SESSION E –
RECOVERY & RECAUST

1.) Chemical Recovery & Recausticizing Improvements: Increased White Liquor Production:

Matthew Broere – **Domtar, Dryden** (in conjunction with) Thanh Trung, **FITNIR**

Chemical recovery cycle plays an important role in the kraft pulping processes, particularly White Liquor (WL) variability and availability. To achieve stable WL production, measurements and control of the entire recovery process is required, starting with smelt dissolving tank Raw Green Liquor (RGL) TTA control, Clarified Green Liquor (CGL) trim control, and Slaker and CE control.

With the implementation of an online FT-NIR (Fourier-Transform Near-Infrared) liquor analyzer and Advanced Process Control (APC) for both RGL TTA control and Recausticizing control, Domtar, Dryden mill was able to achieve an increase in the Causticizing Efficiency (CE) from 77.5 to 79.4 %, with the associated increase in WL EA from 90 to 92.5 g/L as Na2O. Following additional WL filter control modifications the final causticizing throughput increased 9.5%. Overall reduction in process variability ranges from 30% to 40% for key parameters such as RGL Total Titratable Alkali (TTA), CGL TTA and final %CE were observed. In addition, the other intangible improvements include reduction in scale formation and lower requirements for hydro-blasting of process pipes and digester during outage as well as lowering safety risks for operations personnel.

Key words – Recovery, Recausticizing, Online Measurements, Process Control, White Liquor, Filtration, Green Liquor, Causticizing Efficiency.

2.) New Learnings & Strategies for Meeting Future Recovery Boiler Particulate Emission Limits with Existing Electrostatic Precipitators:

Ivan Stretenovic – **Southern Field Environmental**

Electrostatic Precipitators have been the technology of choice for particulate matter emission control from recovery boilers for decades. Many mills have existing electrostatic precipitators that have been in operation for up to 50 years. Electrostatic precipitators are for the most part a mature technology with very little development on the mechanical side over the last 20 years. However, recent studies performed at the University of Toronto have taken the approach of focusing on how flue gas properties and particulate characteristics affect the operation of existing electrostatic precipitators. These studies consisted mainly of lab analyses of salt cake samples collected in ESPs, in conjunction with limited observations of real operating data from these same ESPs. As federal and local particulate emission regulations continue to become more stringent, seemingly minor factors affecting precipitator performance will become more important to consider, especially with many mills looking to increase boiler throughput. The effect of these factors, including resistivity, particle size, particle composition, and flue gas flow distribution are discussed in this presentation. Implications of these learnings on everyday precipitator operation are considered. Practical recommendations for improving precipitator performance through maintenance, tuning, upgrades, and varying boiler firing strategies are presented.

3.) A New Solution to Old WL Plant Problems:

John B. Johnson II, Product Technology Manager – **Valmet**

A long-standing trend in the North American Pulping Industry is for mills to be pressed for greater production. As production rates climb, reserve capacity is consumed and bottle necks appear, commonly capping further increases. The typical solution approach is to address the single most pressing bottleneck first. This is the intuitive solution but there may be a better way in the White Liquor Plant.

White Liquor Plant capacity can be capped by many issues. For the moment, assume sufficient lime is available. The Green Liquor Clarifier rise rate may be too high and the Clarified Green Liquor dirty. Retention time in the slaker and causticizers may be too short. The White Liquor Clarifier or Mud Washer or Tube Filters may be overloaded. Each alone is a potential bottleneck but all can be addressed by a single action, the installation of a Pressure Disc Filter to process the underflow of the White Liquor Clarifier or White Liquor Tube Filter.

The Pressure Disc Filter provides superior liquor/solids separation. This reduces the volumetric flow of green liquor required to support the same volumetric flow of White Liquor. This unloads the entire green liquor side of the system. White Liquor Clarifier or Tube Filter underflow does not need to be optimized. A Separate Mud Washing step is not needed since the Pressure Disc Filter discharges lime mud clean enough to feed to the Lime Mud Precoat Filter. The presentation will explain these and other gains in more detail and show how the Underflow Filter can solve many problems at one time.

4.) SnapShot - A New Approach to Pressure Filtration:

Trevor Van Bavel, P. Eng – **McFarlen Engineering Ltd.** and
Travis Johnson **– P&R Superintendent, Skookumchuck Pulp**

Pressure filter installations in North America began in the early 1980's in Kraft mills. They were installed for filtration of white liquor or weak wash and utilize a polypropylene filter "sock" with a sealing ring at the top and a flanged, four-foot-long perforated tube. Over the years, as production rates increased, longer and longer filter elements were used, some up to eight feet. At the start acid washing to clean the filter media was once every 6-8 weeks but gradually dropped to intervals of only a week or two. For years new filter media support designs were considered but then abandoned for one reason or another. A few years ago, a decision was made to address the common problems of pressure filter maintenance and operation. On the wish list were the following:

- Easier installation and removal of tubes and socks.
- Make the filter support easier to clean.
- Attain longer intervals between acid washes.
- Eliminate the "pinch" or "pleat", a point of sock failure.
- Gain longer sock life.
- Achieve higher flow rates.
- Be responsible for less "lost tons".

Prototypes of a new filter media support, one after the other were produced, critiqued, tested and thrown into the scrap bin. But not without providing valuable lessons first, however. Each iteration was better than the last. Finally, a design was created that looked like it might live up to some or even most expectations.

- Testing revealed it to be stronger, lighter, and more flexible than a perforated tube.
- It had more open area so was easier to clean. All it took was a quick spray.
- Socks slid on and off easily due to reduced friction.
- The product allowed the fabric to take a unique fluted shape and puff out like a bellows during backwash.
- In turn, the Gore sock was modified to increasing surface area while providing a perfect fit. Together, the sock and new support combine to make the new pressure filter element, "SnapShot".

5.) Detection & Diagnosis of Ring Formation in a Rotary Lime Kiln – Part 1, Developing a Ring Formation Indicator: Lee Rippon – **UBC**

Rotary lime kilns are large-scale, energy-intensive unit operations that play a critical role in the recovery cycle of the kraft pulping process. As massive expensive vessels that operate at high temperatures it is imperative from economic, environmental, and safety perspectives to optimize preventative maintenance and production efficiency. To achieve these objectives rotary kilns are increasingly outfitted with more sophisticated sensing technology that can provide additional operating insights. Recently, thermal imaging technology has become significantly more affordable while offering better performance and functionality. Consequently, rotary lime kilns have become increasingly equipped with infrared thermal cameras to measure the shell temperature along the length of the kiln. The kiln shell temperature data is conventionally compared to high-level alarm thresholds that warn operators and help prevent over-heating which can damage both the refractory and the shell. As more kilns are equipped with thermal cameras it becomes increasingly important to maximize the value extracted from this supplementary data. Our research focuses on developing data-driven solutions that leverage process analytics and machine learning to address outstanding process faults. In this work we present the first part of a two-part series on detecting and diagnosing the formation of rings in rotary lime kilns. Infrared cameras are used to measure kiln shell temperatures and these measurements are acquired along with additional relevant operating data over a period of five years. The first part of this work focuses on detecting ring formation and begins by presenting background information into the process, the outstanding fault, the available resources, and the proposed data-driven solution. A novel strategy for visualizing ring formation is presented and accompanied by open-source resources. We present two distinct approaches for developing an inferential ring formation indicator and we compare these approaches while validating them on raw thermal camera images. Ultimately, the finalized ring formation indicator will be used for fault diagnosis in the second part of this work which we intend to present at PACWEST 2022.

6.) TEAM Principles of Line Intervention - Isolating a Piping System That Has No Other Means of Isolation: Rusty Hurl, Sales Representative – **TEAM**

Line Intervention is the means of creating branch connections and / or isolating a piping system that has no other means of isolation. TEAM will outline best practice methods for keeping critical piping and pressure vessels on-line during repairs and modifications. We can speak to successful work executed on 600lb steam lines, 84" water lines, and everything in between.

+ Hot tapping provides a safe, reliable, and effective means to create a branch connection on ”live” piping and pressure vessels while they continue to remain in service.
+ Line Stopping is key to continued safe and effective operations of platforms, pipelines, and process facilities. A single line stop can be used to stop and abandon a shutdown. Two or more line stops can be used in tandem to isolate and bypass many intersecting lines at once. Fluid in the line is bypassed, leaving a workable dead section to alter, repair or add a valve while the line remains in service.

TEAM is the only global provider of truly integrated digitally enabled asset integrity solutions that result in greater safety, reliability, and operational efficiency across an entire supply chain. Through our unique value drivers, our global TEAM of subject matter experts develop comprehensive solutions, reducing downtime and keeping critical systems up and running.