The International Bottled Water Association

Life Cycle Inventory Best Practices Guidance Document

I. Introduction

In an effort for IBWA members to be informed of the environmental impact of bottled water products, IBWA commissioned a Life Cycle Inventory (LCI) report and 3 LCI tools. IBWA believes the LCI documents and tools can provide the industry with initial steps to being more eco-aware and help reduce the industry's environmental footprint.

Various companies are beginning to look for methods to reduce their carbon footprints and public reporting of product environmental footprints. Business goals include, enhancing brands, reducing waste, and downgrading energy consumption.

IBWA sees the value in its member companies working to define a core set of key sustainability performance indicators and raising awareness for sustainability across the industry. Businesses need to be able to analyze the sustainability of their end-to-end business processes today and develop a strategy and related targets for how to improve sustainable practices in the future. Changes will need to be implemented over time, while taking into account positive financial impact and environmental impact simultaneously.

II. LCI Tool Methodology

In general, a methodology for measuring carbon footprint can be broken down into five steps. With the aid of the LCI tools provided, IBWA members have a "leg up" on following these steps. The LCI tools have a user-friendly format that has specific line items to aid in beginning to address each of these steps.

Guidelines for these steps were partially developed from our LCI study, which followed the guidelines of the International Standards Organization in ISO 14040/44, and the efforts of the British Standards Institution (BSI) who published the Publicly Available Specification (PAS) 2050—which highlights the standard methodologies to support the product environmental footprint process[1].

1. **Analyze internal product data**. Use internal data to identify the raw materials and packaging involved in production and the resources used in the manufacturing process

[1] www.bsigroup.com/en/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/.

itself, together with storage, transportation, and any waste materials produced during production.

2. **Construct a process map of the supply chain**. To be sure you have taken into account all possible inputs, map the supply chain, both for the finished product from factory gate to store and for raw materials and input along the way. This will help to account for interim steps, if they exist, and will make your data outcome more substantial.
3. **Collect the data**. Assemble the data required for environmental footprint at every stage in the process. Again, the LCI tool asks for your input at various stages of production, if you cannot provide certain data, the results will vary and may hold less credence. The LCI tools work to cover primary sources for all of the assets, equipment, and resources utilized at each stage.
4. **Take note of the boundary conditions and the associated data needed**. Collecting a perfect 100% of the data required to calculate the carbon footprint can be very difficult given all the variables. The LCI tools formats are detailed and ask for specific information, but when getting the output of data results remember these are tools to lend a helping hand, they do not provide full LCA analysis.
5. **Calculate each step in the lifecycle by analyzing the relevant inputs and outputs**. The LCI tools provide you with the necessary equations for product carbon foot printing, taking into account all materials, energy, direct emissions, and waste across all activities in a product's lifecycle. The calculations involve multiplying the activity data by the appropriate emission factors.

III. Your LCI data <u>output</u> is only as good as your <u>input</u>

Measuring the carbon footprint of a product or service leads to a desire to change inputs, redesign product categories, and reengineer processes, all of which impact product costs and profitably. Therefore, when collecting data and inputting numbers using the LCI tool, one must consider the following:

- **Completeness**: Gather <u>all</u> the needed information to get a reliable output from the LCI tools.

- **Consistency**: If any of your input is manipulated for given reasons, be sure to account for this for all data entries, if necessary.

- **Reproducibility**: Again, this is not a true LCA in that it will not be third party evaluated, but you want to be sure your data is firm. Once you get your data output from using the tools, you should be able to go back and re-enter the data and get the same results.

IV. What should one be able to take away from using the LCI tools and report?

Once all the data is gathered, keyed in, and the outputs have been analyzed, companies should think about where they can make improvements, what have they done well so far, and how can they make changes, if necessary. To begin to analyze these things, organizations should get answers to questions such as:

- Using the output of the LCI, determine which activities and processes have the most impact on the environment?
- If we invest in carbon footprint reduction processes, how will that impact product cost and profitability?
- Are our most profitable products also those with the biggest carbon footprint, if so, how can we change this?
- Where are the "quick wins" that can be realized rapidly with minimal cost implications?
- Will we eventually have to recognize and allocate a cost of carbon to our products to recognize direct and indirect costs of carbon emissions?

An organization that has a platform to consider both cost and carbon is able to make better-informed investment decisions. Companies should measure its current carbon footprint and identify those ingredients and activities in the lifecycle where most carbon is generated. Changes in input costs or emission limitations can be assigned to the underlying activities that consume those resources. Steady review of the LCI report and use of the LCI tools can put a company on the track to building a "carbon versus cost platform" and eventually build upon the industry's efforts in respecting our Earth's natural resources.

V. Potential methods of carbon footprint reduction for small pack and HOD water

From review of the IBWA LCI report it can be seen that many of the methods of reduction tie-in to one another, thus if you make an effort to reduce solid waste you may also reduce energy consumption and/or greenhouse gas emissions. Below is a summary of the major contributions of solid waste production, energy consumption, and global warming potential for both small pack and HOD, along with methods of reduction. *These values take into account co-product credit (see page1-6 of the LCI report) and recycling credits (see page 1-9 of LCI report).*

1. SMALL PACK

Solid waste reduction- Solid waste is dominated by disposal of postconsumer containers, caps, and packaging (70%). There is also a smaller amount of fuel-related solid waste, mainly from energy use for production of containers and packaging and for plant processes (20%).

HOW TO REDUCE – Light-weighting is greatly effective way to reduce solid waste. From the year 2000 to 2008, the gram weight of the 16.9 ounce "single serve" bottled water container has dropped by 32.6%. Currently, the average

amount of PET resin in each bottle is 12.7 grams. Beverage Marketing Corporation estimated that during this time span, more than 1.3 billion pounds of PET resin has been saved by the bottled water industry through container light-weighting. In 2008 alone, the bottled water industry saved 445 million pounds of PET plastic by reducing the weight of its plastic bottles.

Recycling is another great way to reduce solid waste. Plastic bottles should be recycled but companies should also look into recycling all materials that can possibly be associated with their day to day processes— paper, corrugated, metals and other items that can be recycled. Consumers should also be encouraged to recycle.

- **Energy consumption reduction-**The LCI report shows that the total energy requirements for small pack bottled water are dominated by the production of primary containers—approximately 50% of energy consumption (primarily PET bottles). This includes the production of the resin and the molding of the bottles (on and off site). Energy processes at the plant only account for 20% of the total energy and transport of filled bottles is 10-12% of the total energy.

  HOW TO REDUCE - incorporating rPET resin into the package manufacturing and/or light weighting of the bottles can greatly reduce the carbon footprint.

  A life cycle analysis performed for PETRA and NAPCOR (see IBWA Environmental Fact Book) found the total amount of PET post consumer containers recycled in 2008, if reclaimed in the U.S., would require approximately 30 trillion Btu less energy than the amount of energy that would be required to produce the equivalent tonnage of virgin PET resin. The corresponding savings in greenhouse gas (GHG) emissions is 1.1 million tons of CO2 equivalents. For a single pound of recycled PET flake, the energy use required is reduced by 84%; the GHG emissions, by 71%.
  The IBWA light-weighting study performed by Beverage Marketing Corporation found that approximately 445 million pounds of PET resin was saved in 2008 by the US bottled water industry by light weighting 16.9 ounce bottles. The total amount of resin saved collectively from 2000 to 2008 was over 1.3 billion pounds.

- **Global Warming Potential (GWP) reduction-** Plant operations accounts for approximately 25% of the small pack GWP. Over half (approximately 50%) of the GWP for small pack is attributed to the production and transport of containers and packaging.

  HOW TO REDUCE -To decrease GWP in plant operations efforts can include investing in energy-saving equipment and focusing on motive-power facilities

(introduction of free cooling, inverters, energy-saving facilities, fuel conversion, etc.)

Also, adjusting appropriate room temperature for office air conditioning, saving electricity for lighting and office automation equipment can have an impact on plant operation GWP.

The use of rPET resin and light weighting in the production of bottles can contribute to lowering GWP—see Energy Consumption reduction above. Also, the use of energy efficient machines and delivery vehicles while contribute to reduction efforts.

2. HOD

- **Solid waste reduction-** For HOD, solid waste at the plant account for a considerable amount of waste (33%), but fuel waste has the highest impact (49%).

  HOW TO REDUCE - To reduce the solid waste at the plant, companies should consider recycling (as above) all materials used at the facility. Many waste assessments show that glass, aluminum, plastic and cardboard can be the major components of a company's waste.
  To help with fuel related wastes, companies should be sure to use energy efficient machines and delivery vehicles. Companies should also consider reducing the number of deliveries—arrange with customers to reduce the frequency of deliveries/ back hauling to the extent practicable.
  Also, more efficient delivery routing can help—use routing software or other tools and load consolidation to improve the energy efficiency of product delivery to customers.

- **Energy consumption reduction-** Delivery and back hauling accounts for 43-46% of the total energy, while plant energy accounts for 28-30% of energy. Of the total energy requirements for HOD bottles, only 25% goes into the production of bottles.

  HOW TO REDUCE – Again, deliveries is the largest contributor as it was with solid waste (fuel waste). Companies should consider reducing the number of deliveries and enforce more efficient delivery routing. In addition, energy-efficient vehicles can aid in noted energy reduction (see Solid Waste reduction above).

  Methods to reduce plant energy can include investing in energy-saving equipment and focusing on motive-power facilities (introduction of free cooling, inverters, energy-saving facilities, fuel conversion, etc.)

- **Global Warming Potential reduction-**For HOD, transport of bottled water contributes the greatest share of GWP (approximately 50%), followed by fuel-related emissions from plant processes (approximately 30%).

  HOW TO REDUCE – Use of vehicles with increased efficiency and fuel economy improvements. Also, see Energy Consumption reduction above. For Plant processes reduction, see Small Pack GWP reduction above.

VI. Company Case Studies:

Jeff Davis, Director of Operations at Blackhawk Molding Co., Inc.

Blackhawk's experience using the LCI Tool: Jeff was able to take note of "the significant impact changes to the closure could have on the entire HOD packaging LCI. HOD bottlers using our current SafeGard closure, or similar style closure, can realize a significant reduction in resin required to produce the closure, reduce their global warming potential, reduce their solid waste, and even reduce their overall energy requirements by going to our SafeGard Plus or U5 closure."
Blackhawk has used the information to develop an internal Marketing Summary Sheet detailing the LCI benefits from using our SafeGard Plus and/or our U5 closure to assist sales staff in communicating those LCI advantages to current customer base and to potential new customers.
Blackhawks advice for IBWA members: "It truly is easy to run LCI "What Ifs" scenarios and see the impact of seemingly minimal changes. I think all first-time users will be amazed at how easy the spreadsheets are to use and how easy it is to quantify proposed/actual changes/improvements to their HOD package/system."

Kevin Mathews, Director of Health and Environmental Affairs at Nestle Waters North America

*Nestle's experience using the LCI tool: "*The tool allows bottlers to directly input data from their product mix and operations into a simple spreadsheet. Results are then automatically calculated in the program and graphed for visual aid of results. This is much simpler and certainly more cost effective than using an outside LCA firm that will take much more time and cost more to execute."
How Nestle uses LCI information: In communication—both internally and externally—to speak to the merits of bottled water or to compare our operations against each other for continuous improvement. The IBWA LCI is an internal data gathering and comparison program that is an excellent tool for continuous improvement in operations.

Nestlé's advice for IBWA members: "It is imperative that IBWA bottlers do an LCI (or ever better an LCA) to assess their environmental footprint. As we have seen, bottled water has been under

attack from environmentalists as unsustainable or bad for the environment. This LCI, and overtly an LCA, allows us to portray our products as the most environmentally sustainable beverage product. Communication of this externally is a huge win for bottle water industry."

Portola Packaging implementing sustainability practices:

Portola was able to decrease its environmental footprint significantly in 1 year (2009-2010):

Energy conservation- (efforts were more than 20 different initiatives across all eight plants) Portola purchased new equipment with reduced energy requirements; switched from injection to compression molding for specific products; implemented productivity improvements which reduced energy load; shut off protocols for idle equipment; and also plant and office heating/cooling conservation.

Reduction of use of new materials- Portola's material recycling efforts included production scrap/regrind (mostly high-density polyethylene and polypropylene), corrugated shippers, hydraulic oil waste, scrap metal, aluminum cans, paper, etc.

European Federation of Bottled Water- "Bottled Water Achieving a Sustainable Life" Report- To read more on the sustainable practices of various companies such as Danone, NaturAqua, Font Vella, and Valvert, please click on this link, *http://www.efbw.eu/images/file/EFBW%20Sustainability%20Report%20lowres3.pdf*

VII. Summary

The LCI report, tools and this "Best Practices" document complement one another in order to provide the best means to study methods of potential improvement of resource use and environmental emissions associated with product systems. In addition, these documents can help to pinpoint areas (material components or processes) where changes would be most beneficial in terms of reduced energy use or environmental emissions and help facilitate plans of action to impact environmental footprint.

The IBWA will continue to make advances to help the industry in all aspects of environmental sustainability. Please contact Tamika Sims, IBWA Director of Science and Research, at tsims@bottledwater.org or 703-647-4614 if you have any questions or concerns.