Conference Report

International mechanical pulping trends

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The 1991 International Mechanical Pulping Conference held in Minneapolis, Minn., during the first week of June at the Hyatt Regency hotel, blended research, development, and practical experiences well. It allowed for open information exchange between the delegates during sessions and social gatherings.

Overall, the conference offered no breakthrough in new technology. There were no quantum leaps in process or in equipment development, only small improvements. There is no development in energy reduction to report. Some can be saved by chemical pretreatment, as seen in the alkaline peroxide mechanical pulping (APMP) process, but these modifications represent reduced yield and increased pollution.

The conference did shed light on trends and on the direction in which the industry is being led. The future of mechanical market pulp mills will depend on the acceptance of tailor-made pulps by the papermakers. Eventually, economy will drive the replacement of chemical fibers. Aspen APMP will be the leading product, which will compete with hardwood kraft. Sulfonation as a means of improving fiber strength is fading because of the associated effluent pollution. Zero effluent must be developed and incorporate chemical recovery for reuse.

Recycled old newspapers will replace mechanical pulp in many paper grades. This will slow capacity increases in integrated mills. The high-strength thermomechanical and chemi-thermomechanical pulps, however, will dominate greenfield newsprint mills. PGW on the other hand will gain wider ground for supercalendered and lightweight coated grades.

It is hoped that research and development, neglected recently, will pick up shortly as the industry recovers from a recession. Some of the key issues such as energy reduction, color reversion, and zero effluent must be addressed if mechanical pulping is to prosper. There must be a better way of producing mechanical pulp than by compression and decompression cycles.

Wastepaper challenge

Recycling of old newspapers (ONP) is a major challenge to the mechanical pulping industry. ONP could replace 10,000 tons of mechanical pulp in newsprint annually, noted Douglas S. Atack, retired from the Pulp and Paper Research Institute of Canada (Paprican), in his keynote address. Most integrated pulp mills are planning to adopt deinking technology. The quality requirements for deinked paper must be defined in the early design stage to select the best process, Atack said. Defining the quality of the available wastepaper is equally important. Since the quality will most likely fluctuate, the plant must be designed for flexibility. It appears that a combination of flotation and washing will be needed, often followed by dispersion of hard-to-remove inks.

Stanley A. Heimburger of FMC of Canada Ltd. reviewed the bleaching of deinked news and magazine papers. While the use of hydrogen peroxide is successful in the pulper, it is more efficient in post bleaching, especially at high consistencies. The reject rates from the plant must also be defined and their disposal planned carefully. Deinking is not a pollution-free process. While energy costs of deinking are low, plant operating costs are on the high side.

The legislated use of wastepaper will have a detrimental effect on the Canadian newsprint industry, Heimburger believes. Canadian mills are designed for virgin wood pulp and most mills use a single TMP furnish. The use of recycled newspaper is not economical for these mills. They are far from their customers, mostly outside Canada. Most of the mills will be forced to import waste newsprint from the United States. The high cost of shipping could therefore make it harder for Canadian mills to compete.

APMP

Little if any new information was reported on alkaline peroxide mechanical pulping (APMP). The process has, however, found wider acceptance because it is environmentally more friendly than sulfonation. It is best suited for low-density hardwoods, like aspen. High-density woods by themselves are not suitable for the APMP process because they yield low-strength pulps. Some wood species, like beach and maple, can be blended up to 33% with softwoods without any serious loss in pulp quality. Pulping yield will be lower, around 80%, and biochemical oxygen demand (BOD) loads will increase over 100 kg/ton, note researchers who've been working with high-density hardwoods at the Andritz Sprout-Bauer pilot plant in Springfield, Ohio.

Harry D. Wilder of Scott Paper discussed the number of impregnation stages in the alkaline peroxide pulping

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During the International Pulping Conference in Minneapolis, Minn., the Arne Asplund Mechanical Pulping Award was presented to **W. Donald May**, retired, of Paprican. Pictured are (L–R) **Lennart Lundén**, vice president of Sunds Defibrator; **Lennart Stockman**, chairman of the awards foundation; **May**; and **Ted Hooper**, president of Sunds Defibrator Lteé/Ltd., Canada.

process. He emphasized the need to remove or inactivate the heavy metal ions in the wood. This is accomplished by multistage pre-refiner impregnation of the chips, before peroxide is added to the system. It is important to add peroxide early enough to avoid yellowing by alkalinity, Wilder advised.

Processes

Chung-Li Lee of Paprican discussed compression ratios, which confirmed that a 4:1 ratio is most desirable. Squeeze ratio is equally important. It represents the amount of liquid removed from the chips, which can be replaced by chemical solutions, thus deciding the chemical concentration of the impregnation liquor.

Paprican's Cyril Heitner reviewed the sulfonation process for ultra-high-yield mechanical pulps at various pH levels. Acid bi sulfite produces a pulp with higher brightness and bonding strength from softwoods. The process is highly corrosive when air leaks into the system, forming sulfuric acid. This would require expensive anti-corrosion metallurgy.

Heitner's work clarified previous controversial claims on steam explosion pulping. He found no evidence of any benefits in power consumption, when compared to conventional chemi-thermomechanical pulping. Irrespective of the process, energy consumption to a given pulp quality is a function of chemical consumption and pulp yield. The work clearly shows that steam explosion of the chips does not take place during discharge from the digester.

Pressurized grinding is an accepted alternative, which is competing with refiner-based mechanical pulping, especially for supercalendered (SC) and coated paper grades. And researchers at the Myllykoski mill in Finland have found that super pressure groundwood (PGW) pulp is 16% stronger than regular PGW. The 4.3 bar operating pressure in the grinder produces more flexible fibers, but the 120°C shower temperature results in 4–5 units brightness loss and lower light scattering. Lowering the shower temperature to 95°C, while maintaining high grinder pressure avoids brightness loss while still benefiting from higher strength. A further benefit of keeping shower temperatures below 100°C is that the pressurized thickener can be replaced by atmospheric equipment, saving capital.

Stora Forest Industries reported a 10% energy saving for grinders that use helical grooves in the pulp stone. The grooves help to keep the stone clean. Higher production rates are achieved without adverse effect on pulp quality.

The Niagara of Wisconsin mill reported on the benefits of advanced control systems combined with extensive operator training.

High yield pulps

A report by Ron Reis of Millar Western Pulp Ltd. on new high-yield market pulps was an eye-opener for many integrated pulp mills. Kraft mills produce and market a single pulp quality. This pulp is developed in the paper mill on stock preparation refiners by the papermaker as desired by the end product. High-yield mechanical pulps, on the other hand, can be altered only to a small degree in the paper mill, as through post refining. The mechanical pulp must be tailor made in the pulp mill to suit the papermaker. To do this successfully, the mechanical pulp producer must develop a much greater understanding of the papermaker's need. The Millar Western mill is using the alkaline peroxide process to produce a variety of pulp grades from softwood and aspen. These pulps are now finding their way into paper grades that were reserved for chemical pulps.

Many speakers felt that the existing paper grade-structure is outdated and it limits the wider use of mechanical pulps. The grades should be reclassified by end-use performance and not by furnish content. This will make tailor-made mechanical pulps suitable in paper grades, which are reserved for chemical pulps only. Brightness and brightness stability limits the use of mechanical pulps in fine paper grades. Brightness of softwood mechanical pulps is limited to 80 units and aspen to 85. But most paper grades do not need higher brightness levels, and only a few papers need to be permanent. Economics will drive the replacement of chemical pulps in many paper grades.

B. C. Strand of Pacific Simulation reported on improvements on the PQM 400 on-line pulp testing device, which is now capable of handling multi-variable inputs and outputs. Jan Hill of QualTech AB—the inventor of the PQM—reported on a sensor to measure consistencies in the blow line of pressurized refiners. Because of bulk density and moisture variations in the raw material, feed rate to the refiners is not uniform. Consistency fluctuations in the refiner have a significant effect on load swings. The optical sensor, using infrared technology, could measure and then control consistency between the refiner discs, representing a major step in control strategy.

A new development in refining equipment was presented by Daniel Jutras of Hymac Ltd. Design details of the HXD-64 refiner revealed two single disc refiners built into one unit. None rotate, but movable plate holders are loaded against both sides of the rotating disc in the center. The trust load on the unique machine is designed for 100 tons on each side, which can be loaded individually. Load is measured on each side of the machine by a torque arm technique. The design of the refiner allows for two-stage refining in a single unit, which should save capital and installation cost.

Johannes Kappel from Andritz AG, Austria, discussed the importance of resin removal from mechanical pulps. Elevated temperatures and alkaline pH above 8 assure high removal efficiency. Peroxide bleaching can reduce the amount of extractives by 40%. On the same line, Sandoz provided interesting information on the exhibit floor, on an organism that feeds on resins, without eating the cellulose or the lignin in the wood. One southern U.S. mill is using it commercially, with good results. Full-scale tests are under way for other wood species.

Paprican proved the benefits of joint research efforts by making valuable contributions to the conference. John R. Wood's presentation on the Dynamic Sheet Former was interesting: the device is a better research tool than the handsheet machine for predicting paper quality from a paper machine. It could become a useful tool in developing paper grades to replace chemical fibers by mechanical pulps, after incorporating white water recirculation.

The last session of the conference presented a set of mathematical equations by W. Donald May of Paprican. These were developed to predict pulp and steam flow between the disc of commercial scale refiners. The equations predict plate gap, axial thrust, and average refining intensity throughout the refining zone. The work will become an important tool in understanding and optimizing refiner operation. May also received the 1991 Arne Asplund Mechanical Pulping Award during the conference.

A comparison of results using 1200 rpm vs. 1800 rpm on double revolving disc refiners by Paprican's Mustafa I. Stationwala proved that refining intensity increases at higher rotational speeds. The increased centrifugal forces reduce fiber residence time between the refiner discs. When a higher speed refiner is followed by a lower speed, lower intensity refiner, one third of the energy can be saved. This suggests different refiner speeds in primary refiners vs. secondary refiners. Unfortunately, the proposal cannot be applied to single disc refiners, because in North America 1800 rpm is the practical highest speed. It could be a potential improvement on double revolving disc machines.

Attendance and tours

This year's conference was combined with a small table top exhibit by suppliers. Attendance was 428 delegates, somewhat below the last conference, held in Helsinki, Finland.

The three-day technical program was followed by mill visits to Champion International's mill in Sartell, Minn. Some of the delegates participated in a separate two-day trip to Blandin Paper's mill in Grand Rapids, Minn.; Lake Superior Paper Industries' mill in Duluth, Minn.; and Sartell. □