SESSION 2A TECHNOLOGY

2A1 Advances in Recovery Boiler Furnace Bed Imaging
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From the early 80's until present, improvements in infrared imaging technology has given us the opportunity to observe and tune recovery boiler combustion processes in real-time. Now, with work being done to develop technologies that visually measure smelt bed volume, and the ability to accurately measure furnace exit gas temperature across the entire furnace cavity, process optimizing could be taken to a whole new level. By taking a deeper dive into past, present, and future developments in recovery boiler imaging technology, we can better understand how this technology improves daily operations.

2A2 Impact of Energy Efficiency and Bio refining on Energy consumption and GHG Emissions across the Forest Sector Value Chain
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The Canadian forest industry is in transition from a position where it was a net energy consumer of fossil fuels, to one where it can become a net producer of green energy. This change is not only reflected in the product diversification that is occurring, but also in the corresponding energy and GHG impacts.

The energy inputs into the manufacture of forest-based bio-products include the entire value chain: starting with the supply chain from tree harvesting and chip supply to the different facilities (sawmills, pulp mills, wood products facilities) all the way through to the final products. The sum of these inputs determines the carbon intensity of manufacturing the final products, and the impact they have on GHG emissions. It is important to understand the inputs, as well as their magnitude, in order to effectively reduce and optimize the energy used in the manufacture of bio-products from forest resources.

In the short-term, individual production sites will continue to apply innovative measures that cost-effectively reduce energy consumption by the maximum possible degree. However, the industry's medium and long-term strategy towards energy and GHG emissions requires a higher-level view that focusses on the full value chain and not just the immediate impacts at the mill level. Therefore, the need to quantify GHG for all aspects of the forest to mill to finished product value chain is needed to measure the impact best in class practices can have on each step of the value chain and better understand these activities' sensitivity to changes in carbon pricing schemes.

In this work, two value chains in two regions of Canada (one East and one West) have been evaluated. It was determined what potential energy and GHG reduction can be achieved by means of optimizing heat recovery and water reutilization in facility operations. Several bio refinery and energy efficiency technologies were also evaluated in order to maximize GHG emissions reduction.

2A3 Western Canadian pulp mill employs fast COD analyzer for improved process control and savings
Kerry Betz-Stablein*, Matthew Jensen, Adam Lancaster,* Canfor Pulp*; Maggie Grierson,* Mantech

All Canadian Pulp mill effluent is required to meet certain Biological Oxygen Demand (BOD) guidelines before being discharged into the watershed. Many mills also use the BOD test to monitor numerous effluent flows from the mill and throughout the treatment system. This information is used to monitor and control the efficiency of the system and ensure that effluent quality standards will be reached. Unfortunately, due to the five day test time, actions to improve effluent quality tend to be reactive rather than proactive. Chemical Oxygen Demand (COD) testing provides a shorter feedback time, with information about effluent quality being obtained within two

and a half hours. The traditional Dichromate method poses safety and environmental concerns due to its use of mercury, dichromate, and concentrated acid. Photoelectric Chemical Oxygen Demand (PeCOD) is a newer, green technology that completes analysis of samples within 15 minutes using only salt and sugar solutions.

Canfor Pulp, in Prince George, BC, purchased a PeCOD analyzer with an auto sampling system at the end of 2016 and has been using it to monitor effluent quality and control treatment processes at the Intercontinental and Prince George Pulp and Paper mills. Canfor Pulp has built robust correlations for mill effluent streams prior to microbiological treatment, with R-squared values in excess of 0.7. Having daily feedback on what is going into and coming out of the effluent system has allowed operators to make changes to improve effluent quality, meet permits, and lower operating costs.

PeCOD is monitored on a regular basis and values are used to direct flows to the appropriate treatment systems, control treatment of high PeCOD effluents, and make decisions about reclaiming spills into the process. Incoming PeCOD data has been used to make decisions about the amount of aeration required for effluent treatment, allowing for significant electricity saving by shutting down excess aeration while maintaining effluent quality. This paper covers the basics of the PeCOD technology, the comparison with Dichromate COD, the system setup process and troubleshooting, correlations with BOD in Canfor Pulp effluents, the use of data in the mill, and the benefits achieved.

2A4 A case study to monitor water side deposition in Recovery Boiler tubes
Mike Ward */Mike Trivett,* Valmet

The recovery boiler is an essential part of the Kraft pulp mill, in the liquor cycle, where it is used to recover the spent cooking chemicals, and simultaneously to generate steam for both process and power production. The recovery boiler is one area where safety is a key factor in both equipment design and operation. With the risk of smelt-water reactions, the recovery boiler has traditionally required the operators to frequently inspect for deposition on the water side of the water wall tubes by extracting a physical tube sample with lab analysis for Deposit Weight Density (DWD). The presence of a deposit, if large enough, can impede heat transfer and lead to a loss of tube cooling. Where a loss of tube cooling occurs, the tube can overheat and develop a leak. The resultant water leak could instigate an undesirable smelt-water reaction and recovery boiler failure.

Valmet provides a service to measure and record the thickness of internal boiler tube deposit layers in boiler water wall tubing. The service uses ultrasonic technology and proprietary software to accurately measure the thickness of the deposit layer. The technology can be used to supplement the traditional cutting of tubes for a Deposit Weight Density (DWD) analysis. In addition, the technology provides a more complete analysis of the boiler deposition than what could be observed with just one tube sample.

This presentation will review the development of the technology and service, the field equipment involved and discuss several recent case histories.

2A5 SEMSYSTEMS Power Quality Improvement in Svilosa Plant at Svishtov, BG
Dave Tunnah, SEMAN Group

Svilosa AD through its main subsidiary company Svilocell EAD is the only producer in Bulgaria of bleached kraft pulp and products thereof. Svilosa plays a crucial role in Bulgarian pulp and paper industry and is a market leader in the country and the region. The Company pursues an ambitious investment strategy consolidating its leading position in the pulp and paper industry on the Balkans and in whole Europe.

The project, aiming at electric energy saving & power quality optimization through cutting off all interactions between the electric loads concerning various resonance scenarios, was divided in phases. The phase A of the project, for the 21% of the total installed electric loads (OSO-2 Dept.) was concluded by SEMSYSTEMS at the early days of June 2018.

In order to elaborate the scientific study for Svilosa OSO-2 Dept. Electric Power Grid, SEMSYSTEMS staff of engineers, performed measurements & recordings of all the required electrical values in each individual load of the installation (AC & DC motors, motors operating with Inverters, inductive furnaces, DC Converters, Star- Delta switches etc., in the low voltage level of 0,4kV).

2A6 Practical Performance-Monitoring of Centrifugal Pumps
Bryan Bohn, UBC

Whether a few watts or a multi-thousand-horsepower titan, the centrifugal pump is a mainstay in fluid-moving processes across industries. In many applications, efficient energy usage and prevention of unanticipated pump downtime are paramount to the economic interests of the user. These applications often warrant the use of a pump performance-monitoring sensor system to actively monitor machine health and efficiency. Unfortunately, these same applications are likely grounded by the practical constraints of production, making the implementation of wide-scale performance-monitoring unfeasible.

We are currently researching sensor system architectures and data analysis approaches to enable more intelligent performance-monitoring of centrifugal pumps. Most critically, the research is being performed with an eye toward affordability and practical implementation on an industrial scale; something many current commercial monitoring systems sidestep. This presentation will discuss measurement techniques and data analysis methods for extracting performance data from centrifugal pumps while adhering to the realistic limits of the industrial production environment.