



NOMACORC

THE CARBON FOOTPRINT ASSESSMENT OF THE NOMACORC SELECT GREEN CLOSURE



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STUDY PREPARED FOR:



VINVENTIONS

Vinventions SA

ZI Les Plénesses, Chemin de Xhénorie, 7
4890 Thimister-Clermont
Belgium

IN COOPERATION WITH:

Olav Aagaard, Ph.D.

Principal Scientist
Vinventions SA
olav.aagaard@vinventions.com
(+31) 6 3468 7360

AUTHOR:

Pedro Pereira

Life Cycle Assessment Analyst
ppereira@ecointegra.eu
(+1) 831 869 1665

REVIEWED BY:

Robert Vos, Ph.D.

Vice President of Research
rvos@cleanagency.com



Clean Agency

830 Traction Avenue Suite 3A
Los Angeles, CA 90013
United States



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EXECUTIVE SUMMARY

INTRODUCTION

In 2012, Nomaticorc commissioned a product-level life cycle assessment (LCA), with the goal of identifying the environmental impact stages of Nomaticorc closures. The study quantified process and product improvements in Nomaticorc's highest volume product line between 2008 and 2011 – Classic and Classic+, and it concluded that raw materials are the major contributor to most environmental performance indicators.

Addressing the recommendations included in the LCA study, Nomaticorc has developed and launched the zero carbon footprint closure series named Select Green. The Select Green closures in majority consist of bio-based polymers derived from sugarcane. The renewable nature of the biopolymer feedstock removes Carbon Dioxide (CO₂) from the atmosphere and significantly reduces the use of fossil fuels. The outcome is a net negative impact of raw materials used in the Select Green composition, which offsets other production and supply chain greenhouse gas emissions.

In order to provide proof of the zero carbon footprint claim for Select Green Nomaticorc has commissioned this study.

SCOPE AND METHODOLOGY

This study documents the basis for the Select Green carbon neutrality claim in accordance with the technical specification ISO/TS 14067. It analyses the full carbon footprint of a product (CFP) by quantifying the potential environmental impacts of the Global Warming Potential (GWP) associated with every stage in the life cycle of this closure.

A Nomaticorc Select Green 500 closure of 44 mm length and 23.5 mm diameter was used in the reference flow. This is expected to be the most sold product in the Select Green Series. The closure is manufactured in Belgium and exported worldwide. Since the distribution and end-of-life phases differ significantly according to the customer location, two reference flows were considered in the study. They refer to conceivable scenarios, and show the influence of these stages in the overall results.

The inventory was based on the proprietary formulation of the Select Green 500 closure and in the yearly consumption estimates of generic raw materials, utilities, and modes and distances from transportation steps.



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	Select Green Europe	Select Green U.S.
Closure	Select Green 500 (23.5 mm x 44 mm)	
Country of manufacturing	Belgium	
Shipping of raw materials from suppliers	1,800 km by truck; 11,308 km by container ship	1,800 km by truck; 11,308 km by container ship
Distribution of the finished products to customers	1,000 km by truck	5,013 km by truck; 6,578 km by container ship
End-of-life scenario	57% incinerated with energy recovery; 43% landfill	18% incinerated with energy recovery; 82% landfill

The product system includes all steps associated with the manufacturing of raw materials, their transport to Nomacorc's facility in Belgium, the co-extrusion of the closure, its packaging, distribution to the customer, and final post-consumer disposal.

Preference was given to primary data given by the biopolymer producer. Braskem provided the life cycle inventory (LCI) model of their green polyethylene production. Since there are small differences in the manufacturing of polyethylene types, such as is the case with the green low density polyethylene (LDPE) used in the Select Green closure formulation, a correction of extra energy requirements and its impact on GHG emissions was added to the Braskem LCI dataset. This primary LCI dataset allowed for the separate documentation of specific GHG emissions and removals associated with the green LDPE feedstock used in Select Green.

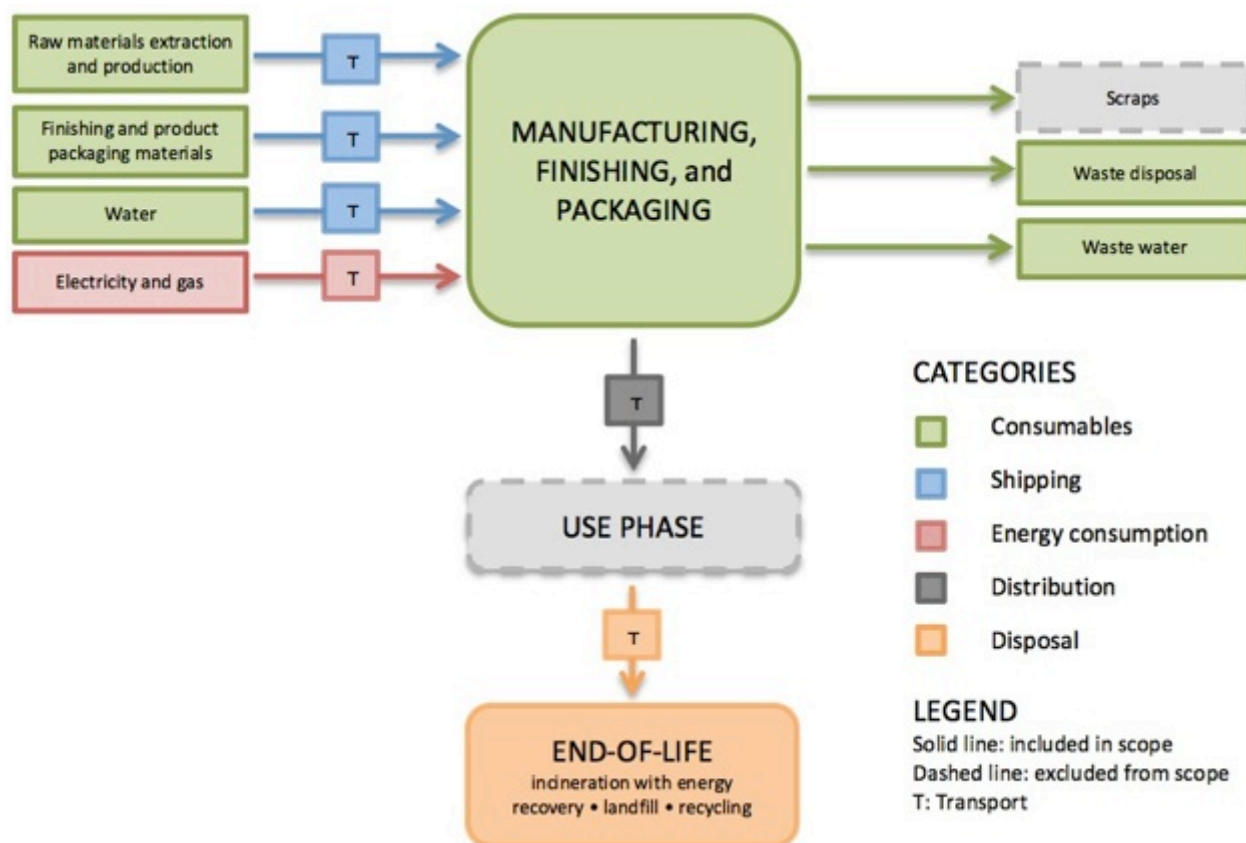
The GWP is the relative measure of the contribution of GHGs to global warming. The study followed the CML 2001 – November 2013 impact assessment methodology, ensuring the use of the most recent characterization factors published by IPCC.

Results are presented in five user-defined categories named after each stage represented in the product system:

- consumables – includes the impacts generated by the raw materials used in the co-extruded closure, raw materials used in its finishing & packaging and the disposal of generated waste;
- shipping – covers emissions associated with the shipping of goods from suppliers to Nomacorc Belgium;
- energy consumption – includes electricity and gas consumption during the closure manufacturing process;
- distribution – represents the impacts from freight to customers or distribution centers;
- disposal – analysis of the end-of-life of the closure according to regional waste management averages.



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SELECTED RESULTS AND CONCLUSIONS

The cradle-to-grave results validate the claim that the Select Green 500 closure has a zero carbon footprint.

The use of green LDPE sourced from sugarcane in the majority of the Select Green 500 closure composition, provides a negative carbon footprint for the consumables. CO₂ sequestered from the atmosphere by sugarcane is converted into a biogenic carbon sink, which is outweighing emissions associated with the industrial production of green polyethylene. Within the scope of Braskem's study, credits for renewable, co-produced surplus electricity and from direct land use change increase the offset potential of consumables. Other life-cycle stages like shipping and closure production add contributions to the GHG emissions, but the total CFP remains significantly below zero for a cradle-to-Nomacorc's factory gate.

Two other life cycle stages influence significantly the end result: distribution and end-of-life. The distance and mode of transport affect distribution, increasing the impact of this stage in the U.S. reference flow. Depending on the distance covered, distribution can be the highest



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source of GHG emissions. However, the cradle-to-customer gate shows in both reference flows a negative CFP.

The end-of-life results vary with the waste management options represented in each reference flow. GHG emissions and removals from landfill are relatively small when compared to incineration. The closure behaves inert in a landfill environment, but all carbon stored in the closure represents a waste of material and energy resources.

If incinerated, synthetic closures are a valuable source of energy, thanks to their high heat content. Within this scenario, depending on the efficiency and the source of fuel being replaced, incineration can yield different GWP emissions (higher credit in the U.S.).

It is noted that the Select Green closure is 100% recyclable and this was calculated to be the most environmentally preferable end-of-life scenario. However, due to the uncertainty of whether or not the closures are collected and sorted, recycling is not represented in any of the two reference flows.

Apart from the change in the feedstock from raw materials, preference for local providers and the continuous source of 100% renewable electricity to power Nomacorc's facility will continue to assure the carbon neutrality of the Select Green closures.

This study represents Nomacorc's effort to mitigate its impact on climate change. The study does not confirm superior performance on other environmental impact indicators. It is recommended to expand this analysis to a full LCA to assess these other environmental impact indicators.

	Select Green Europe		Select Green U.S.	
	kg CO ₂ e/1000 closures	relative contribution*	kg CO ₂ e/1000 closures	relative contribution*
Consumables	-4.91	56%	-4.91	56%
Shipping	0.59	7%	0.59	7%
Energy consumption	0.05	1%	0.05	1%
Distribution	0.35	4%	2.35	27%
Disposal	2.90	33%	0.84	10%
TOTAL	-1.02		-1.08	



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