

Tembec

A biorefiner ahead of its time

By Mark Williamson, Journalist Engineer

It's hard to escape the talk about biorefining in the pulp and paper industry these days; many conferences, technical papers and magazine articles are dedicated to the subject. However, there are a select group of companies who have been refining wood chips into their constituents for years, producing specialty cellulose and by-product chemicals.



Tembec's Témiscaming mill

Tembec, headquartered in Montréal, Canada and with mills in Témiscaming, Québec, Canada and Tartas, France is a leader in the field with a total capacity of 310,000 t/y of specialty cellulose. Tembec is a broadly based forest products company with additional production facilities for market pulp, paper and lumber. Specialty cellulose, dissolving pulp for viscose staple and specialty chemicals derived from ammonium sulfite pulping processes at both mills account for 30% of the company's sales. Total sales for 2012 were CDN 1.66 billion (EUR 1.26 billion). The company employs almost 3,700 people.

Tembec reports it is the world's second largest specialty pulp producer. The product applications by Tembec's customers who chemically modify the pulp include the many and diverse uses of cellulose acetate, cellulose ethers, nitrocellulose, micro-crystalline cellulose and other cellulose pulp derivatives. The marketable byproducts at Témiscaming are lignosulfonates, which are unique to sulfite pulping, and ethanol. Biomethane, consumed in the pulp drying process, is generated by anaerobic waste treatment at the Témiscaming mill.

Growth in mind

With growth in mind, the company is planning with its customers to increase the specialty cellulose component of its business, phasing out the less profitable and less stable income from dissolving pulp used in viscose staple fiber. James Lopez, President and CEO, elaborates, "We



James Lopez

have been on a journey to divest the commodity business and, at the same time, we continued to upgrade our process technology to get more of the specialty pulp business. Fortunately, we have been extremely successful."

Recent company investments are aimed at increasing the production of specialty pulp products for a growing market and green electrical energy, which is now a profitable and stable revenue stream. Through these investments, Tembec expects both mills to be among the lowest cost pulp producers. The most recent announcement is a CDN 310 million (EUR 234 million) two-phase investment at Témiscaming to increase the capacity for specialty pulp, increase green electricity production with the commitment of a long-term supply contract with the electrical utility, and significantly reduce sulfur dioxide emissions. At Tartas, a new 18 MW steam turbine driven by a biomass boiler started up in June 2012. The project cost was EUR 16 million. Surplus electricity will be sold to the electrical utility.

Step back 40 years

Tembec's history as a specialty cellulose producer goes back to 1973 when a group of determined managers and rank and file employees bought the Témiscaming commodity dissolving pulp mill that was about to be closed by its former owner. The story received lot of complimentary press coverage in Canada as a victory for the little guy and for a mill town that refused to die. The employee-focused Tembec was incorporated as a public company in 1979.

Since then, the company has steadily invested in specialty pulp production technology, by-product processing and effluent treatment. That latter aspect of the business is especially important since the high purity of the final product implies that the yield is low and the mass fraction of the removed lignin, hemicelluloses and extractives is much higher than a kraft market pulp mill. The footprint of the effluent treatment facility at the Témiscaming mill is as big as the pulp mill itself. Similar investments were made at the Tartas mill which was acquired in 1994 as a joint venture with Cascades. The former fluff pulp mill was converted to a specialty pulp

mill. "We had to take the technology we had developed at Témiscaming and move it to Tartas," says Lopez.

Since 2000 Tembec has invested CDN 185 million (EUR 140 million) in various process improvements and anaerobic effluent treatment at Témiscaming and EUR 66 million in hot caustic extraction, wash presses, an evaporation plant and biomass boiler at Tartas.

Specialty pulps, special fiber needs

Tembec emphasizes the distinction between dissolving pulp for viscose rayon used in general purpose textile manufacturing and the specialty pulp that Tembec makes. Often the term dissolving pulp is an imprecise catch – all description. Specialty pulp is very highly purified and viscosity has to be managed precisely for each end use application. For instance, viscosity is critical for gelling or thickening agents or the coating on a pill. The strict purity requirements are quite obvious since many products are used as food additives or ingested with medications. Tembec even has kosher certification for pulps used to produce food additives.

The "special" in specialty cellulose starts with the all important fiber supply, mixed softwoods in Témiscaming and Maritime pine planted decades ago in the sandy soils near the Tartas mill. All Canadian forests managed by Tembec are FSC certified and the forests in France are certified according to FSC and PEFC chain of custody standards.

"Every tree species is unique in terms of how you process it and what properties you get from it," says Derek Budgell, vice president of Business Development for Specialty Cellulose. Lopez continues,

"Fiber makes a huge difference. Each type of tree will give you different performance characteristics. In addition to moving our technology to Tartas, we had to figure how to make it work with the local species." He says that some customers prefer a product from one of their two mills due to the fiber differences. The Témiscaming and Tartas mills pulping processes are similar: ammonium sulfite pulping which partially hydrolyzes hemicelluloses and produces sulfonated lignin, followed by a hot caustic extraction and pulp purification stage to remove more lignin and solubilize resins, and then ECF bleaching, the final step to high purity cellulose. Pulp viscosity is controlled at each step.

Figure 1 shows the flow of biomass, spent pulping liquor, extractives, bio-products and bio-energy production at the Témiscaming mill.

Bark, wood residues, sawdust, and chip fines are combined with activated sludge for biomass combustion. Alkaline lignin and hydroxy acids flow

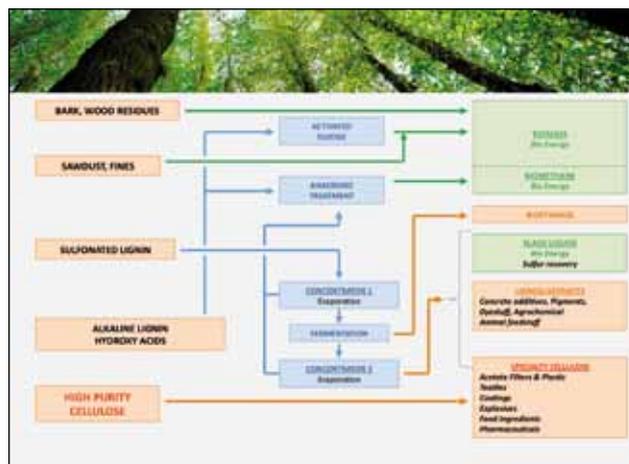


Fig. 1: The flow of biomass, spent pulping liquor, extractives, bio-products and bio-energy production at the Témiscaming mill



The anaerobic effluent treatment reactor at Témiscaming produces bio-gas for the mill's pulp drying process

to the anaerobic treatment plant and to the activated sludge process. The anaerobic treatment plant produces methane which displaces natural gas in the pulp drying process. Some of the sulfonated lignin from the sulfite pulping process is concentrated and fermented for ethanol distillation and the rest is used for sulfonated lignin products. The mill's capacity for sulfonated lignin is 170,000 t/y. Up to 15 million l of ethanol are produced per year.

Leading in high viscosity cellulose ethers

The final applications of Tembec pulps after chemical modification by Tembec's customers are extremely diverse. With a global market of 700,000 t/y cellulose acetates are the most significant, says Budgell. Applications include cigarette filters, other filter media, strengthening agents for eyeglass frames, fibers for fabrics, and optical films for LCD manufacture.

According to Budgell, Tembec is the foremost supplier of pulp for cellulose ethers which were developed in the 1980's. "Tembec took a leading position in the development of high viscosity cellulose ethers," he says. Appli-



Derek Budgell

cations include film coatings for pills, texturizers and stabilizers for food, thickening agents for personal care products, splatter control agents for paint, mortar and plaster, and thinning agents for oil drilling mud. Pulp derived nitrocellulose is used in lacquers, nail varnish, inks, coatings and explosives for the mining industry. Microcrystalline cellulose is used as a binder in pharmaceuticals and as a hydrocolloid in foods. The list of other applications goes on.

Customer service is crucial

With such a diverse range of product applications and many customers, excellent service is essential for Tembec's long-term business relationships. Lopez says the qualification period for specialty pulps is extremely long so that emphasizes the need to work with the customer to meet their end needs and maintain performance. He says, "Our most important skills are in our technical people who work with our customers and their processes. We are constantly working with our customers to improve our product and their end products as well. For instance we used to make high viscosity pulp; now we make super high viscosity and we are planning to go even higher than that."

Budgell agrees that customer knowledge is the key to success. "You have to know what you are doing and react to the customers' need if there is a problem. The limitations that they have might require an adjustment in the fiber raw material."

Pursuing a higher value

Tembec is a member of the Forest Products Association of Canada and has signed on to its Vision2020 strategic plan which will hopefully transform and revitalize the industry. One of the planks is to generate an extra CDN 20 billion in revenue for the industry by 2020. When questioned about Tembec's contribution to this objective, Lopez gave the following response: "We can add value in two ways. First, we are working with our customers to improve the value of our pulp to them so we can get more value per t. The second way to add value is by selling electrons (electrical energy) to the utilities. For the next three years or so these items are going to be the major focus of our company."

The announced CDN 310 million two-phase investment project at the Témiscaming mill will add another 35,000 t/y of specialty pulp capacity and add 40 MW of



Applications of Tembec pulp include:
1 concrete mix, 2 nail varnish, 3 mortar,
4 pharmaceuticals, 5 creams, 6 lacquer

green electricity generation capacity to the mill site. Sulfur dioxide emission will be reduced by 70%. In the CDN 190 million Phase 1, now underway, a new high pressure sulfite liquor boiler will replace three inefficient low pressure boilers and will provide the motive steam for a new steam turbine.

Tembec has signed a 25-year electricity supply contract with Hydro Québec. The utility will take 100% of the turbine's output at green electricity rates indexed to the rate of inflation. Specialty cellulose capacity will be increased by 5,000 t/y in Phase 1. In the Phase 2, now under study, and currently scheduled for 2014/2015, the digester production capacity will be increased by 30,000 t/y. ■