

Fact sheet

Pulp bleaching

Stora Enso's fact sheet for stakeholders - February 2017



This fact sheet describes the methods used in Stora Enso for pulp bleaching. It also includes frequently asked questions around pulp bleaching and a glossary of the most important abbreviations and concepts.

- Stora Enso's pulp mills mainly use ECF (Elemental Chlorine Free) bleaching for chemical pulp
- The total production of chemical pulp at Stora Enso is approximately 4.4 million tonnes per year, of which 90% is bleached
- Stora Enso's Nymölla Mill applies TCF (Totally Chlorine Free) bleaching

No elemental chlorine used at Stora Enso mills

Stora Enso mills mainly use ECF bleaching, which today is the world standard for chemical pulp with more than 75% of all chemically produced pulp. This technology was taken into use to replace chlorine with chlorine dioxide in the first stage of bleaching, and it virtually eliminates the formation of toxic compounds like dioxins and furans. In the 1990s there was a strong desire to stop the use of chlorine totally, and the TCF bleaching technology was introduced. However, this technology never reached the expected market share because the technical properties of TCF pulp were not satisfying customer needs.

Over the past few decades, ECF technology has developed remarkably, and modern ECF bleaching provides pulp with the same or even lower environmental impacts than TCF. ECF bleaching, in combination with oxygen delignification, provides - with lower energy consumption - higher yield and produces stronger fibres compared to TCF bleaching. This, in turn, enhances the ability to recycle the products made out of the pulp and contributes to more efficient use of wood resources. ECF pulp is also has brighter than TCF pulp.

Studies by the International Joint Commission, the European Commission, the Darmstadt Technical Institute for Papermaking in Germany, and documented reports from industry sources support the efficiency of ECF. The European Commission and US Environmental Protection Agency have recognised ECF bleaching as "Best Available Techniques."

Modern ECF pulp mills use bio-activated sludge in wastewater treatment, so the water released back to the watercourses is virtually free of toxic substances.

Glossary and key concepts

Elemental Chlorine (EC) bleaching is the traditional method for bleaching pulp, using chlorine gas (elemental chlorine). This process produces large amounts of toxic chemical compounds called dioxins and furans.

Elemental Chlorine Free (ECF) bleaching technique uses chlorine dioxide and e.g. hydrogen peroxide as bleaching agents. Oxygen delignification is used prior to ECF bleaching at all Stora Enso mills, as this reduces the amount of bleaching chemicals required.

Dioxins and furans are toxic chemical compounds mostly formed during bleaching with elemental chlorine.

Process Chlorine Free (PCF) indicates that fibres are recycled and treated/bleached using totally chlorine-free compounds. Recovered fibre cannot be considered totally chlorine free, because the previous bleaching method of the fibres is not known.

Pulp bleaching is the process where wood pulp fibres are chemically treated before paper-making to remove lignin and resins. Pulp bleaching results in white and clean paper products.

Totally chlorine free (TCF) bleaching technique uses oxygen delignification in combination with hydrogen peroxide or ozone as the main bleaching agents.

Bleaching gives white, bright paper and hygienic packaging

Why is pulp bleached?

Wood pulp fibres are bleached before paper-making to reduce or remove lignin and resin in order to improve the ability of the paper to withstand degradation, which may cause the paper to turn yellow. Bleaching results in paper that has clean, white, and bright characteristics. Bleaching also sterilises the pulp and eliminates taste and odour for use in demanding applications, such as food packaging.

How is wood turned into pulp?

In the pulping process the wood is first made into smaller chips which are then cooked to separate the fibres from other particles of wood such as lignin. The fibres are then bleached and can be spread in thin layers over a wire to form paper.

Does recycled fibre have to be bleached?

Recycled pulp is produced from recovered paper through mechanical re-pulping. Ink and other impurities need to be removed for high quality applications. This process is called de-inking. The de-inked recycled pulp is bleached using a TCF method, but as the original bleaching process is not known, it is called Process Chlorine Free (PCF).

How do mechanical and chemical pulps differ?

Chemical pulp is desired for its high tensile strength and cleanliness but, depending on the end-product, also provides good printing qualities like smoothness, opacity, and bulk. Mechanical pulp is sought after for its filler, bulk, and stiffness properties and printing qualities.

The production of mechanical pulp requires a lot of energy, while chemical pulp production is more than self-sufficient in energy, and modern pulp mills usually sell their surplus energy made from biomass.

What is the bleaching situation of purchased pulp to Stora Enso?

All of Stora Enso's purchased mechanical and de-inked pulp is bleached using a TCF process. Purchased chemical pulp is either bleached using ECF or TCF processes.

How does Stora Enso bleach pulp?

Chemical pulp is bleached using ECF or TCF methods. For ECF pulp, chlorine dioxide and hydrogen peroxide are the main bleaching agents. For TCF, hydrogen peroxide is the main bleaching agent. In all chemical pulp mills, oxygen delignification is used prior to bleaching to reduce the amount of bleaching chemicals required. All Stora Enso's mechanical pulp is bleached using the TCF method, with hydrogen peroxide and sodium hydrosulphite as the main bleaching agents.

Does ECF bleaching have any disadvantages?

ECF bleaching process requires more water circulation and thus an efficient wastewater treatment system. All Stora Enso pulp mills use activated bio-sludge water treatment. In the chemical pulp process, water and chemicals are reused as much as possible, and the water is returned to the water course after purification. All our Nordic pulp mills and our joint venture pulp mills in Latin America use surface water, not groundwater.

The advantages of ECF bleaching are lower energy consumption, better fibre properties, and better yield than with TCF, thus saving natural resources. As ECF-bleached fibres are also stronger, ECF pulp makes it possible to have lower packaging weights.

