Summary of Study: „Simplified life cycle assessment of beverage kegs – a comparison of chromium steel and plastic beverage kegs"

Goal and Scope

The study aims for modeling the environmental impacts of one chromium steel beverage keg 1/6 bbl compared to two different single-use plastic containers, used in the USA. The study is commissioned by Franke Blefa GmbH for internal use. The study has a limited scope, is a simplified life cycle assessment (LCA) and does not comply with ISO 14040 and 14044.

The functional unit is one beverage keg delivered empty to the customer (brewery) in the USA and then distributed in a circle of 800 km around the brewery. The plastic containers go into the waste stream after a single use (8% recycling rate), while the steel keg goes back to the brewery for reuse. Post-consumer recycling is modeled according to the recycled content approach. No credits are given for recycling steel or plastics. The chromium steel kegs are produced by Franke Blefa GmbH in Germany. Production of beer and beer-storage in large tanks is not included in this study. The reference year is 2012.

A commercial LCA software (Simapro 7.3.3) is used to model the product system, to calculate the life cycle inventory and impact assessment results and to document the data (PRé Consultants 2012). Background data are represented by ecoinvent data v2.2 (ecoinvent Centre 2010). Present technologies and their environmental impacts are used in the LCA models.

Data Sources and Data Quality

Data about the production of the chromium steel kegs stem directly from the production plants of Franke Blefa GmbH. Data about washing and cleaning the steel kegs stem from relevant suppliers within the industry and are considered to be reliable.

The composition of the plastic containers are based on product information out of the respective internet-sites and sample-products, whereas the production, inputs and resources needed base on generic data in the above mentioned database ecoinvent data v2.2. The production of the plastic containers is modeled with generic LCI data on plastics processing (injection moulding and blow moulding). These two processes contribute a substantial share to the overall greenhouse gas emissions and water consumption of plastic kegs displayed in this report. Hence, the cumulative greenhouse gas emissions (GWP) and the water consumption of plastic kegs are not confirmed.

Life Cycle Inventories

The inventory of the keg production includes the production itself, the transport to the breweries and restaurants in the USA as well as waste streams. The filling of the kegs, beer storage and the respective infrastructure (machinery) are not regarded in this study, but have to be applied for both packages in the same way.

	Chromium steel keg 1/6 bbl (19.8 liter)	**Plastic container 1 (20 liter)**	**Plastic container 2 (20 liter)**
Total weight of empty keg	6.00 kg	1.05 kg	1.00 kg
Materials used to produce the keg	Chromium steel 18/8, rubber	PET, aluminum, PE, rubber	Cardboard, PET, various plastics
Manufacturing country	Germany	USA	Scandinavia
Transport distances	Manufacturing to brewery in the USA (8,600 km); brewery to restaurant and return (two times 800 km)	Manufacturing to brewery in the USA (2,500 km); brewery to restaurant (800 km)	Manufacturing to brewery in the USA (8,600 km); brewery to restaurant (800 km)
After use	Cleaning and shipping of keg between two uses (rotations) 100% recycling of steel at end of life	92% municipal waste stream (landfill, incineration); 8% recycling (average USA)	92% municipal waste stream (landfill, incineration); 8% recycling (average USA)

Results

The production of a steel keg is resource and energy intense. However, the more often a steel keg is used, the lower become the environmental impacts per keg usage (turn). When changing the number of turns (rotations), only the share of the production is influenced. The kegs need to be washed and transported each time anyway.

Hence the reuse rate (number of turns) is a critical parameter. With a reuse rate of 20 times or more, the steel keg causes lower climate change (GWP), energy use (CED) and water use impacts compared to those of the plastic containers. The figure below shows the dependency of the environmental impacts of the chromium steel keg on the keg reuse rate. The environmental impacts are relative to those of the plastic container 2 (with lower environmental impacts than plastic container 1). The share of the washing and of the transport stays constant. However the share of the production is variable depending on the number of reuse cycles. It becomes evident, that the higher the number of turns, the lower become the environmental impacts. Depending on the indicator the break-even point with the plastic container 2 is reached between 15 and 20 reuse cycles.

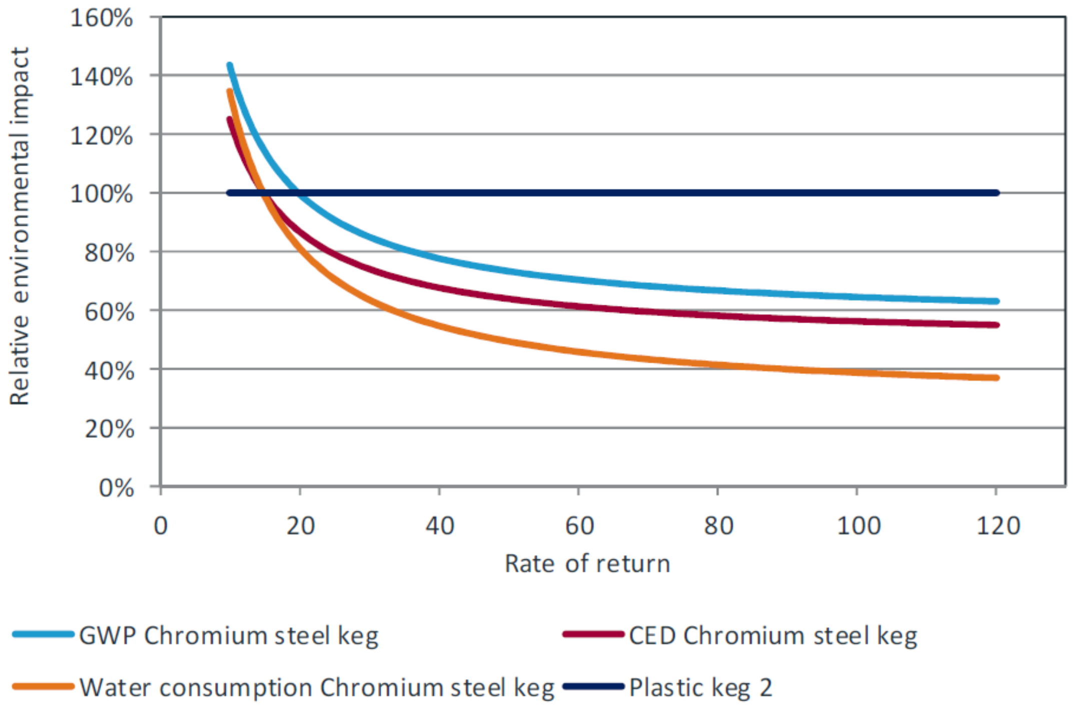

Figure: Environmental impacts of the chromium steel keg relative to the plastic container 2 in function of the rate of return (number of turns). GWP = global warming potential or cumulative greenhouse gas emissions; CED = cumulative energy demand.

Imprint

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