Report on China Paper 89

***Tappi Journal* Staff Report**

The following are program notes on the technical conference of China Paper 89, held at the Great Wall Sheraton Hotel in Beijing, People's Republic of China, Nov. 10-11, 1989. All papers presented at the conference are published in the China Paper 89 Proceedings, *available from TAPPI PRESS.*

Official greetings

Welcoming the delegates to the China Paper 89 technical conference, TAPPI Vice President F. Keith Hall, chief scientist and director of science and exploratory development of International Paper Co., extended greetings to the Chinese pulp and paper industry as a whole and offered a special hand of friendship and congratulations to the China Technical Association of the Paper Industry on the occasion of its 25th anniversary.

He named one of the primary goals of TAPPI as the broadening of the communication bridge among the international pulp and paper community. He also pointed out the following:

> Though sometimes we are viewed as an American organization, we have had international membership since our foundation nearly 74 years ago and, in more recent years, we have put a great emphasis on broadening our international focus—with seminars, classes, publications—all aimed at an international exchange of information and ideas. We recognize that TAPPI has a special relationship and obligation worldwide. And so we continue to look for ways in which our organization, and our peer organizations across the world, can contribute together the experts in our industry for the common objective of improving our industry worldwide.
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> This year's participation in China Paper 89, and this portion of the technical conference, is one such activity aimed at achieving that goal.

Global patterns and outlooks for paper/paperboard and fibrous raw materials

Ronald J. Slinn of the American Paper Institute analyzed the outlook for pulp and paper to the year 1992. The following includes information from his report.

Paper and paperboard

For total paper and paperboard, global capacity is projected to grow from some 242.6 million metric tons in 1988 to 276.8 million metric tons in 1992, a growth rate of 3.4% per year, matching the rate of capacity growth between 1984 and 1988, and keeping pace with recent economic growth in most of the countries which generate demand for paper and paperboard.

Within the overall paper and paperboard category, however, expansion of newsprint capacity is expected to



accelerate to an annual 4.5% rate between 1988 and 1992, more than twice the 2.2% annual rate over the preceding four years.

Paper grade wood pulp

The rates of growth in capacities of paper grade wood pulp while accelerating a little over the next four years to 3.0% per year do not match those for paper and paperboard. This does not imply a primary fiber shortage for the global industry.

Overall, paper grade wood pulp capacity is projected to grow at an average annual rate of 3.0% from 160.2 million metric tons in 1988 to 180.0 million metric tons in 1992, having grown at only 2.1% over the preceding four years.

In summary, despite the relatively short outlook in the data presented, there are several dynamic changes inherent in the patterns they reveal: an accelerating rate of growth in thermomechanical wood pulp capacity relative to chemical wood pulp capacity, a continuing increase in the proportion of hardwoods in chemical wood pulp capacity, only modest growth in the availability of nonwood pulps, perhaps an acceleration in the declining ratio of primary pulp capacity to total paper and paperboard capacity, and, finally, a significant surge in the supply and consumption of recyclable waste paper.

Kenaf: a fast-growing fiber source for papermaking

Andrew F. Kaldor of Ankal Pty. Ltd. in Sydney, Australia; Hank Verwest of Sandwell Swan Wooster, Inc. in Vancouver, Canada; and Curt Karlgren of Cinterna, Inc.

in North Vancouver, Canada, and Curt Karlgren of Cinterna, Inc., in North Vancouver, Canada, discussed kenaf in thorough detail. In summary they said: kenaf is annual plant, maturing in 5-6 months. It contains two basic fiber components, the bark and the core.

The Ankal Separation Technology makes it possible to produce two different pulps from the bark and core, and they are pulped individually. These fibers can be used in both mechanical and chemical pulping processes. Neither the bark nor the core fiber requires much of refining energy to develop its strength in the papermaking process.

The kraft or soda-AQ processes seem to produce good results. The kenaf pulps can be bleached to the same brightness levels as conventional kraft (wood) pulps. The growth yield (tons per year and acre) of kenaf is about twice that of southern pine in the southern United States, whereas the chemical pulp yield (in percent) is similar.

The kenaf bark and core pulp blends can be used in most paper end uses. In addition, the kenaf bark pulp can replace specialty pulps in a range of specialty paper products. Kenaf pulp mills can be built to a much smaller size than kraft (wood) pulp mills.

In the future, kenaf offers an interesting high-quality pulp and papermaking raw material in many parts of the world, particularly in areas with (coinciding) fast-growing paper consumption, depleted forest resources, high energy costs, and limited investment capital availability.

The state of the art of deinking graphic papers (difficult-to-disperse inks)

Following his overview of secondary fibers presented at China Paper 87, Wayne F. Carr of Wayne Carr & Associates, Appleton, Wis., focused his discussion on the characteristics of the contaminant, approaches to removal, and systems commercially applied. Further, he suggested a basic design approach and examined trends in new system design. Concluding his presentation, he made the following statements.

Wastepaper containing difficult-to-disperse inks are rapidly growing and are further difficult to segregate in paper stocks provided to deink facilities.

Conventional deinking processes of washing and flotation are not very effective on reclaiming speck-free fiber. All approaches commercially applied to date have not been successful in producing fiber qualities necessary for printing and writing grades. Commodity grade tissue and toweling papers have successfully been produced with difficult-to-disperse inks utilizing mechanical dispersion at both 20%- and 36%-consistency ranges.

Mechanical dispersion without effective removal of the ink particles before high-consistency dispersion results in severe brightness loss.

Design trends for new systems are focusing on:

- Agglomeration of ink particles followed by screening and cleaning techniques
- High-consistency pulping followed by screening and cleaning, screening, and flotation or washing followed by high-consistency grades of pulp to cope with the variable paper stock feeds. To accomplish this, it is necessary to separate the deinking process from the papermaking operations totally.

This process step is extremely critical to the future growth of deinking pulps and to the utilization of difficult to deink paper stock sources.

Oxygen bleaching and other oxygen delignification

The use of pressurized oxygen gas as an active bleaching agent for papermaking pulps is a rapidly evolving technique. James L. Minor of the Forest Products Laboratory in Madison, Wis., discussed some of the chemical principles involved in oxygen bleaching and provided an overview of the directions of current research. He also reviewed the various ways oxygen is used in the pulp and paper area. He drew much of his information from the most recent TAPPI conferences. Looking into the future of bleaching technology, he made some important observations:

With the present state of the art, there is no proven method of bleaching softwood kraft pulps to the brightness required by today's market with the strength required for processing and use without including some chlorine in the bleaching process. However, because of the number of approaches that have been taken in attempts to eliminate chlorine, it is generally believed that with a combination of the proposed approaches it will be possible to have nonchlorine bleaching.

For the near future, chlorine dioxide will be acceptable to provide final brightness increases and to substitute as much as possible for chlorine. Eventually, chlorine dioxide may have to be replaced as well.

Some combinations of oxygen bleaching agents (oxygen, hydrogen peroxide, and ozone) are at present the most likely candidates. The process may include extended delignification, lignin activation, oxygen delignification, oxidative extraction, ozone, and peroxide in some combination. Research in this area is very active, but there still is much to be done.

Opportunities for improved plantation forestry in the People's Republic of China

The People's Republic of China has only about 9 billion cubic meters of forest reserve, and only about one third of that is accessible. Because of very low per capita consumption of both solid wood and fiber products, the demand for wood products for the more than 1.1 billion inhabitants is expected to increase dramatically in the coming decades. The 800,000 hectares of commercial forest land that were denuded by fire in 1987 in northeastern China are in need of regeneration but, because of marginal growing conditions for plantation forestry in that area, the area south of the Yangtze River will receive greatest attention for intensive forestry.

The species of greatest importance in southern China are and will be the southern pines (*Pinus taeda, P. elliottii, P. kesiva* and *P. caribaea*) and *Eucalyptus spp.*, according to R. C. Kellison of North Carolina State University in Raleigh, N. C.

Kellison feels that other fast-growing hardwoods that will be grown on a selective basis include *Acacia mangium, A. auriculiformis, Paulownia spp., Populus spp.* and others. Tree improvement programs are essential for all

species, and vegetative propagation, inclusive of biotechnology, will become of increasing importance in optimizing production from plantation forestry. As the genetic improvement of the species is realized, the intensity of silvicultural practices must be increased accordingly.

The major concerns about plantation forestry in southern China are the planting of slash pine on sites where loblolly pine would do better, the depletion of soil nutrients during the second rotation from collection of the nutrient-rich leaves (foliage) from the first rotation crop for fuel, and the premature use of vegetative propagules for commercial forestry without adequate testing. Plantation forestry has a bright future in the People's Republic of China.

Energy conservation in the pulp and paper industry: examples from the Swedish industry

When the first oil crisis came in 1973, the Swedish pulp and paper industry reacted quickly. The Swedish Pulp and Paper Association immediately formed a Standing Energy Committee, which is still very active. Among many other projects, the committee performed energy audits of Swedish mills in 1973, 1979, 1984, and 1988. While the results of the 1988 audit were not yet available, Thomas K. Wahlberg of Mo och Domsjo in Norrkoping, Sweden, presented the results of the 1984 audit. He also gave specific examples of energy conservation in bark burning, spent liquor burning, heat from the thermomechanical pulp (TMP) process, and in the paper mill. Concluding his report, he said:

> My review of energy consideration in the pulp and paper mill has mainly dealt with the saving of thermal energy. Very good results have been achieved. I have only illustrated a few of them.
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> It is much more difficult to save electric power. In the Swedish pulp and paper mills—as an average 60% of the electric power is consumed in pumps, fans, and agitators closely connected with the process—30% is consumed in refining and beating. Altogether 98% of the power is used for driving electric motors.
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> Much effort in the form of R&D is at present devoted to find solutions to reduce the power demand by various means in the pulp and paper industry.

Practices and techniques needed for good corrugated box plant operation in the People's Republic of China

J. F. Stevenson of SAS International, Inc., in Cincinnati, Ohio, presented a thorough review of what makes a box plant successful. He based his presentation on his company's wide experience in various countries and on discussions with machinery and paper suppliers to the Chinese corrugated industry. He provided details on the following topics: strategy, some distinguishing characteristics of the Chinese box plant, achieving cost effectiveness in a Chinese box plant, and reduced fiber cost per box.

In determining a strategy for achieving a cost-effective operation, he said it is critical first to identify the major costs of producing a box.

In all countries, containerboard is the largest single cost, typically 50%–65% in fully developed countries and 80% or more in less developed countries.

Other raw materials, such as starch, ink, and coatings, typically are 5+% of containerboard cost.

Labor cost—factory, staff, management—usually is the second highest cost, but not always. For example, labor cost is about 15% of total cost in the United States versus 3%-4% in China. This substantial difference supports a significant difference in strategy for optimizing cost effectiveness in China versus in the United States.

The third highest cost in most plants is the cost of delivering the product to the customer—typically 4+% of the selling price.

Other smaller, but significant, costs include energy, maintenance, working capital, and invested capital.

Carbonless and thermal papers

Charles P. Klass of Klass Associates, Inc. provided an overview of carbonless and thermal coated paper products, their similarities and differences, market trends, current and developing applications, and technical developments. He concluded his discussion with an outlook for thermal papers.

Thermal printing encompasses a variety of products and applications and is gaining widespread acceptance. The key underlying ingredient in all direct thermal applications is the widespread availability of cost-effective, high-quality printer grade, and facsimile grade thermal paper from a variety of worldwide manufacturers.

One of thermal printing's greatest strengths is application where forms, data formats, logos, and grids are printed on-site, on demand, thereby eliminating expensive, preprinted media along with registration problems that might occur between the preprinted items and the data.

Its key weakness or limitation is lack of multi-copy forms printing. The current high growth rate for thermal fax papers should continue for at least the next several years.

New developments in pulping research

For the purpose of his thorough presentation, William S. Fuller of the Weyerhaeuser Co. in Tacoma, Wash., defined research and development as the laboratory, pilot, and mill trial activities that lead from a conceptual idea or theory to full-scale mill practice.

Regarding research needs and trends, he said that the resources allocated to pulp and paper research and development are historically much smaller than those for such industries as computers, electronics, and food processing, for example. Even in the best economic climate, the largest forest products companies allocate less than 1% of their sales revenues to research and development. The technologies that receive the most attention vary according to geographic needs.

Fuller pointed out how a recent survey of world leaders in the industry showed that these needs reflect the wood supply, environmental, energy, per capita consumption and other economic trends in each particular country or geographic area. The needs were defined further in terms of those focused on process technology and those emphasizing improvements in product quality.

Experience of commercial bagasse newsprint production

R. Field of Beloit Walmsley Ltd. in Bolton, England, presented a detailed review of the very successful bagasse-based newsprint production unit at Tamil Nadu Newsprint and Papers Ltd. (TNPL) in India. Beloit Walmsley was the main process line supplier for the mill.

This mill produces newsprint and fine papers on a dual purpose installation. The main furnish component for both products is bagasse. The total production of the mill is 90,000 tons/year, with 50,000 being newsprint and 40,000 being fine papers.

The particularly unique feature of the newsprint production line is a thermomechanical pulp/chemimechanical pulp (TMP/CMP) mechanical bagasse pulping line, which allows newsprint to be produced, together with chemically pulped bagasse, from 85% bagasse furnish.

This furnish mix has proved to have the characteristics required for acceptable newsprint. The paper machine started up in late 1984 with purchased pulp, and the three pulp lines followed in series so that the complete process line was commissioned into full-scale operation in October 1985.

An overview of the use of TMP and CTMP

Mechanical pulps provide a yield of over 90% based on wood, and therefore represent the most efficient use of the forest for papermaking, said O. L. Forgacs of MacMillan Bloedel Ltd. in Vancouver, Canada.

Over the last three decades, the traditional wood grinding process has been progressively replaced by the use of chip refiners. This process offers many process options, such as the use of elevated temperatures (TMP) and the use of softening chemicals (CMP and CTMP), and facilitates process control.

While coniferous woods traditionally have been the main source for mechanical pulps, TMP and chemithermomechanical pulp (CTMP) from poplar species are being increasingly recognized as prime papermaking materials. Forgacs reviewed the future for mechanical pulps from these fast-growing trees.

With respect to problems that still need to be overcome with mechanical pulps, he said the following: In the first place, mechanical pulping requires a great deal of electrical energy, in the range 2200 - 3000 kW·hr/ton of pulp. The TMP and CTMP processes become more attractive economically if as much energy as possible can be recovered. Present technology can recover 40–60% of the energy as steam, which can be used to dry the pulp, or process paper in an integrated pulp and paper mill. Improvements in heat recovery will make mechanical pulping more attractive, especially in areas of high energy cost. However, it is difficult to recover the energy in nonintegrated pulp mills. Effluent treatment, particularly for CTMP mills, still presents serious challenges in dealing with toxicity and biological oxygen demand. This subject is being researched intensively in a number of companies, including MacMillan Bloedel. Lack of information in this area may delay the installation of CTMP mills in certain locations.□