

Biofuels

<p>Renewable energies are contributing to the 3 pillars of sustainable development: the economy, the environment and social wellbeing.¹</p>	<p>Black liquor, created during pulp production, is a biofuel and a primary renewable fuel source used to generate steam and power in our integrated pulp and paper mills.</p>	<p>Black liquor is the 5th most important fuel in the world. It is the world's most prominent biofuel-derived energy source.²</p>
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Biofuels — a renewable carbon-neutral energy source

What are biofuels?

Biofuels are any kind of fuel made from living things, or from the waste they produce, including:

- Wood, wood chippings and straw
- Pellets or liquids made from wood
- Biogas (methane) from animal excrement
- Ethanol, diesel or other liquid fuels (including used cooking oil) made by processing plant material.

What is the difference between biomass and fossil fuel derived energy?

Biomass derived energy is fundamentally different from fossil fuel derived energy because biomass recycles carbon whereas fossil fuels introduce carbon that has previously been 'locked away', to the atmosphere. Biomass is deemed 'carbon neutral' — the carbon dioxide (CO₂) generated during combustion is equivalent to that which was originally bound from the atmosphere through photosynthesis.

Are biofuels climate-friendly?

In principle, biofuels derived from plant-based sources are a way of reducing greenhouse gas emissions by replacing long carbon-cycle

fossil fuels which release greenhouse gases that had been locked away. Although the burning of biofuels also releases CO₂, plants absorb (capture) a comparable volume of the gas from the atmosphere while growing, as part of the photosynthesis process.

Does diverting woodfibre to energy use affect Sappi?

Unfortunately, reserves of good quality wood are being used to produce energy, with government subsidies supporting the practice.³

In **Europe**, our position is that we should take advantage of wood's many versatile and renewable properties to firstly create wood products, pulp and paper, and recycled paper, all of which can then be used for renewable energy after their material use. By extending the lifecycle of wood before it is ultimately used for energy, we can add value to the economy, create and retain jobs, thereby using our raw materials more efficiently. The pulp and paper industry creates seven jobs for every one created by the energy industry.⁴

In **North America**, we share the position of the American Forests & Paper Association (AF & PA) that any government policies that encourage additional demand for biomass should be coupled with policies that increase the available long-term supply of wood to meet future demand for paper and wood products, as well as new and growing energy markets. Policies also should include safeguards to minimise disruptions in the flow of fibre and related market distortions.

Globally **45.2%** of the **energy** we generate is derived from **renewable sources**.

73.6% of the **renewable energy** generated is own **black liquor**.

In **Europe** and **North America**, the **diversion of biomass to energy** is **threatening the sustainability of fibre supply** for our industry.

Does Sappi use biofuels?

Yes, overall, biofuels are a significant fuel source. At a mill specific level, the extent to which biofuel is used, depends on the type of mill and pulping process. Globally, **45.2%** of the energy we generate is derived from **renewable sources**: black liquor, bark, sludges and purchased biomass. In the USA, the country's energy profile is only 10% renewable energy whereas the pulp and paper industry uses 62%⁵ and Sappi North America's use of renewable energy is over 78.7%. This is a significant competitive benefit not just in terms of costs, but also in terms of customers choosing papers with a lower environmental footprint and as a result we have the lowest reported greenhouse gas emissions amongst the major domestic coated freesheet suppliers.

Deriving energy from renewable fuels such as biofuels replaces the use of fossil-fuel-derived energy and avoids introducing new carbon into the atmosphere.

The **black liquor** produced in our integrated mills is the **dominant renewable fuel source**. Globally, 73.6% of renewable energy generated is own black liquor.

What is black liquor?

Pulpwood chips are digested (cooked under pressure in white cooking liquor) into pulp by removing lignin, hemicellulose and other extractives from the wood to free the cellulose fibres. The resulting spent liquor, weak black liquor, is a diluted aqueous solution of extractives, and the inorganic chemicals used to make up white cooking liquor.

Black liquor contains more than half of the energy content of the digested wood. As a renewable biomass-derived fuel, black liquor replaces fossil fuels, with a corresponding reduction in greenhouse gas emissions. Globally, black liquor is the fifth most important fuel in the world, after coal, oil, natural gas and gasoline. Being derived from wood, a renewable resource, it is the world's most prominent biofuel-derived energy source.⁶

Does Sappi plan to increase its use of biofuels?

Yes. The focus throughout the group is on **promoting recycling** and **recovering materials**.

As the pulp and paper industry is highly capital intensive, it is difficult to change processes quickly. Nevertheless, we are moving towards **replacing fossil fuels with biomass** wherever economically viable.

Our Biorefining Cluster brings together scientists from around the world to specifically identify opportunities in biobased chemicals and energy as they relate to our businesses, and report these to the Group Technical Management Team.

How does black liquor generate energy?

The recovery process starts by concentrating weak black liquor in concentrators and evaporators. The resulting thick black liquor is then burned in a recovery boiler to produce steam and energy, which is used in the mill.

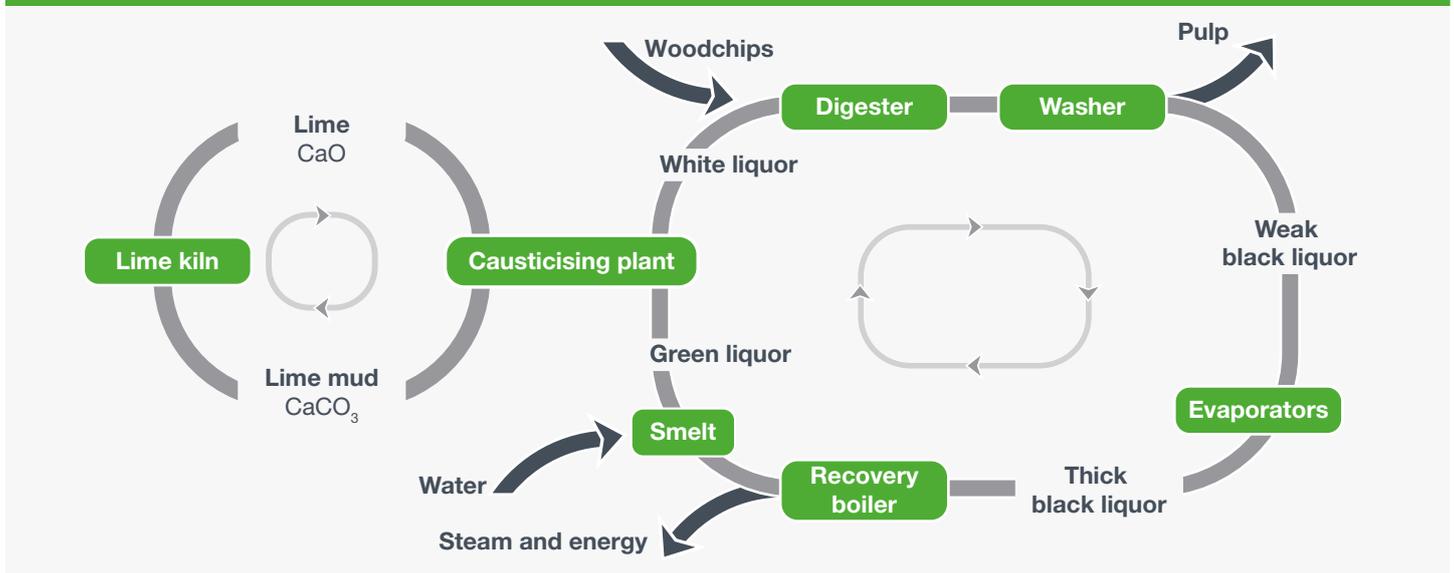
How does black liquor fit into the pulping process?

The inorganic chemicals originally used to make up the white cooking liquor, are recovered as a smelt from the recovery boiler.

The smelt is dissolved in water to form raw green liquor, which is then causticised with unslaked lime (calcium oxide), yielding white cooking liquor again. The precipitated lime mud (calcium carbonate) resulting from the causticising reaction is washed and heated to a high temperature in a lime kiln to be regenerated as calcium oxide and re-used to causticise raw green liquor again.

1 International Energy Agency
 2 <https://www.pulpandpaper-technology.com/>
 3 Rush to use crops as fuel raises food prices and hunger fears, New York Times, 2011
 4 <http://www.cepi.org/>
 5 <http://www.afandpa.org/docs/default-source/one-pagers/-2014-sustainability-report.pdf>
 6 Reeve, D W The Kraft Recovery Cycle, Tappi press, 2002

The kraft recovery process⁵



Sappi figures quoted are for FY2017.