REPORT SUMMARY
This major new study identifies and profiles the top 25 disruptive technologies that are expected to affect the global pulp and paper supply chain over the next 10 years to 2020. Ten-Year Forecasts of Disruptive Technologies in Paper and Board to 2020 is the essential planning and strategy guide. It provides definitions and descriptions of disruptive technologies that could impact the industry, along with the potential impact the top 25 disruptive technologies will have. It includes exclusive analysis and ten-year forecasts, detailing how current and emerging trends will shape the pulp and paper industries. This brand new report is essential reading for anyone working in the paper and board, and related, industries.

FIND OUT ABOUT
• The top 25 disruptive technologies in paper and board
• Realistic scenarios for these technologies
• Eight categories of disruptive innovations

FOR FURTHER INFORMATION
SEE INSIDE OR VISIT:
WWW.TAPPI.ORG
TEN-YEAR FORECASTS OF DISRUPTIVE TECHNOLOGIES IN PAPER AND BOARD TO 2020

METHODOLOGY

Ten-Year Forecasts of Disruptive Technologies in Paper and Board to 2020 is the result of an exhaustive primary research programme incorporating interviews with a panel of leading paper and technology experts. The expert responses were tabulated and ranked to form the overall top 25 technologies. Secondary research was carried out to be able to provide a more detailed description of each item on the top 25 list. In addition, the most recent available data was consulted for worldwide consumption of different grades of pulp, paper, and paperboard products. The report provides a unique depth of information and analysis.

WHAT DO YOU GET?

• Thorough definitions and descriptions of the disruptive technologies that could impact the paper and board industries to 2020
• An assessment of the potential impact of the top 25 disruptive technologies on the industry over the next 10 years
• Exclusive paper and board technology forecasts clearly illustrated with 75 tables and figures

HOW WILL THIS MARKET INTELLIGENCE REPORT BENEFIT YOU?

• Identify and understand effects of the top 25 disruptive technologies on the paper industry to 2020
• Understand global trends affecting the pulp and paper industry
• Use scenario plans of emerging trends and ten-year predictions of disruptive technologies to plan your business strategy with confidence

WHO SHOULD BUY THIS REPORT?

• Paper chemical suppliers
• Paper manufacturers
• Print equipment manufacturers
• Packaging converters
• Consumable and equipment suppliers
• Brand owners and retailers

WHAT’S INCLUDED IN THE PRICE?

• One hard copy of report couriered to you (see order form for postage costs) on publication date
• CD-Rom with searchable PDF
• Global intranet licence allowing everyone in your organisation electronic access to the study

AUTHOR PROFILE

Martin Hubbe – Professor and distinguished scientist, Department of Forest Biomaterials, North Carolina State University

Martin Hubbe is an international authority in the field of biomaterials and paper and has been active in his research for the past 34 years.

His expertise includes colloidal chemistry, polyelectrolyte interactions, electrokinetic phenomena, and adhesive properties of polyampholytes. Martin’s research extends to papermaking chemistry, strength additives, dyes, online charge control and paper machine process optimisation.

Martin is the founding co-editor of BioResources.com, a peer-reviewed journal devoted to the science of lignocellulosic materials, and has co-authored 20 other related publications.
EXECUTIVE SUMMARY

INTRODUCTION AND METHODOLOGY
- Overview of project goals
- Scope of study
- Top 25 list of disruptive technologies for the pulp and paper supply chain
- Definitions of key terms
- Some clarifying questions
- Methodology (survey of experts and tabulation of their input)

THE PAPER AND BOARD SUPPLY CHAIN IN 2010 AND CATEGORIES OF POTENTIAL DISRUPTIONS
- Overview of the paper and board supply chain in 2010
- Descriptive terms for the investment environment
- Sectors of the industry
- Panel ratings for the 61+ potentially disruptive ideas included in the 2010 survey
- Categories of disruptive innovations affecting the pulp and paper supply chain
- Descriptions of the survey items by category
  - Category 1: Electronic Media
  - Category 2: Biomass
  - Category 3: Materials
  - Category 4: Markets
  - Category 5: Production
  - Category 6: Computerisation
  - Category 7: Fibres
  - Category 8: Nanotechnology

DISRUPTIVE TECHNOLOGIES IN THE PAPER AND BOARD SUPPLY CHAIN
- Summary of the top 25 disruptive technologies resulting from this study
- Merging of certain closely related items into the top 25 list
- Disruptive technology summaries for top 25 list
  - News on the internet
  - Tablet computing
  - Internet shopping
  - Electronic books and paper
  - Functional coatings
  - Digital archiving
  - On-demand printing
  - Text messaging
  - Air-laid papermaking
  - Cellulosic bioenergy
  - Innovative packaging
  - Radio frequency ID
  - Computer advances
  - Exporting waste fibres
  - Fibre sources
  - Hygienic and bioactive paper
  - Video gaming vs. reading
  - Smart inks
  - Tree bioengineering
  - Microfluting
  - Green marketing, laws
  - Moulded paper products
  - Nanotechnology
  - Web-formed composites
  - Novel paper products

TABLES AND FIGURES
- Scorecard of top 25 disruptive technologies of the pulp and paper supply chain, based on panellist ratings
- Complete listing of the survey results with panel rankings and scores
- Merging of certain closely related items into the top 25 list
- News on the internet: Disruptive technology summary
- Tablet computing: Disruptive technology summary
- Internet shopping: Disruptive technology summary
- Electronic books and paper: Disruptive technology summary
- Functional coatings: Disruptive technology summary
- Digital archiving: Disruptive technology summary
- On-demand printing: Disruptive technology summary
- Text messaging: Disruptive technology summary
- Air-laid papermaking: Disruptive technology summary
- Cellulosic bioenergy: Disruptive technology summary
- Innovative packaging: Disruptive technology summary
- Radio frequency ID: Disruptive technology summary
- Computer advances: Disruptive technology summary
- Exporting waste fibres: Disruptive technology summary
- Fibre sources: Disruptive technology summary
- Hygienic and bioactive paper: Disruptive technology summary
- Video gaming vs. reading: Disruptive technology summary
- Smart inks: Disruptive technology summary
- Tree bioengineering: Disruptive technology summary
- Microfluting: Disruptive technology summary

PAPER AND BOARD TECHNOLOGY FORECASTS TO 2020
- Chapter overview
- Evidence of a rapid pace of technological change since the preceding study in 2005
- Technology forecasts according to pulp and paper grades
  - Pulp grades (general)
  - Kraft pulp – unbleached
  - Kraft pulp – bleached
  - Mechanical pulp
  - Recovered fibre (paper recycling)
    - Paper grades (general)
    - Uncoated free-sheet paper
    - Newsprint paper
    - Coated magazine paper
    - Paper bag and similar
    - Linerboard
    - Corrugating medium
    - Coated board
    - Liquid packaging board
    - Tissue and towel
    - Specialty papers and boards
      - Cellulosic bioenergy
• Green marketing, laws: Disruptive technology summary
• Moulded paper products: Disruptive technology summary
• Nanotechnology: Disruptive technology summary
• Web-formed composites: Disruptive technology summary
• Novel paper products: Disruptive technology summary
• Transition table for unbleached kraft pulp production
• Transition table for bleached kraft pulp production
• Transition table for mechanical pulp production
• Transition table for recovered fibre production (recycling)
• Transition table for uncoated free-sheet paper production
• Transition table for newsprint paper production
• Transition table for coated magazine paper production
• Transition table for bag paper production
• Transition table for linerboard production
• Transition table for corrugated medium production
• Transition table for coated board production
• Transition table for liquid packaging board production
• Transition table for tissue and towel production
• Transition table for specialty papers and boards production
• Transition table for cellulosic bioenergy production
• Categories of disruptive technology that can be expected to impact the pulp and paper supply chain during the coming 10 years
• Potentially disruptive technologies in the electronic media category
• Potentially disruptive technologies in the market category
• Potentially disruptive technologies in the production category
• Potentially disruptive technologies in the computerisation category
• Potentially disruptive technologies in the fibres category
• Potentially disruptive technologies in the nanotechnology category
• Millions of readers of newspapers in the Washington DC area 1961–2003
• Today’s coffee shop scene, where e-news meets traditional news
• Illustration of the different transit requirements, comparing an internet sales transaction vs. a traditional visit to a store
• Concept of using light from an external source to read the electronic paper of an e-book
• Division of labour between a paper base-stock and advanced coating layers on a cellulosic base-ply
• Illustration of two key trends in digital archiving
• Illustration of how on-demand printing has the potential to change the logistics of delivering printed items to the user
• Whether hard-copy printouts will ever become commonplace on hand-held messaging devices
• Simplified illustration of steps in air-laid formation of paper from dry cellulosic pulp
• Illustration to emphasise four categories of biomass from a tree with their potential uses
• Typical cycle for domestic pulp and paper production at a source country, with much of the used paper becoming collected and exported
• Dimensions of commonly used wood fibres for papermaking
• Artistic depiction of a ‘smart box’
• Biosynthetic steps in main route to form a key precursor of lignin (sinapyl alcohol) from a starting compound (cinnamate)
• Representation of the most widely used standard formats for fluting (corrugation) in the manufacture of corrugated board
• Images of three widely known certification emblems
• Examples of packaging items that can be made from moulding of paper pulp
• Representation of three aspects of nanotechnology that are particularly likely to have influence on future product developments for pulp and paper
• Example of the range of composition of composite material that can be formed on a paper machine
• Plot of the rank order of items that appeared in top 25 lists in both the previous 2005 edition and the current 2010 edition
• Plot of the scores of items (potential impact times likelihood of full implementation) that appeared in top 25 lists in both the previous 2005 edition and the current 2010 edition
ORDER FORM

<table>
<thead>
<tr>
<th>Qty</th>
<th>Title</th>
<th>Unit price*</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TEN-YEAR FORECASTS OF DISRUPTIVE TECHNOLOGIES IN PAPER AND BOARD TO 2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Price is subject to change without notice due to variations in exchange rates.

1 Sales tax will automatically be added to all orders from residents of Georgia, Illinois, Maryland, Ohio, and Canada. If you need exact total in advance, please contact TAPPI at 1-800-332-8686 (US), 1-800-446-9431 (Canada), +1-770-446-1400 (Worldwide)

Payment for orders shipped to Canada must include the 6% GST or 4% HST.

2 Shipping will be automatically added to credit card orders. If you need a quote in advance for an exact total, please call TAPPI PRESS.

SITE LICENSE AVAILABLE Many TAPPI CD-ROM products can be installed on a Local Area Network, making them available to employees throughout your workplace.

3 MEMBERSHIP TAPPI members receive a 5% discount on this publication. Join TAPPI and receive the member pricing on all TAPPI PRESS published products. The cost to join TAPPI as a Professional member is US$174.

Indicate here if you would like to receive Paper360° (10 issues yearly; official magazine of TAPPI and PIMA) and TAPPI JOURNAL (monthly online publication and end of year printed summary edition and index) free of charge. US$14 postage fee applies for all non-US members.

COMMUNICATION PERMISSION TAPPI may use my contact information to communicate about products or services TAPPI believes may be of value and comply with government regulations. I hereby give TAPPI, TAPPI's business associates, the TAPPI Foundation, and TAPPI & PIMA's Local Sections written permission to contact me for the above stated purposes and to communicate with me via (tick as applicable):

- Fax and/or email for those purposes (Note: TAPPI does not release emails to third parties)

Signature __________________________ Date __________

YOUR DETAILS

Title __________________________ Name __________________________

Company __________________________

Street address __________________________

(No PO boxes) __________________________

Town/city __________________________ Zip __________________________

State __________________________ Country __________________________

Tel __________________________ Fax __________________________

Email address __________________________

PAYMENT METHOD (please indicate)

- Check or money order enclosed $ __________________________
  Check number __________________________

- Credit card __________________________

CREDIT CARD DETAILS (please tick as appropriate)

- American Express ________________
- Diner’s Club ________________
- Discover ________________
- Mastercard ________________
- Visa ________________

Card no. __________________________ Expiry date __________________________

Signature __________________________

ONLINE ORDERS Visit www.tappi.org/bookstore to place an order online.

MAIL OR FAX YOUR ORDER FORM TO:

TAPPI PRESS
PO Box 933644
Atlanta, GA 31193-3644 USA
Fax Number: +1-770-209-7206

Call or Email TAPPI PRESS:
1-800-332-8686 (U.S.)
1-800-446-9431 (Canada)
+1-770-446-1400 (Worldwide)
Email: tappipress@brightkey.net or order online at www.tappi.org

DELIVERY

Most orders are shipped within 5–7 business days, depending on product availability. The approximate transit time for International Air is an additional 7–21 business days. The approximate transit time for International Surface is an additional 2–12 weeks.

QUANTITY DISCOUNTS

TAPPI offers volume discounts on many TAPPI PRESS publications when multiple copies of one title are ordered. Please contact TAPPI for more information.

PAYMENT

TAPPI PRESS requires prepayment before orders are shipped. If you mail your order without payment, we will send you a pro forma invoice, and will ship your product(s) upon receipt of your payment.

WWW.TAPPI.ORG
TAPPI OFFERS MORE MEMBER VALUE WITH EXCLUSIVE MARKET INTELLIGENCE

MEMBERS RECEIVE DISCOUNTS ON PAPER, PACKAGING AND NONWOVENS MARKET REPORTS FROM GLOBALLY RESPECTED EXPERTS AT PIRA INTERNATIONAL

TAPPI is pleased to announce that it is now offering members discounted prices on select market reports from Pira International. Pira reports provide exclusive insight into market drivers, technology and end-use trends. ‘TAPPI’s mission is to help members find better ways to do business, and reports from Pira offer key information for creating a proactive strategy to compete in the global marketplace,’ said Larry Montague, TAPPI President. ‘With access to in-depth analysis and critical forecast data, members of our paper, packaging and nonwovens communities can better respond to change and contribute to their company’s future success.’ TAPPI members can receive a 5% discount on the latest market reports within three dynamic sectors.

### PAPER AND PRINTING
- The Future of Global Printing: Market Forecasts to 2014 Functional and Barrier Coatings for Paper and Board
- The Future of Paper and Board in Central and Eastern Europe: Market Forecasts to 2014
- The Future of Banknote Printing: Market and Technology Forecasts to 2014
- Novel Applications for Printing Technologies
- The Future of Digital Print for Packaging: Market Forecasts to 2014
- The Future of Printing in Asia: Market Forecasts to 2014
- The Future of Sheeted in a Digital Age: Market Forecasts to 2014
- The Future of Printed Business Communications: Market Forecasts to 2014
- Ten-Year Forecast of Disruptive technologies for paper and board

### PACKAGING
- The Future of Active and Modified Atmosphere Packaging: Market Forecasts to 2014
- Forecasts of Disruptive Technologies in Consumer Packaging to 2019
- The Future of Packaging: Long-term scenarios to 2020
- The Future of Global Flexible Packaging: Market Forecasts to 2014
- The Future of Industrial Decoration: Market and Technology Forecasts to 2014
- The Future of Packaging in the Middle East and North Africa: Market Forecasts to 2014
- The Future of Global Markets for Folding Cartons: Market Forecasts to 2014
- The Future of Global Packaging: Market Forecasts to 2014

### NONWOVENS
- The Future of Global Nonwoven Wipes: Market Forecasts to 2014

Each market report comes with a hard copy, CD with searchable PDF and global corporate intranet license. For more information and to order visit: www.tappi.org/marketreports.