



CHP  
TECHNICAL ASSISTANCE  
PARTNERSHIPS

# Cosmo Specialty Fibers

## Cosmopolis, Washington

### 17.2 MW Biomass-Fired CHP Project



Cosmo Specialty Fibers operates a sulfite mill in Cosmopolis, WA that produces 550 tons of dissolving pulp per day from hemlock wood chips.

#### Quick Facts

**LOCATION:** Cosmopolis, Washington

**MARKET SECTOR:** Forest Products

**FACILITY SIZE:** 17.2 MW

**EQUIPMENT:** Four biomass boilers and two topping cycle steam turbine generators

**FUEL:** Biomass waste from logging and byproduct waste from the pulping process

**USE OF THERMAL ENERGY:** Steam is used for heating, drying, and evaporation

**YEARLY ENERGY GENERATION:** about 17 MW average output (148,920 MWh)

**CHP IN OPERATION SINCE:** 1957-2006, 2011 to present

#### Original Project Description

Weyerhaeuser constructed the Cosmopolis mill in 1957 as a magnesium-based paper-grade sulfite mill. The mill was converted into a dissolving-grade pulp mill in 1962 and produced acetate grade pulp, cellophane grade products, and paper grade sulfite. Dissolving pulp is a special grade of bleached sulfite pulp that is used as the feedstock for a wide variety of cellulose derivatives such as rayon, cellophane, cellulose acetate and methylcellulose. Weyerhaeuser shut the mill down in 2006. A group of investors—the Gores Group, a global private equity firm—purchased the mill in 2010 and restarted the mill as Cosmo Specialty Fibers to produce dissolving pulp for sale to customers in Asia.

#### CHP at the Sulfite Mill

Cosmo Specialty Fibers processes Western hemlock wood chips in nine batch digesters. The wood chips are cooked at high temperature and pressure in a bath of sulfurous acid and magnesium counter ions to extract lignin. Pulp exits the bottom of the digesters and is washed, producing a weak red liquor. The red liquor is concentrated and, given that it contains spent cooking chemicals and organics, is used as a fuel in three chemical recovery boilers. The boilers generate over 310,000 lbs/hour of high pressure superheated steam (at 860-psig and 825°F) to power the mill and provide heat to thermal processes, while also recovering magnesium and sulfur for subsequent reuse. About 35% of the wood chips are ultimately converted into pulp products. The mill produces up to 550 tons per day of pulp products.

The mill also operates a wood waste (called “hog-fuel”) power boiler that provides additional steam for the mill processes. Hog fuel is delivered by truck where it is stockpiled until it goes through a dryer prior to combustion in the power boiler. The power boiler burns about 13,160 tons per year of bark, wood residuals (such as reject knots and fiber), wet hog fuel, pressed hog fuel, and hogged fuel dust. The power boiler shares a common header with the recovery boilers with steam feeding two steam turbine/generator sets at two pressure reducing stations. Total steam turbine power output is 17.2 MW. The lower pressure exhaust steam is used for evaporation, heating, and drying. This site attests to the long life of

CHP equipment, having operated in some form for more than 50 years. While the products from the mill may vary, as long as thermal energy is required, CHP is a valuable asset.

### Moving Towards a Bio-Refinery

Mills must be adaptable to remain in business. Cosmo Specialty Fibers is looking to diversify the mill's revenue base through selling higher volumes of specialty pulps and the C5/C6 sugars found in their spent pulping red liquor stream to commodity markets. The C5/C6 sugars are attractive feedstocks for the bio-plastics industry. Acetic acid, ethanol, poly-lactic acid, and methanol are additional products that can be produced in commercial quantities from the mill's red liquor and evaporator streams. Cosmo Specialty Fibers is also examining the possibility of converting CO<sub>2</sub> emissions from the boilers into formic acid. Ancillary benefits to the mill would include a net reduction in thermal energy demand; less effluent to be treated; and potential chemical and maintenance cost savings.



**Cosmo Specialty Fibers currently produces pulp rolls or bales for a wide variety of specialty paper and other products.**

### Sourcing of Wood Fiber for Pulp and Fuel

Cosmo Specialty Fibers sources fiber in an area extending from Oregon to Alaska, but the majority of fiber comes from commercial forests within 25 miles of the Cosmopolis mill in Washington. The mill mainly uses Western Hemlock for its pulp products as it is one of the dominant species in the local region and it reacts favorably to the chemical conversion process used in the mill in terms of process speed, completeness, and end product uniformity. Compared to other softwoods, Western Hemlock contains low natural resins, a condition favorable to obtaining of high purity pulp products. Cosmo pulp has attained The Program for the Endorsement of Forest Certification (PEFC™). This brand label indicates that forest products are purchased from growers that have demonstrated their excellence in sustainable forest management.

Over 95% of the mill's thermal energy use comes from hog fuel and deconstructed and dried biomass from the pulp cooking process. Steam turbine generation is used to offset electrical loads at the mill as the mill electrical load is generally greater than the CHP project output. Even though the electricity is being used to offset the mill's own consumption, the CHP system earns Renewable Energy Credits from the renewable energy market.

### Emissions Control is Critical

Pulp mills must meet strict environmental regulations to operate, as must the CHP system. The sulfite mill must control for SO<sub>x</sub>, particulates and odors. Exhaust from recovery boilers 1 & 2 flows through multiclones, three SO<sub>2</sub> absorption towers in series, and an induced draft fan. Recovery boiler #3 flue gas flows from a multiclone to a cooler/cyclone evaporator and then to three SO<sub>2</sub> absorbers in series. Flue gases from all three recovery boilers then combine to pass through a common ducted venturi scrubber before being discharged through a common 140-foot high stack. The power boiler is equipped with an integral combustion air pre-heater and multiclone collectors, separating screens, and fly ash re-injection. Flue gas from the boiler passes through a venturi scrubber with a mist elimination section. Separate pollution control systems are required for the mill's dryer, bleach plant, and evaporator.

*The Cosmopolis mill produces green energy from the use of bark and other biomass waste materials. "Developing biochemical and fuels from residual process streams is now a necessary practice in our industry...to remove pulp market volatility and improve our financial position."*

*--- Mike Entz, CEO, Cosmo Specialty Fibers*

### For More Information

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Date produced: 2020

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