

Sustainability Facts

Pulp Bleaching at Stora Enso

This fact sheet describes the methods used for pulp bleaching at Stora Enso. Ultimately, the customers' needs determine which pulps are used. The optimal selection depends on the type and function of the paper. The sheet also provides a glossary, which explains the most important abbreviations and concepts.

- **Stora Enso has 15 pulp mills**
- **They produce 5 million tonnes of chemical pulp**
- **14 mills apply ECF bleaching**
- **Nymölla Pulp Mill applies TCF bleaching in its sulphite process**
- **Kemijärvi Pulp Mill applies TCF bleaching to part of production**
- **Mechanical pulp is bleached using TCF processes**

Stora Enso does not use elemental chlorine in bleaching

- When international research found that replacing chlorine with chlorine dioxide in the first stage of chemical pulp bleaching virtually eliminates formation of toxic chemicals dioxin and furan, Stora Enso pulp mills began implementing this elemental chlorine-free (ECF) bleaching technology.
- The world standard for chemical pulp bleaching is the ECF process, which accounts for greater than 75% of all chemically produced pulp. TCF pulp production is over 5%, with the balance bleached using varying levels of chlorine dioxide substitution.
- Treated waste water from well-managed pulp and paper mills using ECF bleaching, is virtually free of dioxin and other persistent, bio-accumulative and toxic substances.
- ECF bleaching, in combination with enhanced pulping technologies, provides higher yield and produces stronger fibres compared to TCF bleaching. This, in turn, enhances the ability to recycle wood fibre and makes for more efficient use of wood resources.
- Studies by the International Joint Commission, the European Commission, the Darmstadt Technical University Institute for Papermaking (Germany); and documented reports from industry sources support the efficacy of ECF.
- The European Commission and US Environmental Protection Agency have recognized ECF bleaching as "Best Available Technology."

Glossary and key concepts

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

Elemental Chlorine-Free (ECF) pulp bleaching technique that uses chlorine derivatives, such as chlorine-dioxide, and achieves reductions in dioxins. ECF paper can contain either virgin or recycled fibres.

Enhanced Elemental Chlorine-Free (EECF) the use of oxygen delignification and/or extended delignification processes in addition to traditional ECF bleaching. This reduces the amount of bleaching chemicals required.

Polychlorinated Dioxins a family of toxic chemical compounds that are unintentional by-products of certain industrial, non-industrial and natural processes, usually involving combustion.

Polychlorinated Furans a family of chemical compounds similar in structure to polychlorinated dioxins that have similar toxicological effects.

Process Chlorine-Free indicates the fibre is recycled and unbleached or bleached using totally chlorine-free compounds. Recycled fibre cannot be considered totally chlorine-free because previous bleaching of the fibre is unknown.

Pulp Bleaching the process of chemically treating wood pulp fibres before papermaking to reduce or remove lignin and resin. Bleaching results in finished paper that has clean, white and bright characteristics.

Totally Chlorine-Free (TCF) pulp bleaching technique that uses a combination of oxygen delignification with hydrogen peroxide or ozone as the bleaching agent. Paper made from TCF pulp is made with 100% virgin fibres.

Bleaching gives white, bright paper and hygienic packaging

What is the purpose of pulp bleaching?

Wood pulp fibres are bleached before papermaking to reduce or remove lignin and resin, in order to improve the ability of the paper to withstand degradation, which may for instance cause paper to turn yellow. Bleaching results in finished paper that has clean, white and bright characteristics. Bleaching also cleans and sterilizes the pulp, and eliminates tastes and odours, resulting in hygienic product packaging.

How is wood turned into pulp?

Pulping is the process of breaking down wood into its component fibres, which can then be spread in thin, matted layers over a wire to form paper.

Does recovered fibre have to be bleached?

Recycled pulp is produced from recovered paper through mechanical repulping. 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 the pulp cannot be considered TCF because the previous bleaching processes of the recycled content cannot be determined. Therefore it is called Process Chlorine-Free (PCF).

What about purchased pulp?

All of our purchased mechanical and de-inked pulp is bleached using a TCF process. Purchased chemical pulp is either bleached using traditional ECF or enhanced ECF or TCF processes.

How do mechanical and chemical pulps differ?

Pulp produced by chemical methods is desired for its high tensile strength and cleanliness (less dirt, lignin, resins). Mechanical pulps are desired for their filler properties and printing qualities – smoothness, opacity and bulk.

How does Stora Enso bleach its pulp?

Chemical pulp is bleached using enhanced ECF or TCF methods. For ECF pulp, chlorine dioxide is the main bleaching agent. Enhanced ECF means oxygen delignification and/or extended delignification processes are used in addition to traditional ECF bleaching. This reduces the amount of bleaching chemicals required. All of Stora Enso's mechanical pulps are bleached using TCF methods, with hydrogen peroxide and sodium hydrosulphite as the main bleaching and whitening agents.

Read more

- Sustainability 2004 report at www.storaenso.com/annualreports
- Policies at www.storaenso.com/sustainability
- Alliance for Environmental Technology, Trends in World Bleached Chemical Pulp Production: 1990–2002, 12 December 2003
- American Forest & Paper Association - www.afandpa.org
- Bright, et al., Environmental Impacts of Pulp and Paper Waste Streams, SETAC Press, 2003.
- U. Hamm and L. Göttching: Comparison of the Aquatic Environmental Impact Resulting from the Production of ECF and TCF Sulphate Pulp, Concise assessment of current knowledge VDP – INFOR project (No. 19), Institute for Papermaking, Darmstadt Technical University, December 2002
- European Commission, Integrated Pollution Prevention and Control (IPPC): Reference Document on Best Available Techniques in the Pulp and Paper Industry, December 2001, pages 22–24
- Lehtinen, K.J., Relationship of the Technical Development of Pulping and Bleaching to Effluent Quality and Aquatic Toxicity, 2004, ISBN 1-932078-37-1.

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