Inside TAPPI JOURNAL

TJ SUMMARIES

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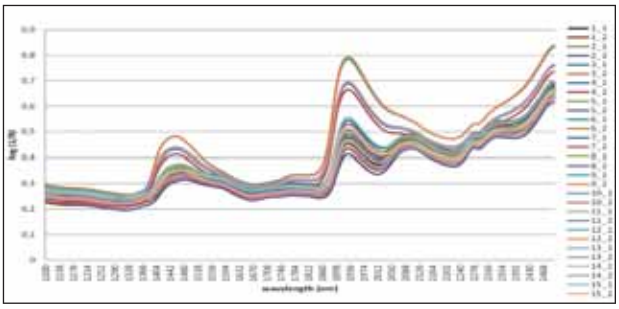


CARBOHYDRATE ANALYSIS. Near infrared spectra of 30 rice straw samples.

APRIL

FINANCE

Early-stage design methodology for biorefinery capital appropriation

Eemeli Hytönen and Paul R. Stuart

This research presents a methodology for enhancing the strategic investment decision-making process for retrofit forest biorefinery (FBR) implementation. This is achieved by improving the link between retrofit process design and capital appropriation activities through cost accounting. The methodology is based on step-wise screening of retrofit alternatives where (1) traditional techno-economic analysis and multivariate stochastic risk analysis are used in the first pre-screening step, and (2) an advanced analysis framework based on steady-state process modeling, product costing using principles of activity-based costing (ABC), and panel-based multicriteria decision-making (MCDM) is used in the second screening step. In the MCDM, financial- and risk-based decision-making criteria are used. A case study considering the retrofit implementation of a biorefinery into a kraft pulp and paper mill demonstrates the methodology.

Feedstock, Product (Process)	Capacity (ML/year)	IRR (%)	Standard Deviation (%)	Downside IRR (%)
Corn stover, mixed alcohols (steam reforming)	379	13.0	2.1	8.7
Lignin, ethanol + higher alcohols (steam reforming)	189	12.3	2.0	8.2
Biomass, mixed alcohols (steam reforming)	95	8.7	1.6	5.5
Hemicelluloses, ethanol + acetic acid (near-neutral hemicellulose extraction prior-to-pulping)	19	6.9	0.9	5.0
Biomass, ethanol + higher alcohols (steam reforming)	95	5.9	1.5	2.9
Corn stover, ethanol + higher alcohols (steam reforming)	379	3.4	2.0	-0.6
Pulpwood, mixed alcohols (steam reforming)	189	3.4	7.3	-11.1
Lignin, ethanol + higher alcohols (gasification)	189	1.5	3.3	-5.1
Corn stover, mixed alcohols (gasification)	379	0.7	3.4	-6.0
Biomass, FTL (gasification)	95	0.6	2.1	-3.5

FINANCE. Most promising design alternatives based on ranking using internal rate of return (IRR).

CARBOHYDRATE ANALYSIS

NIRS determination of carbohydrates from hydrothermal-treated rice straw

Ana Moral, Maria Dolores Hernández, Antonio Tijero, Zoilo González, Juan García, and Maria Jesús de la Torre

Several studies have shown that "hydrothermal process" wastes might serve as raw material to obtain monosaccharides and oligosaccharides. High-performance liquid chromatography (HPLC) traditionally has been used to study these carbohydrates. However, HPLC has a series of disadvantages that could be avoided by use of other methods. This study evaluated the potential use of near infrared spectroscopy (NIRS) as a substitute analysis method for HPLC, using rice straw as raw material. The results showed that NIRS analysis can be used as a prediction method for monosaccharides and oligosaccharides. This method has the additional advantage of being a fast, nondestructive technique that does not require pretreatment of samples, and therefore, decreases the costs and the environmental impact of the analyses process.

BIOGAS

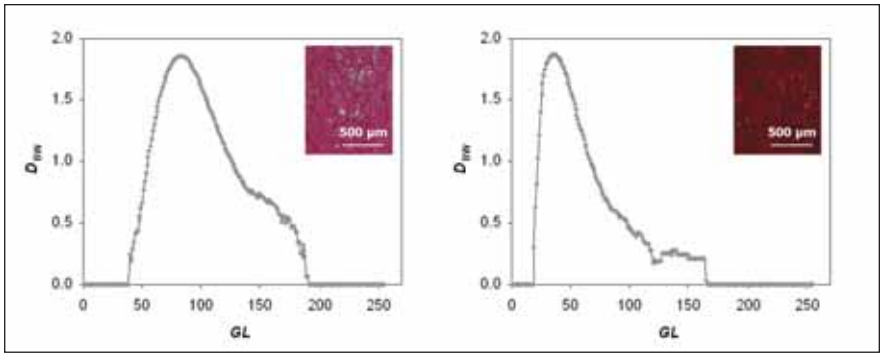
Commissioning of a biogas pilot plant: From brown grease to paper mill-generated organic wastes

Ricardo B. Santos, Peter W. Hart, Gary W. Colson, Simon Evers, and Dennis Evers

The MeadWestvaco mill in Evadale, TX, USA, in conjunction with VOW Resources LLC, has constructed and commissioned a green biogas skid-mounted pilot plant to evaluate the potential of various organic waste streams to produce high-quality biogas. It is the fourth plant in the world incorporating this technical approach to biogas production.

At initial startup, the plant used cow manure as organic feedstock. To commission

BIOGAS. Two views of the Skippy pilot plant unit in Evadale, TX.



PRINTING. Fractal spectra of samples of high bulking offset paper with the ink layer thickness of 0.66 µm (left) and 6.95 µm (right), along with corresponding digital images.

the plant for verifying the VOW bioaugmentation process, the transition was made to using brown grease. After the brown grease commissioning trials are completed, the plant will be transitioned to a number of paper mill-generated organic wastes to acquire the design parameters and engineering data that will aid in construction of a full-scale biogas facility.

MAY

PRINTING

Characterization of printed offset ink layers on printing papers using fractal analysis

Hana Holická and Markéta Držková

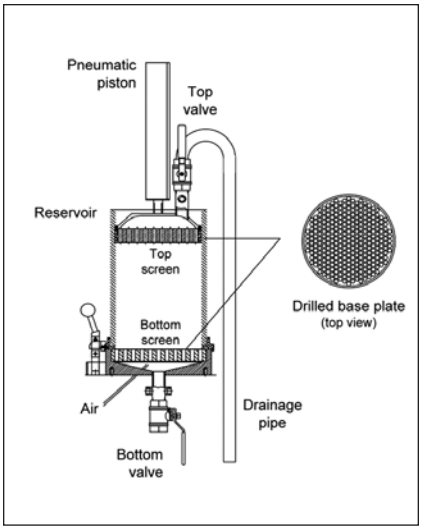
The method of fractal analysis was applied to study different types of printing papers with respect to their offset printability and the relationship between paper properties and fractal characteristics of unprinted and printed area. Fractal analysis of captured digital images of samples was done using a box counting method. For each sample, four fractal parameters derived from fractal dimensions were determined. Results show that fractal characteristics chosen reflect the properties of individual types of printing papers and corresponding printed offset ink layers. Correlations of fractal parameters with the thickness of ink layer, optical density of printed samples, and paper roughness are discussed in detail. This paper provides an overview of the relationship between fractal characteristics and common parameters determined by conventional methods for various types of printing papers and offset prints.

TEST METHODS

Two-sided drainage handsheet machine

Alois Vanerek, Jimmy Jong, Young-Il Jeong, Françoise Forel, and José-Antonio Orccotoma

A new Two-Sided Drainage Handsheet Machine (TSDHM) allows either one-sided or two-sided drainage during sheet formation. When the drainage was reversed on the TSDHM from the classical 100 percent bottom to 100 percent top, the fines and filler profiles in the handsheets could be reverted. The two-sided drainage mode on the TSDHM can produce fines and filler profiles across the paper thickness that are completely different from the one-sided drainage mode. These profiles are more representative of top and twin-wire formers.



TEST METHODS. Schematic representation of the Two-Sided Drainage Handsheet Machine.

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

EXTRACTION
Alkaline xylan extraction of bleached kraft pulp—effect of extraction time on pulp chemical composition and physical properties
Esa Saukkonen, Katja Lyytikäinen, and Kaj Backfolk

EXTRACTION
Properties of extracted Eucalyptus globulus kraft pulps
G.V. Duarte, J.A.F. Gamelas, B.V. Ramarao, T.E. Amidon, and P.J. Ferreira

BIOETHANOL
Assessment of *Arundo donax* (giant reed) as feedstock for conversion to ethanol
Renata Bura, Shannon Ewanick, and Richard Gustafson

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

Optical and photocatalytic properties of photoactive paper with polycrystalline TiO_2 nanopigment for optimal product design
Seonghyuk Ko, Paul D. Fleming, Margaret Joyce, and Pnina Ari-Gur

SCALING
Scaling risk assessment in a closed circuit recycled board mill by speciation methods
Patrick Huber, Sylvie Nivelon, and Patrice Nortier

NONWOOD PULPING
Effect of black liquor replacement in wheat straw soda-AQ cooking and lignin structure of pulps
Kai Dai and Huamin Zhai