SESSION C –
AUTOMATION & CONTROLS

1.) Augmented Reality to Keep OEM & Mills Connected:
Eric Giasson – Manager, Field Services Growth Accelerator – **Valmet**

With in-person visits either very limited or impossible, OEMs and mills had to find alternatives for products experts to keep in touch with mill personnel. This interaction is essential to maintain equipment and to optimize machine performance. In this presentation, we will review case examples of successful use of AR to support mill operations, we will take a look at the lessons learned as we rolled out this new technology and discuss how this communication tool fits within a broader ''remote services'' offering.

2.) An Online & Real Time Process Analyser for Closed-Loop Control In Pulp & Paper Manufacturing:
Dr. Johnathan Speed, Product & Applications Manager – **Keit Spectrometer**

Real time analysis of manufacturing is an area of intense interest at-the-moment due to Industry 4.0 and recent developments in technology. Whilst online parametric measurements – such as pH, temperature, color measurements and conductivity – allow for some limited control through inferential models, it is spectroscopy based analysers that show real, long-term potential. Near infrared spectroscopy (NIR) has been trialled extensively in various industries, but it suffers from poor sensitivity and very poor chemical specificity and selectivity. Mid infrared (also called FTIR) offers significantly better performance but traditional FTIR instruments need fragile fiber optic cables and probes that make the instruments wholly unsuitable for manufacturing environments. Here we present the use of a static optics FTIR spectrometer with a fiber-free probe that gives the performance of FTIR spectrometers with the reliability and robustness of NIR.
We present the design of the instrument, highlighting the differences in its design that separates it from classical FTIR instruments. We will also show the performance of the instrument in a range of chemicals of relevance to the Kraft process specifically as well as other additives or high-cost chemical monitoring. Specifically, we will demonstrate the differentiation and quantitation of sodium sulfate and sodium sulfite simultaneously in aqueous mixtures. We will also show a direct comparison of the static optics spectrometer with NIR, Raman and a traditional FTIR spectrometer.
Lastly, we will explore the potential for application of the technology in lignocellulosic processing to unlock and improve savings in the higher value aspect of the pulp and paper manufacturing as well as the core processes.

3.) Analytical Gas-Sesnsing for More Efficient Pulp & Paper Making:
Jim Kapron, PhD, Technical Sales Rep – **Novatech**

Combustion in the wood fibre industries must be controlled to maximize the value of fuel and to minimize the chance of accidental fires. Furnace optimization and dryer operations will be examined in this presentation. The former involves stoichiometric combination of fuel and oxygen. Mills should monitor for slight excess of oxygen, and for the minimization of carbon monoxide & hydrogen as indicators of incomplete, and therefore inefficient, combustion.
Dryer operations are more subtle because volatile organics including pitch may not combust while being swept away and potentially depositing in cooler downstream locations. Build-up of flammable residues in a

warm, oxygen rich environment may lead to an accidental fire. Monitoring for changes in oxygen level and the buildup of carbon monoxide may indicate pre-fire conditions.

Novatech specializes in the integration of optical, physical and gas-sensing analyzers for primary industries in Canada. This presentation will describe the state-of-the-art close-coupled extractive zirconia analyzers and cross-stack tunable diode laser absorption spectroscopy, both for multiple gas component analysis in the pulp & paper industry

4.) <u>Caustisizing Optimization Programme</u>:
Danny Zuver, Process Optimization Manager – **Valmet**

Chemical recovery in Kraft pulping processes plays a crucial role in mill-wide optimization and stabilization. The [Paper Inc.] papermill in Anytown, USA recognized the value of improving their Kraft chemical recovery processes and sought to do so with Valmet's causticizing optimization solution.   Paper Inc. in Anytown is a single line Kraft mill with one recovery boiler and causticizing line that produces [260,000-300,000] tons of [uncoated freesheet] annually.   The mill wanted to reduce the variation in the green liquor titratable alkali (TA) and the white liquor causticizing degree (CE%), as well as increase both variables to reduce the hydraulic and chemical deadload in the liquor cycle.   A pre-existing conductivity dependent control system was replaced with Valmet's Alkali-R analyzer and Causticizing Optimizer advanced control system (VCO).   By utilizing the online titration results from the Alkali-R and process instrumentation from the recovery boiler and causticizing areas the VCO system was able to reduce the variation of TA and CE% by at least 60%, and subsequently increase both variables. This paper reviews the scope of delivery for the Alkali-R analyzer and the VCO control system, as well as essential control strategies.   The results of the project are compared to the baseline key performance indicators along with a discussion of the overall impact on the Anytown Mill.

5.) <u>Spartan & Canfor Advanced Bleaching Controls</u>: Devin Marshman – **Spartan Controls**

Bleach plants are becoming increasingly well instrumented with both traditional measurements such as brightness probes and kappa analyzers, and newer measurements such as dissolved lignin transmitters and bleach plant brightness analyzers. It is challenging to ensure the best use of these probes and analyzers in a control system.

In 2019 Canfor implemented an advanced bleach plant control system at its Northwood pulp mill. The mill is highly instrumented with a bleached load transmitter, two K# analyzers, two brightness probes, and three brightness analyzers on each line. Pulp machine brightness scanner measurements are also available for each line. The large number of measurements support a great number of possible control strategy permutations. Optimizing the control system required carefully determining which signals were the most useful to ensure the best tradeoffs between measurement accuracy, robustness, and deadtime reduction. Alkali stage pH control was also upgraded to include vat pH control.

This paper describes the control system including lessons learned during its commissioning. A comparison of the performance before and after implementation is also provided.

6.) <u>Optimizing Evaporator Train Using a Simple Advanced Regulatory Controls Approach:</u>
   Koowar Singh, Process Control Engineer - **Mercer Celgar**
   and Valois Parisien **– Enero Solutions Inc.**

Evaporators play a critical role in the Kraft recovery cycle by elevating the solids content of Black Liquor for effective recovery boiler operation and has a direct impact on a mill's profitability. Being a major energy consumer, evaporators can be used as a lever towards operating at optimum mill efficiency. However, high process variability will prevent optimization efforts due to runnability, performance, and stability issues. Due to its inherent nonlinear behaviour, evaporators cannot successfully be regulated with a standard PID controller. As a result, third-party Advanced Process Control (APC) packages are often used. However, the uptime of those APC packages tends to decrease over time due to lack of understanding, high maintenance, and difficulty to troubleshoot. As an initial process optimization effort, the combination of operator training, rigorous loop tuning, and a simple Advanced Regulatory Controls (ARC) strategy approach including feedback, feedforward, and adaptive controls allowed a significant evaporator stability and energy efficiency improvement at Mercer Celgar's mill. This presentation will highlight how Mercer Celgar was able to significantly improve its evaporator operation through Advanced Regulatory Controls.