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Institut für Energie-
und Umweltforschung
Heidelberg GmbH



Comparative Life Cycle Assessment of beverage cartons combibloc *Slimline* and combibloc *Slimline EcoPlus* for UHT milk

(LCA SIG / CB-100730)

Summary

commissioned by SIG Combibloc

Eva von Falkenstein
Frank Wellenreuther

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Summary

Background, goal and scope

In the “Comparative Life Cycle Assessment of beverage cartons combibloc*Slimline* and combibloc*Slimline* EcoPlus for UHT milk”¹ conducted by IFEU Heidelberg, a new packaging system was analysed, which was recently developed by SIG Combibloc primarily for UHT milk. In this beverage carton, a new barrier technology is used. This life cycle assessment evaluates the environmental impact of the ‘combibloc*Slimline* EcoPlus’ system and compares it with that of a firmly established alternative packaging solution. The study covers the West European market situation as observed for the EU 15 countries & Switzerland in 2009/2010. It was conducted in accordance with the relevant ISO standards (ISO 14040 and ISO 14044) and accompanied by a critical review process; the full report can be obtained from commissioner (www.sig.biz/ecoplus).

According to the geographic and time scopes, the established ‘combibloc*Slimline* 1000ml’ packaging system was chosen for comparison to the new the ‘combibloc*Slimline* EcoPlus’ 1000ml, based on the fact that it is SIG Combibloc’s beverage carton with the highest market relevance in Europe for 1-litre units of UHT milk. Both systems were regarded with and without caps, as this is an optional part of the primary packaging. For each packaging system, a base scenario was defined to reflect the most realistic combination of settings for the respective scope. Regarding the end-of-life phase, an average recycling rate for post-consumer packaging was applied as well as an average final waste disposal split (landfill/incineration) for Western Europe (EU15 & Switzerland). In order to provide indications on how (country-)specific end-of-life settings might influence the results, specially designed scenario variants were modelled and calculated.

A wide range of environmental impact categories and inventory level indicators were analysed. Those related to the use of resources are the ‘*Use of nature*’ (focussed on sealed land and area occupied by forest) and the consumption of ‘*Fossil resources*’ (energy carriers). The emission-related impact categories are ‘*Climate change*’, ‘*Summer smog*’ (‘photo-oxidant formation’), ‘*Acidification*’ and *terrestrial* as well as *aquatic* ‘*Eutrophication*’, furthermore ‘*Human toxicity*’ (using the PM10 and carcinogenic risk approaches). The following inventory level categories are included: ‘*Primary energy consumption*’ – both ‘*total*’ and ‘*non-renewable*’ – as well as ‘*Transport intensity: lorry*’.

In addition to the base scenarios and variants, a sensitivity analysis was conducted to verify the influence of the allocation factor applied for open-loop recycling, as this parameter is a theoretical (value-based) assumption. A normalization step was included to improve understanding of the relative importance of each single indicator result of the systems under study.

Based on the commissioner’s special interest in a ‘cradle-to-gate carbon footprint’, this part of the life cycle was highlighted in an additional section of the report, documenting the relative difference between the two regarded packaging systems in terms of indicator results.

¹ This version of the summary dated October 2012 the packaging’s names under study had been changed due to trademark issues. However, goal and scope, packaging specifications and scenarios, respective results, conclusions and recommendations are still valid, as published in the final report and summaries of this LCA dated July 30th, 2010.

Results and conclusions

A detailed analysis of the 'combibloc*Slimline EcoPlus*' packaging system's life cycle reveals that overall the major impact in all examined environmental indicators originate from the production – and in some cases also the end-of-life treatment – of the primary packaging's (material) components. The production of liquid packaging board and the plastic elements (sleeve component and closure) can thus be considered the areas with the most promising optimisation potentials. Furthermore, reducing landfill rates (further) would most likely improve this packaging system's overall environmental profile, with the end of life being especially relevant concerning '*Climate change*' and '*Transport intensity – lorry*'.

The comparison of the two examined packaging systems shows that for all environmental aspects that were regarded in this study, the 'combibloc*Slimline EcoPlus*' system's net results are more favourable than those of the firmly established 'combibloc*Slimline*' beverage carton, except for '*Aquatic eutrophication*' and '*Use of nature: forestry*'. In these two categories, the opposite relation emerges, however the difference is only considered significant in the case of '*Aquatic eutrophication*'. The cradle-to-gate excerpt delivers a similar picture: in the category '*Climate change*' for example, which was of special interest to the commissioner, the 'combibloc*Slimline EcoPlus*' system's indicator result is 28.6% more favourable than that of the established 'combibloc*Slimline*' system.

The robustness and validity of the results regarding the allocation factor used for open-loop recycling were confirmed by means of a sensitivity analysis.

Recommendations

The authors developed several recommendations from the findings, among them the following:

- The results of this LCA study provide conclusive reasons to prefer the newly developed 'combibloc*Slimline EcoPlus*' beverage carton over the established 'combibloc*Slimline*' system when choosing a packaging solution for ambient milk on the West European market, as for the majority of regarded environmental indicators, the former appears to perform more favourably than the latter.
- If the 'combibloc*Slimline EcoPlus*' system is chosen over the established 'combibloc*Slimline*' packaging, a focus on (further) reducing the '*Aquatic eutrophication*' potential is advisable.
- As landfilling appears to be the least favourable of the three regarded end-of-life treatment options, the landfill rate of beverage cartons should be reduced further wherever this is possible. This would also be in accordance with the EU's 'Landfill Directive'.
- The findings should not be applied directly to other market situations.

For further recommendations and more details, please refer to the full report (available from the commissioner under www.sig.biz/ecoplus).