



# ENVIRONMENTAL BRIEFING

A CONTRIBUTION TOWARDS SUSTAINABLE DEVELOPMENT FROM THE EUROPEAN PRODUCERS OF STEEL FOR PACKAGING

*“We must preserve both the industry that is our living and the environment that supports our life” - Hubert Reeves*

In this issue of the Environmental Briefing, APEAL makes a new contribution to the debate on the proper use of Life Cycle Analysis<sup>1</sup>. APEAL's message is simple. LCAs are extremely valuable when properly used by industry to reduce the environmental impact of its activities. For example, they can be used to great effect to prioritise environmental investments. On the other hand, LCAs can be counter-productive when wrongly used by politicians for discrimination between packaging types, usually leading to legislation which is damaging to the environment which politicians intend to protect. The following article is an executive summary of the TNO report (see references) which was presented at the DG Environment/Europen seminar on the uses of LCAs for policy-making on 20th June 2002.

## *“Towards the development of objective environmental legislation on packaging - Use of Life Cycle Analysis (LCA)”*

### **INTRODUCTION TO THE TNO LCA SENSITIVITY ANALYSIS AND ECO-EFFICIENCY STUDY.**

Some EU Member States appear to be making politically motivated decisions against the concept of one-way packaging. Invariably these lead to the introduction of discriminatory measures, such as eco-taxes, quotas, or deposits. They claim to be based on Life Cycle Analysis. However, such measures against one-way packaging are not justified on environmental grounds.

APEAL, the trade association representing the European producers of steel for packaging, is naturally concerned that steel, despite its environmental achievements in terms of recycling and sustainability, appears to face challenges arising from these studies. For this reason APEAL commissioned an in depth LCA sensitivity analysis by an independent LCA company of considerable renown, “TNO - Environment, Energy and Process Innovation”.

The following pages describe how TNO demonstrates that fundamentally there are no packaging materials sufficiently poor environmentally to call for economic sanctions. TNO examined the parameters which are sensitive for the LCA of a number of packaging materials and concepts, one-way as well as refillable, relating to a number of environmental themes. Their analysis took into account ranges of values, rather than single values (which is of course far more realistic) and demonstrated that the differences in the eco-efficiency of various materials and packaging concepts are insufficient to allow politicians to discriminate between them.

1. A Life Cycle Analysis is a multi-criteria evaluation tool that can be applied to both products and services to quantify their environmental burdens. The assessment is performed on the whole life cycle of the product, from cradle (extraction of resources) to grave (final fate of the product through waste management). The first concern of LCA studies was to assist industry in the environmental evaluation and improvement of products.



It is clear that politicians need to be extremely cautious when attempting to use the LCA tool to discriminate between packaging types. This is our first key message. Indeed, by doing so they decrease competition and this eventually leads to monopolistic situations which are detrimental both to the consumer and to the environment they seek to protect. By discriminating on a fallacious basis, they could well be reaching erroneous conclusions and taking erroneous decisions.

Whilst politicians have to be careful when using LCAs, the technique is commonly used (correctly) by the members of APEAL to minimise the impact of their industrial activities on the environment. LCA is an effective tool for improvements within an industry, but not for comparisons between different industries, materials or packaging concepts leading to taxes and barriers to trade.

Because Life Cycle Analysis should be based on rigorous methodology, the quality of the data being important for the final result, a data certification procedure should be applied to all materials and packaging concepts, if the results of an LCA study are to be sufficiently robust to allow real decisions to be made. Of course, owing to the statistical variation affecting all measurements, the sensitivity analysis will still be required. This is the second key message of this study.

#### THE ROLE OF SENSITIVITY ANALYSIS IN LCA (REF. B)

By Ir. A. Ansems (TNO Environment, Energy and Process Innovation) and Dr. A. Tukker (TNO Policy Studies).

TNO analysed and evaluated a number of European studies on the Life Cycle Analysis of several one-way and refillable beverage packaging systems. To be able to compare these LCA studies their results were recalculated so that they were all based on the same unit (the packaging of 1000 litres of beverage in 0.33cl containers) and the environmental impact figures were also made comparable. It then became apparent that these studies showed remarkable differences with regard to several key parameters. TNO carried out an in-depth analysis to establish the sensitivity of the results for several packaging systems to variations of a range of key parameters. The most relevant parameters are:

- ▶ weight of the primary packaging
- ▶ transport distance between filler and retailer or point of sale
- ▶ percentage of secondary material used
- ▶ trip rate (number of cycles per bottle) for refillable systems

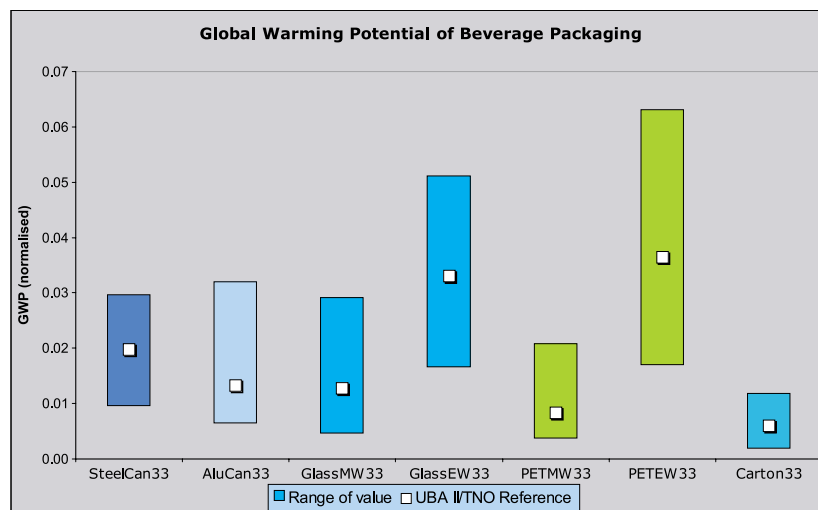


FIGURE 1. Variation in global warming potential.  
The ranges show in figure 1 indicate a real sensitivity to parameter variations.

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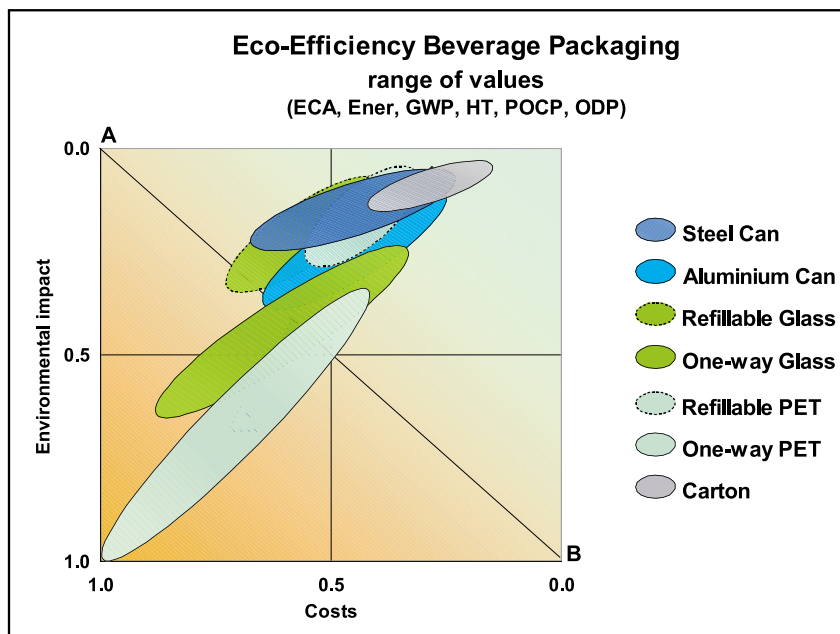


FIGURE 2. Ranges of eco-efficiency for the seven beverage packaging systems

## LCA sensitivity analysis

Normally in an LCA sensitivity analysis only one parameter is varied at a time. To avoid certain disadvantages of this approach, the TNO method used the so-called “Monte Carlo” method. Rather than varying the individual parameters one by one, this uses an integral approach in which all possible combinations of the variable parameters are taken into account, producing a more realistic range of values of the environmental impacts. In figure 1 the possible variation around the reference value for each of the seven packaging systems studied is shown for (in this instance) global warming. The UBA II study, commissioned by the German federal environmental agency (UBA) is used as a reference, because the data used in the LCA is the most complete of all studies analysed. The quality of the data in the study influences the measurement of the environmental impact. The variation inherent in the input data can make a 50% change to the parameter being measured.

## Eco-efficiency sensitivity analysis

Another way to demonstrate existing sensitivities is to show in an “eco-efficiency” graph (figure 2) a combination of the integral environmental impact rating (the results of LCA calculations) and the total costs rating<sup>2</sup> (the integral chain

costs)<sup>3</sup>. To obtain the eco-efficiency of a system, costs and values of the environmental impact are each given a rating between 0 and 1. Thus, in figure 2, large distances above the diagonal AB indicate a relatively high eco-efficiency, large distances below the line indicate a relatively low eco-efficiency.

Variations in the environmental impact (using the UBA II study data as reference) and variations in the costs (with the data of the Austrian GUA/IFIP study as reference) are calculated and included in the eco-efficiency graph; see figure 2.

It appears that two eco-efficiency groups can be identified. One group is formed by the cans, refillable bottles and beverage cartons, which have a relatively high eco-efficiency and one group formed by the one-way bottles with a lower eco-efficiency. It is also clear that a significant amount of overlap of the eco-efficiency of various packaging systems is present.

2. On the eco-efficiency graph one evaluates the value of the environmental impact on a scale between 0 and 1, by setting the maximum occurring value to 1.

3. The Austrian GUA study, with some extrapolations, formed the basis for the cost data. Data on costs often depend on the definitions chosen and the local circumstances. For this reason, one has to be careful to draw hard conclusions on the relative cost performance of the different packaging systems analysed here.



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### CONCLUSION

Given that the values for any system cover a large area (figure 2), and that there is considerable overlap between different systems, the major conclusion arising from the LCA and eco-efficiency sensitivity analysis is that any distinction between ecologically favourable and unfavourable packaging on this basis is at best very tenuous. Discrimination between concepts and materials is therefore to be avoided if the results of an in-depth sensitivity analysis are not available. This sensitivity analysis is essential, because the outcome of the LCA impact assessment will be strongly influenced by the methodology (for instance the inclusion or exclusion of the effect of recycling and the significance ascribed to the input of secondary materials) as well as the quality of the data.

### RECOMMENDATION

As the differences that are observed between individual systems may not be significant, decision makers need to apply great caution when attempting to interpret the results of an LCA study into political and legislative action.

The conclusions drawn from an LCA must be based on a thorough sensitivity analysis and an analysis of the quality of the LCA model and the data used.

Owing to the importance of the quality of the data it is recommended that data certified to an assured level of quality is employed. This means that a certification procedure for the data inventory is required.



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#### References

(1) APEAL Environmental Briefing of July 2001, also available on the APEAL website.

(2) TNO report R 2002/179

LCA sensitivity and eco-efficiency analyses of beverage packaging systems.- May 2002. Available on the APEAL web site at the following address [www.apeal.org](http://www.apeal.org) under Environment Education & Legal/Environmental Section.