

YFY Group Uses Green Chemistry to Address China's Air Quality Issues

A comparative Life Cycle Assessment of npulp and recycled paper pulp used in molded pulp packaging

Lise Laurin, EarthShift Global, LLC; Melissa Hamilton and Dave Hartter, EarthShift, LLC.

China's rapidly growing population and industry are leading to increased air pollution and dire health and economic impacts with global implications. A significant contributor to these issues is the standard local practice of burning straw residue from crops such as wheat and rice. In response to this alarming situation, YFY Group developed npulp,TM a bio-based pulp product which utilizes straw waste to produce products such as paper, corrugated cardboard and molded pulp packaging. Npulp uses a new enzymatic process to convert the waste straw into a feedstock thus avoiding the field burning of straw and the resultant emissions of carbon dioxide and particulate matter. The enzymatic process used to create npulp also eliminates the chemical reactions normally associated with converting straw to pulp. This breakthrough process not only reduces harmful air emissions, it creates a market for what was once a waste product, providing an additional source of income for rural farmers.

China produces approximately 790 million tons of crop residue per year¹

As an added benefit, molded pulp packaging, consisting of 70% npulp and 30% recycled pulp, provides the equivalent performance to a 100% recycled molded pulp packaging but with 20% lower mass. This reduction in mass means less energy is required during the molding process.

In China the energy mix is primarily derived from coal, which results in high environmental impacts compared to other forms of energy, meaning this reduction in energy use is especially significant. To better understand and communicate the life cycle impacts and the potential environmental benefits of the npulp product, a comparative cradle-to-grave² Life Cycle Assessment (LCA) of molded pulp packaging using npulp and recycled pulp was conducted by EarthShift Global, LLC.

The study follows the guidelines outlined by the International Organization for Standards (ISO 14040 and 14044) for comparative assertions intended for public disclosure. The study is intended to assist both YFY Group's customers who desire materials that limit environmental impacts, as well as the Chinese government in helping to reduce air pollution and the burning of straw waste.



China's Ministry of Environmental Protection found particulate matter to be 3 times the WHO's recommendation for exposure³

Although the field burning of straw is a common practice in China and other developing countries, the LCA analyzes the impacts of the npulp molded pulp packaging with and without the avoided burning of the straw. Doing so offers an understanding of the environmental impacts of the process itself regardless of whether or not the straw is a waste product, by-product or raw material. In one scenario, the production of npulp is given a credit for the avoided burning of the straw. In the other scenario, no credit is given for the avoided burning.

² Cradle-to-grave considers processes from raw material extraction, through material processing, distribution, use and disposal at the end-of-life.

³ Bloomberg. (2013, July 31). *China Air Pollution Triple WHO Recommended Levels in First Half*.

¹ Yu, L. H. (2013, July 24). *Straw purchasing and storage equipment problems to be solved*.

Both scenarios indicate that the npulp molded pulp packaging will have lower environmental impacts than recycled molded pulp packaging. The results are primarily due to the avoided burning of the straw and the mass reduction of the npulp material system which results in lower energy consumption during the molding process.

When considering the avoided burning, npulp results in 75% lower human health impacts and 30% lower climate change impacts. This is a result of the avoided particulate and carbon dioxide emissions from straw burning in the field that would otherwise lead to human health and climate change impacts, respectively. When no credit is given for the avoided burning, npulp still results in at least ten percent lower impacts in each of the impact categories analyzed due to the reduced molding energy required.

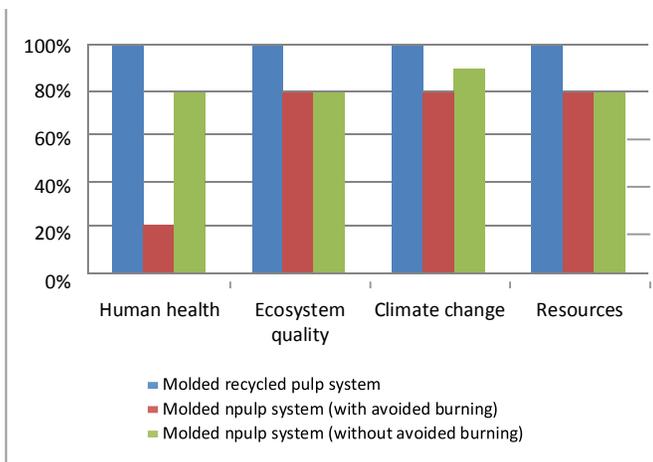


Figure 1: Cradle-to-grave comparison of impacts for npulp and recycled material systems using the IMPACT 2002+ impact assessment method. The results for the npulp material system are shown with and without the avoided burning.

LCA – A Proven Solution

Life Cycle Assessment (LCA) is a data-driven approach to quantifying environmental impacts through measuring the amounts of water, materials, and energy consumed and the emissions and waste generated at each stage of producing a product or delivering a service.

Both credible and scientific, LCA is one of the leading methodologies for measuring environmental impacts, while avoiding burden shifting to other parts of a product’s life cycle or other impacts.



Analysis conducted to examine the robustness of the study results revealed that the footprints of the individual material systems are affected by factors such as allocation approach, energy mix, and disposal scenario. The comparative results and conclusions drawn from this study however, are not sensitive to the assumptions tested and the npulp material system results in lower environmental impacts when the assumptions are consistent between both material systems. This holds true whether or not the avoided burning is assigned to the npulp material system. It is therefore reasonable to conclude that the npulp material system, utilizing straw waste, results in lower environmental impacts when compared to recycled pulp for molded pulp packaging.

Refer to the comparative LCA titled “Life Cycle Assessment of Molded Pulp Packaging” for the complete ISO compliant documentation of the LCA study.

About YFY Group

Founded in 1923, Taipei based YFY Group is one of the oldest and largest business groups in Greater China. Centered around Taiwan listed holding company YFY Paper, the group controls over 100 subsidiaries in pulp and paper, printing, electronic components, financial service, bio-tech and other industries. Among others, YFY owns Greater China’s No. 1 packaging company (YFY Packaging), Greater China’s largest commercial printing group, Taiwan 4th private-sector financial service company (SinoPac Holdings), and the world-leading E-Paper display manufacturer (Prime View Int’l).



About EarthShift Global, LLC

EarthShift Global is a leading international provider of sustainability solutions: software, training and consulting to partners in industry, academia, and government. Our consulting services allow organizations to engage in informed decision-making about the social, economic and environmental consequences that flow from their activities. EarthShift Global leverages innovative approaches to sustainability challenges to effect significant change by shifting the way organizations think and interact with the planet’s ecosystems and the life it supports.



Since 2000, as Earth Shift, we helped our clients evaluate their sustainability performance from a systems-level perspective, and then implement innovative, sustainability-driven practices and improvements. (www.earthshiftglobal.com)