELS AND CHP PLANTS

Christer Gustavsson is working as a senior process consultant for Pöyry Sweden AB with engineering and technical business development in foremost energy- and forest industry. His work focuses on novel utilization of woody biomass and on integration aspects when such utilization is co-located with existing industrial structures.

Bioeconomy has been identified to hold a great potential for reducing fossil fuel dependence and for maintaining and creating economic growth. Large parts of the combined heat and power (CHP) sector, which successfully have contributed in the transition towards a fossil free society, are at present facing stagnation. District heating actors are facing challenges due to warmer climate, better insulated buildings and competition from heat pumps. The forest industry where CHP plants supplies processes with heat is facing structural changes foremost in the graphic segments.

The emerging bioeconomy and the stagnation for the existing business models in large parts of the CHP sector form the background for the examination of additional value-creating processes in the existing CHP structure presented in this thesis. The technical viability for integration of fast pyrolysis, gasification and leaching with existing CHP plants has been analysed as well as the motivation and ability of the CHP incumbents to participate in a transition towards the bioeconomy by developing their plants to biorefineries.

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RAGHU DESHPANDE
DOCTORAL THESIS DECEMBER 15TH 2016

THE INITIAL PHASE OF SODIUM SULFITE PULPING OF SOFTWOOD- A COMPARISON OF DIFFERENT PULPING OPTIONS

Raghu Deshpande is employed at MoRe Research AB, Örnskoldsvik, since 2012. His work incorporates knowledge on softwood dissolving pulp production using sulfite pulping technology. Raghu Deshpande obtained a Master of Science Technology in “Pulp and Paper Science” from Karnataka University, India in 2004. Before starting his doctoral studies he was working in “Wood and Pulp Research Centre” in Grasim Industries/Harihar Polyfibres in India, which is a part of Aditya Birla group.

The sulfite pulping process is today practised in only a small number of pulp mills around the globe and the number of sulfite mills that use sodium as the base (cation) is less than five. However, due to the increasing interest in the wood based biorefinery concept, the benefits of sulfite pulping and especially the sodium based variety, has recently gained a lot of interest. It was therefore considered to be of high importance to further study the sodium based sulfite process to investigate if its benefits could be better utilized in the future in the production of dissolving pulps. Of specific interest was to investigate how the pulping conditions in the initial part of the cook (≥ 60 % pulp yield) should be performed in the best way.

Thus, this thesis is focused on the initial phase of single stage sodium bisulfite cooking of either 100 % spruce or 100 % pine wood chips. The cooking experiments were carried out with either a lab prepared or a mill prepared cooking acid and the temperature and cooking time were varied. Activation energies for different wood components were investigated as well as side reactions concerning the formation of thiosulfate and sulfate.

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MoRe Research

ADITYA BIRLA
Domsjö

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ÅSA NYFLÖTT
LICENTIATE THESIS DECEMBER 11 2014

STRUCTURAL STUDIES AND MODELLING OF OXYGEN TRANSPORT IN BARRIER MATERIALS FOR FOOD PACKAGING

Åsa Nyflött is employed at Stora Enso Pulp and Paper Asia AB, Karlstad since 2010. Her work incorporates knowledge on how oxygen mass transport can be hindered in dispersion barrier coatings. Åsa Nyfött obtained a Master of Science in Engineering Physics at KaU in 2011.

The requirements of food packages are to ensure food safety and quality, to minimize spoilage, and to provide an easy way to store and handle food. To meet these demands for fibre-based food packages, barrier coatings are generally used to regulate the amount of gases entering a package, as some gases are detrimental to food quality. Oxygen, for example, initiates lipid oxidation in fatty foods. Bakery products may also be sensitive to oxygen.

This thesis focused on mass transport of oxygen in order to gain deeper knowledge in the performance of barrier coatings and to develop means to optimize the performance of barrier coatings. This experimental study along with computer modelling characterized the structure of barrier materials with respect to the mass transport process.

This project was performed as part of the multidisciplinary industrial graduate school VIPP (www.kau.se/en/vipp) - Values Created in Fibre Based Processes and
Products – at Karlstad University, with the financial support from the Knowledge
Foundation, Sweden, and Stora Enso.

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Tryck & layout: Universitetstryckeriet, Karlstad 2014

AUTUMN MEETING

ASKO Appliances AB in Lidköping hosted the Vipp Industrial Graduate School's autumn meeting, at which doctoral students and supervisors met for two inspiring days. Vipp Industrial Graduate School, which started in 2011, has 16 doctoral students pursuing research in projects on processes, energy, the environment and service development, in some of the most important industrial areas in Sweden.

The autumn meeting opened with a workshop for the doctoral students on the theme of networking, chaired by Patrik Bångerius and Eamonn McCallion from Grants and Innovation Office at Karlstad University.

"The network potential for VIPP is great, but I don't think the doctoral students have quite understood the possibilities," said Caroline Wilke, doctoral student in chemical engineering. " The Workshop gave us the opportunity to reflect on this and hopefully, we can take advantage of our interdisciplinary variety in VIPP from now on."

Research presentations and study visits
On the second day of the autumn meeting a number of doctoral students presented their research in progress. The participants were also treated to a presentation of the host company ASKO Appliances AB, and a tour of their laboratory environments. A guided tour of Rörstrand's porcelain museum was also on the programme.

"Vipp Industrial Graduate School has been running for around five years now and we are beginning to see the result in the form of several completed doctoral theses," said Lars Järnström, professor of chemical engineering at Karlstad University. "The model we use for the industrial doctoral students and active industrial engagement have resulted in real co-production in research which is the purpose of the graduate school. The graduate school is part of an investment initiative funded by the KK Foundation and the participating companies.

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PLANNED LICENTIATE SEMINARS AND DISSERTATIONS

PLANNED DISSERTATIONS

Peder Bengtsson, Asko Appliances AB (2017-05-05)
Pyry Hämäläinen, Kemira Kemi AB (Q4 2017)
Asif Javed, Billerudkorsnäs AB (Q1 2018)
Caroline Wilke, BTG Instruments AB (Q4 2017)
Sofia Thorman, Innventia AB (Q3 2018)

PLANNED LIC SEMINARS

Jonas Kihlman, Pöyry (2017)
Daniel Ekbåge, Stora Enso Group R&D (2017)
Lisa Mattson, BillerudKorsnäs AB (2017)
Helena Cider Johansson, Härjeåns Energi AB (2018)

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