WATER MANAGEMENT
of ACE paperboard producers

Working with Nature
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1. BEVERAGE CARTON INDUSTRY and WATER

1. Introduction

Freshwater is becoming scarcer and its uneven distribution will increase. Therefore, the value of water as a precious resource is becoming increasingly apparent with a growing population and demand worldwide. In this context, the members of ACE are committed to the preservation and responsible use of this resource which is crucial in the manufacturing of the raw materials like used in beverage cartons.

ACE members are therefore involved in the development of water resource management tools. Some support the development of assessment methods to address the environmental impacts of water use along the life cycle. Other tools support organizations to improve water management in the river basin they operate, and in cooperation with other water users in that basin. This document will show the relevance of water for the beverage carton industry and explain the most important processes that refer to the production of liquid paper board (LPB), water consumption, water use, water stress and water footprinting.

2. Beverage carton structure

Beverage cartons, on average, are made from 75% paperboard. ACE member companies are committed to source the wood fibre from responsibly managed forests. Therefore, this main raw material can be defined as a renewable resource.

Beverage cartons also contain some low density polyethylene layers to prevent leakage (21%) and, in aseptic cartons, a very fine layer of aluminium as a barrier to light and oxygen (4%). All parts are recyclable.
IIa. SUSTAINABLE FORESTRY and THE WATER CYCLE

1. Forest water cycle

In a forest precipitation in the form of drizzle, rain, snow or hail is captured by trees and vegetation and infiltrates the soil. Forests can protect rivers, lakes and groundwater by trapping sediments and pollutants from other surface land uses.

Trees absorb the water from the soil through their roots. The water is released back to the atmosphere and to the global water cycle through evapotranspiration.

Evapotranspiration is the process of evaporating water from trees through plant transpiration during photosynthesis. Photosynthesis requires a combination of water, light energy and carbon dioxide for the creation of oxygen to take place.
IIb. SUSTAINABLE FORESTRY and THE WATER CYCLE

2. Use of water in forests

The only water feed to forests from which ACE member companies source timber comes from natural precipitation. Vegetation in forests uses large amounts of water for growing.

The water use is a part of a natural forest cycle, that would occur regardless if the forest is managed and harvested or not. This is because of evapotranspiration, transporting the water into the atmosphere from a surface (e.g. soil and plants).

“The only water feed to forests from which ACE member companies source timber comes from natural precipitation.”

3. Protective function of forests

Trees need water to grow and water needs forests for storage, purity and other benefits, that are multiple. Forests minimise erosion as roots of the trees and plants hold together soil particles, preventing them from being washed away. By capturing rainfall, fog and evaporating moisture from vegetation, forests have a levelling effect on the amount of water available. Responsibly managed forests provide ecosystem services e.g. water and wood, rural employment, recreation and a source of food.
III. LPB MANUFACTURING

I. Water use

Liquid paperboard (LPB) is a type of cardboard with qualities needed to handle liquid food. It is the main component of a beverage carton.

Water plays a central role in the paperboard production process. The structure of paper depends on water, which is needed to extract and carry wood fibres through the production process, and to form the desired characteristics of the paper. Water is also used for cooling processes, cleaning and washing pulp, as well as a carrier of energy in the form of steam.

The water withdrawn from surface water in the mill surroundings and later used in the LPB manufacturing is not the same as the consumed water. Withdrawal is the total amount of water taken from a lake or a river of which a certain amount is consumed and the rest is returned to its source. Consumed water is defined as water that is withdrawn from its source for a significant time. This water has evaporated, or was consumed by people and therefore removed from the immediate water environment.

Water withdrawal in LPB manufacturing is relatively large, but water consumption is low. In the LPB manufacturing, approximately 95-97% of water used is safely released back to the environment. No treatment is needed prior to releasing cooling water, while process water has to undergo several stages of water treatment. In contrast, only about 3-5% of the entire water intake to the LPB paper mill is consumed. The consumed water is incorporated in products, by-products and waste or evaporated during the process. Even consumed water will return to the water cycle in another location later on. All the water ACE members use in paperboard production comes from lakes and rivers. Water from municipal sources or groundwater is not used in the manufacturing process.

“In the LPB manufacturing, approximately 95-97% of water used is safely released back to the environment.”
All wastewater streams are carefully purified in a treatment plant before being released back to the natural environment. This is essential, since impurities in untreated water discharges can harm ecosystems in lakes, rivers and other natural water bodies.

ACE member paperboard producers Stora Enso and BillerudKorsnäs, are committed to reducing the impacts of their water use, particularly minimising any impacts on water quality. In order to achieve their goals, they have set performance targets covering both the volumes of water discharges, and the quality of discharged water.

Water, released from their pulp- and board mills, is ecologically safe, and in line with the Directive on industrial emissions 2010/75/EU (IED) (former IPPC Directive on pollution prevention and control). The Directive sets emission limits that serve as a basis to regulate the content of pollutants in an outflow.
In **SECONDARY CLARIFIERS** sediments or floats of microorganisms are to a certain extent pumped back to the biological stage. These microorganisms can be once more used in the biological treatment. An excess amount of biological sludge is sent to dewatering equipment.

If needed, a final clarifying step is performed. Clarifying agents are added to improve the sedimentation or floatation. The clarifying agents are polymers, making the suspended material to sink. After this step, the water is biologically and chemically treated. The purified water is then released back to the same water source from which it was previously taken.

The fibre free water is released to aerated tanks or basins. In **BIOSTAGE**, the waste water is biologically treated by micro-organisms, which decompose oxygen consuming material. Nutrients such as nitrogen and phosphorus are often added to improve the amount and type of microorganisms.

Process water contains fibres (losses from the production) and oxygen consuming material. In **PRIMARILY SETTLING BASINS** fibres and other heavy material sink to the bottom. Fibre sludge is then pumped to dewatering equipment.

**SLUDGE** taken from the biostage and secondary clarifiers is dewatered. The dewatered sludge can be used for soil production or as bioenergy.
Water stress is a global concern, but a local problem. According to the European Environment Agency (EEA), ‘water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Water stress causes decline of fresh water resources in terms of quantity and quality.’ To enable understanding of the impact of water consumption, the consumptive water use should therefore be mapped to where the consumption geographically occurs and the water stress at that location.

To refer to water stress, this brochure uses the Water Exploitation Index (WEI), which was initiated by the EEA. It describes how the total water use puts pressure on water resources. The Index also identifies countries that use a lot of water in relation to their resources and are therefore likely to suffer water stress. According to the WEI, all ACE members’ LPB mills are located in water rich areas, i.e. in Skoghall, Gävle and Frövi in Sweden and Imatra in Finland.
**BEST PRACTICES**

**Stora Enso**: Skoghall mill is located on the shore of Lake Vänern. Lake Vänern is one of Europe’s largest lakes with an area of 565,000 ha and a volume of 153 billion m³. The graph shows the TOC (Total Organic Carbon)¹ level in Lake Vänern at its effluent point to the Göta River.

The water quality in the lake has significantly improved in the last 20-30 years. The improving trend since the 1970s is a result of instalments of waste water treatment plants for industries and municipalities, the closure of several industries, and improvements in agricultural practices. While reducing its discharges of oxygen-demanding substances to the lakes, the mills have increased their production of LPB significantly.

**BillerudKorsnäs**: The mill at Frövi is located at a river near Lake Väringen, a shallow naturally nutrient-rich lake. The area is 18,000 ha with a volume of 59 million m³. The lake contains at least 16 different fish species.

The graph shows the outlet of BOD (Biological Oxygen Demand)² to Lake Väringen from the mill in Frövi. The first reduction of BOD occurred due to an installation of biological aerated lagoon in 1972. A slight BOD increase followed an installation of Board Machine 5 in the beginning of the 1980s. It was successfully solved and BOD levels started to drop again after 1985. The water quality has considerably improved despite the significant production increase.

¹ TOC instrumentation measures water quality by analysing the organic contamination within a water sample.
² BOD is a traditional parameter analyzed in the laboratory to determine organic matter in water and wastewater.
IV. ACE WATER ACTIVITIES and FUTURE CHALLENGES

1. ACE members’ objectives

ACE members have a long history in addressing all relevant environmental aspects in the life cycle of a beverage carton as a lever for continuous improvement. ACE members feel particularly responsible for natural resources.

They use natural resources most efficiently and responsibly to provide sustainable packaging solutions. Freshwater plays an essential role as a unique and inevitable natural resource in our supply chain.

Acknowledging this, ACE members have two objectives: to efficiently manage water resources on site and to recognize water use as a part of a comprehensive life cycle approach.

2. From water resource management to water stewardship

It is daily practice for ACE members to monitor water use at their paper mills, the consequent effluents and their effects on the recipient water bodies. Their strict environmental performance objectives include targets for process water discharges.

The progress towards these targets is also monitored and transparently reported every year. This expertise allows ACE members to be well prepared to support the development of more comprehensive tools.

These tools should address water resource management under risk management aspects and with footprinting approaches increase the understanding of water issues and facilitate the stakeholder dialogue.

“Freshwater plays an essential role as a unique and inevitable natural resource in ACE members’ supply chain.”
2.2. ACE’s Pilot Study on Water Footprint

ACE launched a pilot study in collaboration with WWF, Confederation of European Paper Industries (CEPI) and the Water Footprint Network (WFN) to better understand the water footprint concept, and to identify the potential impacts of water use at a mill producing liquid packaging board.

Completed in September 2011, the pilot study measures the water footprint of liquid packaging board at Stora Enso’s Skoghall paperboard mill on the shore of Lake Vänern, Sweden. The report estimates the water footprint of liquid packaging board as indicators to address resource management in a broader perspective. It further estimates the impact of this water footprint based on the Water Exploitation Index.

The study has significantly increased understanding of water footprinting for fibre based materials. It raised important questions for the application of water footprint as an indicator for the forest product industry. Applying current methodology raised questions for discussion in several key areas (e.g. regional differences in forestry, data availability). ACE believes that this pilot study will contribute to the debate within the LCA community and to improve the international water footprint methodology for forest based industries.

2.1. Water Risk Filter

ACE members are proactively engaged in assessing and addressing water-related risks. They are as well advising and are actively involved in the development of a paperboard specific industry add-on to the WWF Water Risk Filter (WRF). This tool, developed by the WWF (the Global Conservation Organization) and DEG (the German Development Finance Institution), is designed to help companies and investors to ask the right questions about water - to assess and mitigate potential risks. The WRF is designed to be easy to use, yet robust in the results that are generated. The aim of the development is to help companies globally in formulating mitigation strategies to drive down hazards and to better respond to water issues – and by doing so, become better water stewards.
Addressing water in life cycle analyses of products and services is becoming more urgent given the increasing threats to this essential resource.

In parallel, the availability of high resolution data allows an adequate recognition of water related issues in a way it has not been possible before. Currently methods are being developed and standardised. This allows a thorough assessment of the impacts of water use on local conditions. It is based on an evaluation of the water availability and scarcity in the area, the volumes used and consumed, and the effluent’s water quality as part of a comprehensive analysis of all impacts along the life cycle.

The development of impact assessment methods for water use is a complex issue, and numerous initiatives are on-going. ACE members are involved in several such initiatives, including the development of water footprint indicators that measure the total volumes of water used in the production of beverage cartons. They support the development of an ISO standard on water footprint to ensure harmonised rules worldwide and across industry sectors and to guarantee coherence to the umbrella concept of LCA as given in ISO 14040.

ACE members believe that the impact assessment of water use has to take into consideration local factors such as water scarcity and the environmental statuses of water bodies receiving discharges, to make an appropriate assessment possible.

ACE members are aware of knowledge gaps when it comes to assessing water issues throughout the beverage carton supply chain. This encouraged ACE to start a study to quantify consumed volumes of water at different stages of a beverage carton life-cycle and allocate impacts appropriately in 2013. This study will help ACE members to include water use related impact into its set of environmental indicators. These indicators serve as levers to achieve improvements along the life cycle in coherence to their environmental responsibility. The outcomes of the study will be presented in 2014.
The Alliance for Beverage Cartons and the Environment (ACE) provides a European platform for beverage carton manufacturers and their paperboard suppliers to engage stakeholders and partners seeking high environmental stewardship. It contributes expertise to EU policy, legislation, and standard-setting. Its members work together to demonstrate that beverage carton packaging is the smart environmental choice today and in the future.

ACE members are beverage carton producers Tetra Pak, SIG Combibloc and Elopak; they develop, manufacture and market systems for packaging and distributing food and produce packaging material at 20 plants in Europe.

Most of the paperboard used by ACE members in beverage cartons in Europe is produced by Stora Enso in Skoghall (Sweden) and Imatra (Finland), and BillerudKorsnäs in Gävle and Frövi (Sweden). Stora Enso and BillerudKorsnäs are also members of ACE.