TJ SUMMARIES

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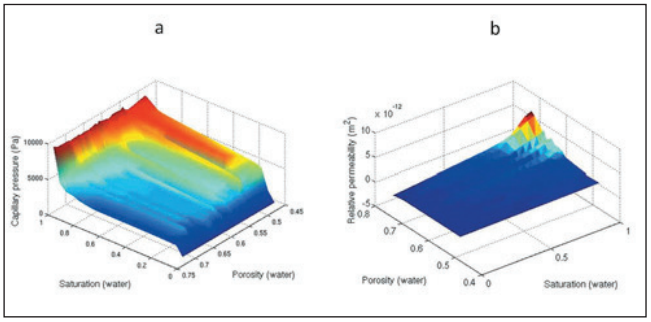


PACKAGING: (a) The capillary pressure as a function of porosity and water saturation for the contact angle 95°. (b) The relative permeability as a function of porosity and water saturation.

JUNE

PACKAGING

Multi-scale simulation of paperboard edge wicking using a fiber-resolving virtual paper model

Andreas Mark, Anton Berce, Robert Sandboge, Fredrik Edelvik, Erik Glatt, Stefan Rief, Andreas Wiegmann, Mats Fredlund, Junis Amini, Maria Rentzhog, Ron Lai, Lars Martinsson, Ulf Nyman, and Johan Tryding

When liquid packaging board is made aseptic in the filling machine, the unsealed edges of the board are exposed to hydrogen peroxide. A high level of liquid penetration may lead to aesthetic as well as functional defects. The ability to make a priori predictions about the edge wicking properties of a certain paperboard material is therefore of great interest to the paper industry, as well as to packaging manufacturers. In this research, a multi-scale framework is proposed that allows for detailed simulation of the edge wicking process. This unique modeling approach for multi-scale simulation of liquid penetration in package paperboard, is proposed to increase the fundamental understanding of edge wicking and how it depends on the paper micro-structure.

BIOREFINERY

Extraction of hardwood biomass using dilute alkali

Jie Luo, Joseph M. Genco, and Haixuan Zou

Near neutral hemicellulose extraction involves extracting wood hemicellulose using green liquor before conventional kraft pulping. The objective of this research was to develop correlations that could be used in process design and economic studies.

Researchers present experimental data for the extraction of northeast hardwood chips using green liquor. The effect of green liquor application rate, liquor-to-wood ratio, and H-factor on the removal of sugars and organic acids is discussed. Response variables include wood yield, total and soluble lignin, component sugars, acetic acid, lactic acid, formic acid, and furfural. Empirical correlations are developed that embody green liquor application rate, liquor-to-wood ratio, and the H-factor. Parameters are presented for the response variables after the extraction and hydrolysis processes. This study might help kraft pulp mills determine the amounts of sugars and organic acids they could potentially extract from wood using dilute alkali.

COATING

Influence of topcoat pigment particle size distribution on tail-edge pick resistance in sheet-fed offset printing

Peter Dahlvik, Guillermo Bluvol, Karl-Heinz Kagerer, Manfred Arnold, and Dan Varney

This research describes ground calcium carbonate pigment particle size distribution and its influence on the tail-edge picking of pilot-coated paper as determined in full-scale sheet-fed offset (SFO) printing. A tailor-made method was developed using a modified printing plate and high-tack inks to assess surface strength in terms of edge picking. In addition to the type, fineness, and particle size distribution of the ground calcium carbonate pigment, researchers also evaluated the solids content of the coating color, binder level, clay usage, and calendering.

This research shows how well actual printing press results compare to data generated in a laboratory. While both are important, it is also important to understand the significance of any correlation and why the results might differ.

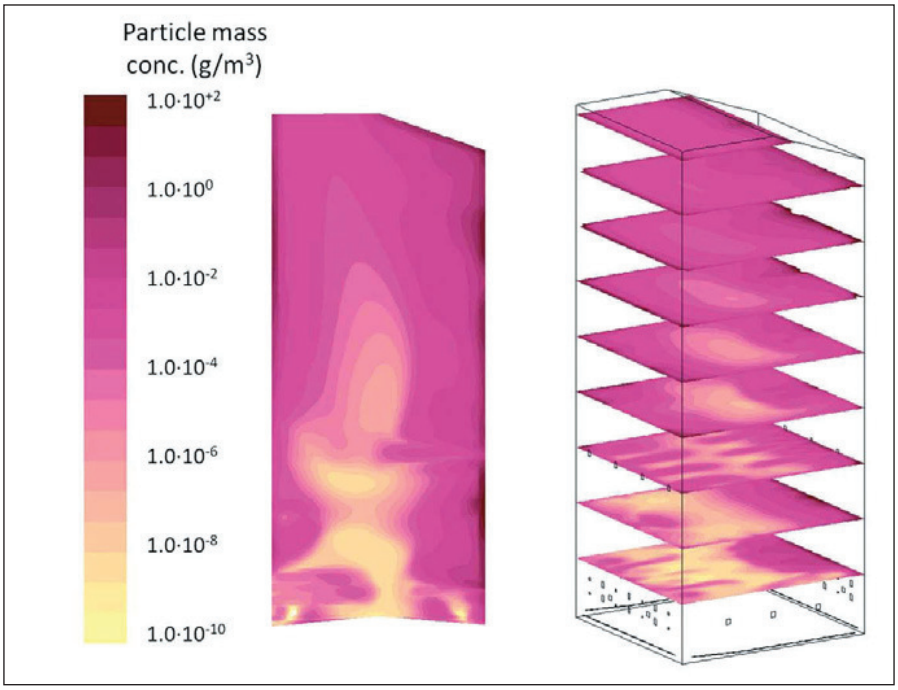
JULY

RECOVERY BOILER

Modeling fine particles and alkali metal compound behavior in a kraft recovery boiler

Aino Leppänen, Erkki Välimäki, and Antti Oksanen

This report describes a computational fluid dynamics-based method for modeling the reactions between alkali metal compounds and for the formation of fine fume particles in a kraft recovery boiler furnace. The modeling method is developed from ANSYS/FLUENT software and its Fine Particle Model extension. We used the method to examine gaseous alkali metal compound and fine fume particle distributions in a kraft recovery boiler furnace. The effect of temperature and the boiler design on these variables, for example, can be predicted with the model. We also present some preliminary results obtained with the model. When the model is developed further, it can be extended to the superheater area of the kraft recovery boiler. This will give new insight into the variables that increase or decrease fouling and corrosion.



RECOVERY BOILER: Total fine particle mass concentration.

FIBER SUPPLY

Use of cold tolerant eucalyptus species as a partial replacement for southern mixed hardwoods

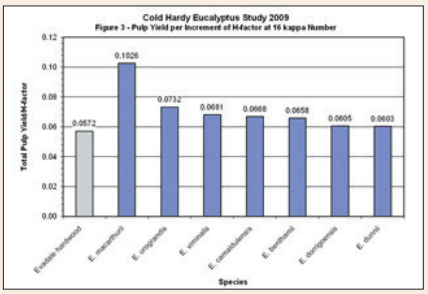
Peter W. Hart and Dale E. Nutter

During the last several years, the increasing cost and decreasing availability of mixed southern hardwoods have resulted in financial and production difficulties for southern U.S. mills that use a significant percentage of hardwood kraft pulp. Traditionally in the U.S., hardwoods are not plantation grown because of the growth time required to produce a quality tree suitable for pulping. One potential method of mitigating the cost and supply issues associated with the use of native hardwoods is to grow eucalyptus in plantations for the sole purpose of producing hardwood pulp. However, most of the eucalyptus species used in pulping elsewhere in the world cannot survive in the southern U.S. climate.

This study examines the potential of seven different cold-tolerant eucalyptus species grown in the southern U.S., to be used as replacements for or supplements to mixed southern hardwoods. The laboratory pulping and bleaching aspects of these seven species are discussed, along with pertinent mill operational data. Selected mill trial data also are reviewed.

Blend	% Fines – Length Weighted	Length-weighted Fiber Length (mL)	Fiber Width (μm)	CSF (mL)
100% mill hardwood	12.86	1.04	18.5	582
67% hardwood/33% *E. macarthuri*	11.02	0.85	17.0	514
58% hardwood/42% *E. macarthuri*	11.29	0.85	17.1	534

FIBER SUPPLY (table): Freeness and fiber properties of 100% mill hardwood and two E. macarthuri/mill hardwood pulp blends.



FIBER SUPPLY (figure): Total pulp yield divided by the H-factor required to obtain a 16 kappa number, an estimate of species suitability.

The eucalyptus fiber produced from these pulping studies had an extremely short fiber length and a very low unrefined freeness. On first glance at these values, significant negative drainage issues on the brown stock washers and paper machines would be expected. When the mill trials were performed at the MeadWestvaco Evadale, Texas, mill, a minor drainage impact was experienced on the washers, but no problems were encountered

on the actual paper machine or in the paper mill. Inclusion of eucalyptus did, however, make the resulting pulp harder to refine.

The initial laboratory work, in conjunction with the mill trials, suggested that several potential cold-tolerant eucalyptus species could be used as a partial substitute for mixed native hardwoods. Even in blends of up to 50 percent eucalyptus, pulp and paper (board) properties were not affected negatively. If it is possible to grow these species economically in a plantation setting in the southern U.S., it might be possible to reduce mill fiber supply costs and ensure a reasonable percentage of the mill fiber demands during the winter months when hardwood procurement tends to be difficult.

OTHER RESEARCH APPEARING IN *TAPPI JOURNAL'S* JUNE ISSUE

BLEACHING

Pre-bleaching of eucalypt kraft pulp with OP stages: Effect of an acid pretreatment or chelation step

Tatiana M. Póvoas, Dina A.G. Angélico, Ana P.V. Egas, Pedro E.G. Loureiro, Licínio M. Gando-Ferreira, and M. Graça V.S. Carvalho

PACKAGING

Rapid comparison of mineral oils vapor transmission rate through paper and board packaging materials

Ineke Tiggelman, Harald Pasch, and Patrice C. Hartmann

OTHER RESEARCH APPEARING IN *TAPPI JOURNAL'S* JULY ISSUE

BIOREFINERY

Biorefinery implementation for recovery debottlenecking at existing pulp mills – Part I: Potential for debottlenecking

Hakim Ghezzaz, Luc Pelletier, and Paul R. Stuart

BLEACHING

The role of copper ions in hydrogen peroxide bleaching: Their origin, removal, and effect on pulp quality

Pedro E.G. Loureiro, Sandrine Duarte, Dmitry V. Evtuguin, and M. Graça V.S. Carvalho

RECYCLING

Paper machine white water deaeration and two-stage flotation with channel flow

Antti Haapala, Mika Körkkö, Kalle Kemppainen, Tuomas Stoor, and Jouko Niinimäki

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