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CAROLINE MARTIN

Guest Editor

O Papel

TAPPI Journal names two Best Research Paper Award winners for 2020

For the first time since the annual award was introduced back in 2006, *TAPPI Journal's* editorial board elected two scientific papers to receive the *TAPPI Journal* Best Research Paper Award for 2020. In analyzing criteria like scientific merit, innovation, creativity and clarity, the editorial board composed of 18 academia and industry experts arrived at the consensus that the two papers should be deemed winners in 2020: [“Creasing severity and reverse-side cracking,”](#) (April issue) co-authored by Joel C. Panek, research scientist for WestRock, Swan D. Smith, R&D researcher for WestRock, and Douglas W. Coffin, professor at Miami University; and [“Modeling of the energy of a smelt-water explosion in the recovery boiler dissolving tank”](#) (August issue) by Eric Jin, performance engineering specialist for The Babcock & Wilcox Company. The last paper's co-authors included Malcom MacKenzie and Steve Osborne, who are technology manager and advisory engineer, respectively, for The Babcock & Wilcox Company, and Honghi Tran, Professor Emeritus at the University of Toronto.

As informed by Peter W. Hart, editor-in-chief of *TAPPI Journal*, in order to be eligible for the award, the paper must be nominated by an editorial board member. Once a slate of nominated papers is obtained, the selection process begins with voting between all members.

“The entire editorial board votes for their top three choices,” said Hart. “When the voting is as close as it was for 2020, a special committee consisting of the current and past editor-in-chief meets to review the two papers and determine the winner. As both papers were of excellent quality, it was determined the best solution for this year would be to have co-winners.”

In this interview, Hart reveals the discoveries presented in each award-winning paper and analyzes the

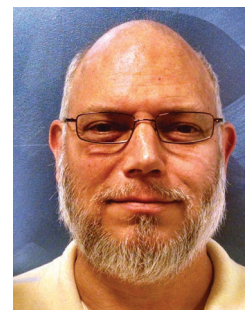
importance of combining research and operations for the continuous strengthening of the sector's competitiveness.

O Papel — **Focusing on the papers selected, what themes were addressed by the authors and what differentials do they present?**

TAPPI Journal Editor-in-Chief Peter W. Hart— The two papers that won this past year are in very different parts of the papermaking process. One paper involves the “modeling of the energy of a smelt-water explosion in the recovery boiler dissolving tank,” while the second manuscript, a paper-physics paper, determined “creasing severity and reverse-side cracking” of paperboard.

The dissolving tank paper extended the understanding of droplet-scale smelt-water explosions to a large-scale multi-droplet explosion. The energy of the smelt-water explosion was assessed using thermodynamic modeling. The results showed operating conditions that increase the conversion of explosion energy into mechanical work, which can potentially cause damage. This work is part of a larger continuing Research Consortium being conducted by the University of Toronto in Canada.

The second paper determined that the 180° reverse-side cracking could be characterized by a single parameter: draw length. The work incorporated z-direction compression into the determination. As with the other paper, this work is part of a larger research project being conducted.



Peter W. Hart

O Papel — *What aspects presented by each paper still need to be further analyzed/studied? Are there, for example, any practical challenges to be solved so that results can already provide increments or improvements to the day-to-day operations of plants?*

Hart — The draw length determination provided guidance on the tooling and penetration depth combination that will maintain creasing at an acceptable level, allowing paperboard converters to choose a penetration depth that is deep enough to give an acceptable relative crease strength without going so deep as to produce cracking. Mills can use the work to determine the operating window for creasing operations. The work is ongoing, with the next step being the identification of a non-dimensional parameter to describe the cracking threshold. The draw length is an absolute length, so it is not clearly transferable to alternative systems.

The other paper provides useful safety guidelines for mills around the operation of the smelt dissolving tank. The work provides a foundation to extend their efforts to the understanding of smelt-water explosions in the recovery boiler. The current work has also helped in understanding improved smelt shatter jet design, which will provide the industry with improved dissolving tank safety.

O Papel — *What is the relevance of this continuous and mutual work between research and operations? In what way does the combination of these two work fronts help strengthen the competitiveness of the pulp and paper industry?*

Hart — The combination of research in conjunction with operations provides a useful and mutual beneficial partnership that strengthens both parts. The operations groups identify pain points and potential operational conditions for research efforts. Research then develops enhanced operational windows to either improve the safety or operational conditions that mitigate or at least reduce these pain points. The two best papers selected by *TAPPI Journal* are excellent examples of these collaborations. By reducing the number of operational pain points, research and development continues to improve the operation and safety of our operating facilities.

O Papel — *Do you believe that research development coupled with operational practice becomes even more important within the bio-economy context? Why?*

Hart — The bio-economy is currently in its infancy. There is a tremendous amount of research being conducted to develop reaction pathways and processes to produce liquid fuels and specialty chemicals. Much of this work is being performed without the input of operational practice and knowledge, which invariably leads these efforts to produce faulty conclusions.

A good example is several of the fermentation processes for extracted hemicelluloses from wood. Most of these efforts developed pathways using corn syrup instead of real wood extracts. The corn routes worked well, but trace contamination associated with wood extracts proved to be fermentation inhibitors, which derailed the research efforts. As such, it is critically important to combine operations, actual process materials, and research understanding to develop bio-pathways to develop the new products and processes associated with the bio-economy.

O Papel — *In your opinion, is the sector mobilizing itself appropriately to become more and more prepared for the industry in the future?*

Hart — The paper industry is rapidly positioning itself to be a leader in the new circular economy. The industry is rapidly expanding its acceptance of materials such as poly-coated cups and used pizza boxes into its recycle stream. In addition, the industry is working on the production of food contact-approved bleached recycled fiber and developing methods for incorporating more sustainable fiber into its products.

The industry is rapidly working on barrier applications to replace PFAS chemicals and poly-based materials with biodegradable materials. The development and use of natural materials are a high priority in the paper industry research arena. By reducing or eliminating petroleum-based plastics, fluorocarbons, and other materials, the industry is positioning itself to be a leader in the circular economy of the future.

O Papel — Still looking at the future, how do you envision the forest-based industry in the next years? Considering current works underway, what paths does the sector have the potential to follow?

Hart — The development of aqueous-based barrier materials as a replacement for poly extrusion is an important and growing trend in the industry. Research is beginning to develop forming and sealing techniques in conjunction with barrier coatings to control oxygen, grease, and water transmission through the board. These containers will replace composite containers and flexible packaging based upon plastics in the consumer marketplace. The recyclability and recycled material content in paper-based solutions will also increase over the next several years. Improved understanding of the entire cradle-to-grave lifecycle of paper-based solutions compared to plastic and other materials will be fully understood and paper will develop enhanced LCAs.

O Papel — In order to consolidate this path, what challenges will need to be faced and mastered?

Hart — The development of aqueous barrier coatings that control both liquid water and humidity, are biodegradable, and are produced from natural materials is a difficult challenge. Adding the need for grease and oxygen barrier properties to these coatings makes the process even more difficult, and these challenges are currently being investigated with some degree of success. The fundamental understanding of these processes is being developed and potential solutions to portions of these challenges are being commercialized.

As the industry gets more experience producing these early solutions, research will develop improved methods to improve the operational window for production. An enhanced understanding of natural material application will also lead to improved processes and products for the paper industry. **TJ**

Martin is a reporter for [O Papel](#), a publication from ABTCP (Associação Brasileira Técnica de Celulose e Papel/ Brazilian Technical Association of Pulp and Paper) where another version of this interview is appearing. Martin is based in São Paulo, SP, Brazil.