SESSION 3B FIBRE LINE

3B1 Constant Pulp Quality and Refining Knowhow – Using Online Fibre Measurement and The Mercer Fibre Centre

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Refining is the key process in papermaking to alter fibre characteristics and consequently to develop the required paper properties. Fibre morphology determines pulp and thus paper characteristics and plays a decisive role in adapting the appropriate mill refining strategy.

Selling market pulp requires to an ever increasing extent a deeper knowledge of the fibres' impact on the products they are used for. Since especially NBSK is hardly ever used as the only furnish for manufacturing a certain product, understanding the interaction with other fibre types is very important, too. Laboratory methods such as PFI mill, Jokro mill, and Valley Beater - still in use in many places - are mainly intended for quality control. However, these data cannot be applied to the industrial refining process. But this is exactly papermakers are looking for. For these reasons Mercer decided to invest in its own "Fibre Centre". The main piece of equipment is a laboratory refiner. Its operating principle is based on refining intensity and refining energy. The refiner does not only simulate the industrial refining process but also offers a high degree of versatility and flexibility for carrying out very specific trials as well as projects with customers and other external partners.

Pulp refining behaviour is very valuable knowledge for the papermaker. But even more important is consistent quality of the delivered pulp. Since Mercer's key quality target is stability we use online measurement of fibre morphology. Fibre morphology correlates well with strength properties. Frequent measurements of the main fibre characteristics built into a strength model allow us to monitor pulp quality and to react quickly to process variations. By aligning this strength model with refining data we have developed a great tool for quality control.

The paper starts with an overview of the Fibre Centre's testing capabilities. It further points out routines for ensuring consistent and reliable results and shares examples for typical applications such as quality control, customer support and applied research. The last part of the paper covers the fibre morphology online measurement and explains how the strength model is built upon the results.

3B2 Implement Papricycle to save caustic and improve COD to D_1 stage

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Increasing caustic prices has led many market kraft pulp producers to explore alternate solutions to mitigate their operating costs in bleaching and other unit operations where caustic is being used pre-dominantly. Papricycle is a process in which washed, chlorinated pulp is treated with recycled E1-stage effluent and is then washed again. It utilizes the alkalinity and heat value of the first extraction stage filtrate to decrease the charge of sodium hydroxide in that stage and simultaneously decreases the steam requirement for pulp heating. If a mill is capable of arranging a spare washer, Papricycle can save 25% to 35% of caustic in the first extraction stage. This presentation will give brief background information on Papricycle process and share main results from a Kraft pulp mill running Papricycle for several years and is planning to implement the technology in a second bleach line.

3B3 Technical Merits of Reclaiming Green Liquor Dregs to the Chemicals Recovery Cycle in Kraft Mills

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The pseudo-cyclic nature of Kraft Pulping process makes it susceptible to undesirable materials accumulation. Often called Non-Process Elements (NPEs), these chemical compounds are reported to deteriorate mill efficiency and reliability. NPE are defined [1] as chemical elements not beneficial at given step of the Kraft pulping process.

Commonly reported elements include Aluminum Al, Barium Ba, Calcium Ca, Chlorine Cl, Iron Fe, Magnesium Mg, Manganese Mn, Molybdenum Mo, Phosphorus P, Potassium K, Silicon Si, and Strontium Sr. Even though Ca, K and Mg are beneficial ingredients to the Kraft process, NPEs are regarded as root cause of fouling, corrosion and energy inefficiencies in Kraft pulp mills. Current strategies for controlling NPEs involve purging of key process streams while periodically dumping others, based on heuristics. Thus, materials from Smelt Dissolving Tank (Green Liquor Dregs), Quicklime Slaker (Slaker Grits) and Lime Mud Kiln (Electrostatic Precipitator Dust, Product Discharges) are permanently landfilled. Salt Cake from Chemical Recovery Boiler (Electrostatic Precipitator and Economizer Hopper Dust) is occasionally sluiced to effluent. An effective mill operation should target NPEs concentration high enough to minimize purges of valuable chemicals yet low enough to prevent process upsets. In this investigation, laboratory trials and process balances are used to assess the technical merits of landfill volume reduction by reclaiming Green Liquor Dregs (GLD) stream to the lime kiln. Calcining behavior, slaking reaction, causticizing kinetics and settling rate of Lime-GLD mixtures are systematically evaluated. Preliminary results (Figure 1) reveal that 85%wt. of GLD dry solids is combustible. Products of calcined GLD affect unit operations, in causticizing plant, marginally.

This exploratory work is part of an ongoing effort for waste valorization and minimization at the Mercer Peace-River (MPR) mill. The goal is to provide operation team with suggestions and improvement ideas for cost effective management of NPE in the Chemicals Recovery Cycle while minimizing landfill footprint.

3B4 Reliable Storage Bins & Feeders for Hog Fuel and Wood

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In the 1950s, Dr. Andrew Jenike, at the University of Utah, developed the theory of using a bulk material's flow properties to design storage bins that self-empty with only the aid of gravity. The material flow properties that Jenike was interested in included the shear strength the bulk material gained when compressed under load as well as the bulk material's internal angle of friction. Jenike's research, which focused on granules and powders, revolutionized the way the mining and pharmaceutical industries design storage bins.

In the 1980s, researchers at an independent research institute located on the campus of the University of British Columbia led a 15-year research program to either prove or disprove whether Jenike's theories apply to fibrous materials, such as hog fuel and wood chips, as well as cohesive materials, such as lime. The aim of the research, which was funded by the Government of Canada's ENFOR (ENergy from the FORest) program, was aimed at supporting Canada's pulp and paper industry to resolve critical materials handling challenges.

The research conducted on the campus of the University of British Columbia was hands-on. The team built a full-size bin, as well as developed new bench test equipment needed to characterize the flow properties of different species of hog fuel and wood chips. The research not only demonstrated that Jenike's theories apply to the design of storage bins for fibrous materials, but also demonstrated safe and reliable bin geometries for handling hog fuel and wood chips. In addition, the research uncovered the negative effects that the behaviour of the feeder can have in causing bin plugging and inconsistent feed.

The critical outcomes of the research included both a scientifically grounded approach to determining correct storage bin geometry for sticky, fibrous and cohesive materials, as well as the Kamengo Feeder, which was designed to resolve the key shortcomings of conventional feeders. The research team was spun out into a new company, Kamengo, which was tasked with extending and commercializing the research developed over the previous 15 years.

This presentation will review the research conducted on the campus of the University of British Columbia, including the research process and outcomes. Specifically, the presentation will review the three root causes of bin plugging and intermittent feed identified by the research team. These three root causes include:
1. poor bin geometry;
2. compaction of the stored bulk material by the feeder; and,
3. uneven discharge from the storage bin.

To support the reader's understanding of Jenike's theories and how they are applied to the design of storage bins, the presentation will also outline key concepts such as mass flow (first-in, first-out discharge) versus funnel flow (first-in, last-out discharge), as well as the effect of bin shape, material temperature, material time at rest, and material moisture content on bin design. The presentation will highlight case studies that demonstrate how the research and its outcomes were applied in the design of new equipment as well as retrofit equipment suffering from chronic plugging.

3B5 Indian Paper Industry - Prospects and Perspectives

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Indian paper industry has been showing a positive demand growth of 6-7% unlike average global growth rate around 2% despite couple of issues being confronted by the paper industry such as availability of good quality raw material, lower scale of operation and environmental issues. In view of the increasing competition among the domestic and the global players, sustainability, green production gaining significance, there is a growing need to upgrade, develop and adopt appropriate advanced technologies tailor made to the requirement of Indian paper industry. In light of above, United Nations Industrial Development Organisations (UNIDO IC-ISID)) implemented a project supported by DIPP, Govt. of India aimed towards improved productivity of the Indian paper industry

The present paper highlights key findings of various activities carried out under the project such as diagnostic assessment of the Indian paper industry, bench level demonstration of identified technologies relevant in Indian context such as membrane technology, TCF bleaching of agro based pulps and Black Liquor Heat Treatment aiming to improve energy efficiency, sustainability and competitiveness of the Indian paper industry.