

Paper is made of renewable wood fibre, grown sustainably. It is Eco-friendly. Use it PROUDLY. Recycle it though!



Dr. Dinesh Mohta
Sales Director
Amazon Papyrus
Chemicals Pvt Ltd

Abstract: *The paper is made of renewable resources using sustainable technologies. Despite this fact, it still requires wise use of paper to minimize carbon footprint and its impact on climate change. At the same time, the paper technologists/manufacturers should continue to make comprehensive efforts for an optimal use of resources – raw material, energy and water during papermaking. Moreover, as part of moving towards “carbon neutral” papermaking process, the mills should work on 5/10 years’ sustainability roadmap to achieve desired targets in this direction. The mills should also take necessary steps to reduce solid waste, gaseous and water related discharge emissions to change community’s perception about paper production.*

Introduction

The paper is one of the highly biodegradable products used in daily life. However, majority of the people know very little about the paper manufacturing process. They feel that paper industry clears forests, use more water and energy, creates an unwanted air pollution and makes it stinky near the mill compared to any other industry in the world. As per the report published by WWF (1), the palm oil plantation is and continues as the major cause of deforestation of rain forests. However, this is not the case with the paper industry. In fact it has evolved as a reliable partner of the society by continuously enhancing environmental sustainability over the last many years. With the new technology available, the industry is fast emerging as carbon neutral with an optimum use of resources. Through this write up, the author is trying to bring an awareness amongst people and to bust all their myths or misconceptions about paper/tissue manufacturing.

Here are some myth buster facts about paper manufacturing -

Myth #1-Paper Industry uses forest wood and is the cause of loss of forest.

In general, the pulp/paper mills will use any cellulosic raw material as long as it is converted to pulp and subsequently

to paper economically. Presently the forest wood, which mills harvest sustainably, is only a small fraction of the total raw material supplied to pulp/paper industry across the globe. Moreover, it is also mainly restricted to countries in North American or in Northern Europe. The biggest pulp producing countries like Chile, Brazil, Uruguay and Indonesia, the raw material is as good as 100% from the plantation wood (Eucalypt, Acacia and Pine). Presently the main raw materials, some of them show in picture 1, used by the industry are-

• Recycled Paper

- As the society is becoming more conscious about environment, the recycling rate is continuously increasing for the used paper and/or its products for the last several years around the world.
- With a mere 33% recycling rate in 1990, it stands above 63% in USA since 2009. In 2020, it was above 65% (2).
- It stands between 75-95% in EU countries except in Portugal and Slovakia (3).
- In Asia, Japan and Korea are the leaders in paper recycling. The bigger countries like China, India and Indonesia are catching up fast as far as paper recycling is concerned.

Paper Day write-up

- Agri-residues such as wheat/rice straw and bagasse (mainly in China and India)
 - Wheat straw is a good raw material for papermaking. Accordingly, it is a common raw material for pulp/paper mills in India and China.
 - Some countries burn majority of the wheat straw in open fields. As a result, it wastes approximately 14,500 MJ/MT of energy and adds as high as 77 kg of contaminants/pollutants to the atmosphere. Such incineration further complicates the risks of Climate Change.
 - With the use of this agricultural waste as a raw material, the paper industry has minimized the carbon footprint of wheat straw (4).
- Sustainably harvested bamboo (mainly in China and India)
- Sustainably grown plantation trees across the globe
 - Trees harvested sustainably from the forests (mainly in Northern Europe and North America)
 - Trees grown on farmlands' edges (mainly in India)
 - With all the saplings and support provided by the paper industries, this social forestry concept has not only provided sustainable raw material to the mills but also generated significant cash for the farmers.
 - Plywood mills' waste (mainly in India)
 - Sawmills' waste
 - In the countries under European Union plus Norway and Switzerland, saw mills' waste accounts for 24.4% of the total wood requirements of pulp mills (5).
 - Any other cellulosic raw material such as cotton, jute, kenaf, hemp, sorghum and flax



Picture 1: 1. Acacia plantation 2. Acacia trees 3. Acacia logs 4. Mixed wood chips 5. Bagasse 6. Eucalyptus plantation 7. Eucalyptus trees grown on the farmland edges 8. Eucalyptus plantation under social forestry 9. Waste paper (brown) 10. Waste paper (white) 11. Wheat straw

Depending on the species, average mortality rate, harvesting cycle and the Mean Annual Increment (MAI), the major pulp/paper manufacturers continuously plant trees in multiples of the industry's needs for such trees for papermaking every year. These efforts are part of sustainable supply of wood to the mills while eliminating the dependence on forest wood. Moreover, as part of conforming to the needs of procuring raw material responsibly, it has also become mandatory for the industry to get certification for the plantation wood and adhering to Sustainable Forestry Practices by global watch organizations such as Forest Stewardship Council (FSC), The Sustainable Forestry Initiative (SFI) and The Program for the Endorsement of Forest Certification (PEFC). It not only gives a desired satisfaction to the end users but also confirms the genuineness of the paper industry towards a sustainable ecosystem.

Additionally with their own robust Research and Development facilities built up in the last couple of decades, the main industry players are also continuously working to increase the productivity (achieve higher MAI expressed as m³/hectare/year) of plantation wood by utilizing modern forestry practices. The industry is also genetically modifying the wood species to improve tonnage from each tree at an optimum harvesting age. Depending on the mortality rate though, the MAI has increased to 22-23 m³/hectare/year for acacia hybrid/mangium in Indonesia, Malaysia, Thailand and Vietnam (6, 7, 8). For various genetically modified eucalyptus species (such as UroGrandis) used for paper production, it stands between 31-38 m³/hectare/year in Brazil (8, 9) and in other South American countries. With such

an improvement in the output from the plantation wood, the number of trees cut for one metric tonne of paper has also come down gradually hence improves sustainability.

Myth #2 – Paper Industry uses huge amount of water.

Amongst various industrial or farm products, the water usage in pulp/paper/tissue manufacturing is amongst the lowest. One may be surprised to know that the highest water using products (10) are-

- Fruits and vegetables.
- Textiles and garments
- Meat production
- Beverages
- Automobiles

Even a cup of coffee (from beans farming to make a cup of coffee) uses more water than it is used to make one kg of paper. In Middle East, the paper manufacturers have the closest loop for water recycling in the world. The fresh water usage in such mills is only 1-3 m³ and aimed to replace its loss due to evaporation (mainly on paper machine) or carried with the final product.

As per UNESCO-IHE report (11), a pair of jeans (approximately one kg) may need 10.9 m³ of water before it comes to the market.

Myth #3 – Paper industry is the cause of huge Green House Gas Emissions.

The paper industry's dependence on the fossil fuel is significantly less as compared to the same for industries producing meat, automobile and iron/steel. In an integrated pulp/paper mill, incineration of concentrated black liquor, which is a by-product of pulping process and contains alkali, lignin and part of cellulosic material, typically generates 60-75% of the total energy requirement (12). However, this ratio will depend on various factors such as equipment and process efficiency. The remaining 25-40% energy is generated by using biomass (such as bark, wood dust, screen rejects, effluent sludge, palm oil mill waste and other bio waste) together with a minimum use of natural gas and coal in power boilers.

As per the report published in 2014 (13), all the industries account for 21% of the Green House Gas Emission (GHG) worldwide. For paper industry, the energy related GHG (Electricity, Heat and Transportation) accounts for 0.6% of the total GHG and is the lowest amongst the peers. The GHG is the highest for iron and steel industry (7.2%) (14). With more innovative technologies available and an

optimum use of resources management, the pulp/paper industry is focusing to achieve ZERO emissions and turn carbon neutral in near future.

Myth #4 – Going paperless will save the planet

On an average, the aviation industry accounted for 2.4% of the total carbon footprint globally in 2018 (15). It is much higher than the total carbon footprint of paper industry.

For the paper usage in USA, its carbon footprint is approximately 1% of the total carbon footprint for a household (16). This is despite that the paper consumption is amongst the highest in the world. In 2019, it was 196 kg per person per year in USA in 2019 (17). For each country, the carbon footprint of the paper will vary due to geographical location and the lifestyle maintained by the people. However, it is unlikely to increase >1% (as in USA) as paper consumption is much lower in countries like India, China, Russia, Brazil and Indonesia compared to that of the industrially developed world. Accordingly the campaigns like "go paperless" or "do not print email" to save the planet will not see any significant reduction in the paper related carbon footprint. On the contrary, the organizations running such campaigns should focus on the recycling of paper after use as part of further minimizing paper's carbon footprint. Moreover, there is a greater need to minimize carbon footprint of offices and data centres, which are coming up in a big way everywhere across the globe, as they have a huge requirement for air conditioning to maintain certain temperature.

With an aim to keep the carbon footprint at the lowest, the paper mills also use CO₂ to generate CaCO₃ used in different kinds of paper together with the cellulosic fibre. Some pulp/paper mills even supply surplus electricity to meet the demand of small towns. This further reduces the carbon footprint of paper industry as smaller amount of fossil fuel (coal, oil or natural gas) is used to generate electricity for public consumption.

Summary

The paper is green. The paper is sustainable as it mainly uses renewable woody cellulosic material or agricultural wastes, which otherwise are burnt or sent for landfill. The paper making process has the lowest water, energy, environmental (GHG) footprint compared to other daily use products. The paper is also easily biodegradable compared to plastic or any other synthetic material. Accordingly, let us help to replace more single use plastic with paper and related products. Use paper proudly but recycle it to keep the environment clean.

References

1. "8 Things To Know About Palm Oil", published by WWF at <https://www.wwf.org.uk/updates/8-things-know-about-palm-oil>(January 2020)
2. <https://afandpa.org/media/blog/blog/2021/05/13/recycling-during-the-pandemic-2020-paper-and-cardboard-recycling-rates-are-in!>
3. <https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/paper-and-paperboard-material-specific-data>
4. G. Montero, M. A. Coronado, C. Garcia, H. E. Campbell, D. G. Montes, R. Torres, L. Perez, J. A. Leon and J. R. Ayala, Wheat Straw Open Burning: Emissions and Impact on Climate Change, Chapter 4, pp. 67-78 in Global Wheat Production, ISBN: 978-1-78923-337-7 (2018)
5. KEY STATISTICS 2019, European Pulp & Paper Industry (CEPI), PP. 1-32 (2019)
6. I. Jusoh, J. K.Suteh and N. S. Adam, Growth and Yield of Acacia mangium Based on Permanent Sampling Plots in a Plantation, Transactions on Science and Technology (4), 513 - 518 (2017)
7. H. Krisnawati, M. Kallio and M. Kanninen, Manual on Acacia mangium: Wild-Ecology, silviculture and productivity (ISBN 978-602-8693-37-0) by CIFOR, Bogor, Indonesia (2011)
8. G. Medeiros 1, T. Florindo, E. Talamini, A. F. Neto, and C.Ruviaro, Optimising Tree Plantation Land Use in Brazil by Analysing Trade-Offs between Economic and Environmental Factors Using Multi-Objective Programming, Forests 2020, 3-23, 11, 723 (2020)
9. Personal conversation with a Senior R&D Director (Forestry) working with a multi-national pulp/paper manufacturing organization in Indonesia (August 2021)
10. <https://www.thomasnet.com/insights/which-industries-use-the-most-water/>
11. Source: <https://waterfootprint.org/media/downloads/Report18.pdf>
12. Personal conversation with Senior Mill Managers at various integrated pulp/paper mills working with multi-national pulp/paper manufacturing organizations in India and Indonesia (August 2021)
13. M. Fishedick, J. Roy, A. Abdel-Aziz, A. Acquaye, J. Allwood, J.-P. Ceron, Y. Geng,H. Khesghi, A. Lanza, D. Perczyk, et al. "Industry," in: Climate Change 2014: Mitigation of Climate Change. Working Group III Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, O. Edenhofer, R. Pichs-Madruga, Y. Sokona, J. C. Minx, E. Farahani, S. Kadner, K. Seyboth, A.Adler, I. Baum, S. Brunner, et al. (eds.), Inter Governmental Panel on Climate Change, Geneva, Switzerland (2014)
14. <https://ourworldindata.org/emissions-by-sector>
15. <https://www.eesi.org/papers/view/fact-sheet-the-growth-in-greenhouse-gas-emissions-from-commercial-aviation>
16. C. M. Jones and D. M. Kammen, Quantifying Carbon Footprint Reduction Opportunities for U.S. Households and Communities, Environ. Sci. Technol. (45), 4088–4095 (2011)
17. Year Book on Forest Products 2019 (ISSN 1020-458X), FAO Statistics, PP 1-168, FAO, Rome, Italy (2019)