Opinion
Volume 7:8, 2022

Advances in Recycling & Waste Management

ISSN: 2475-7675 **Open Access**

Economic Conditions for Clinical Plastics Circularization

Calvin Lakhan*

Department of Mechanical Engineering, University of Ibadan, Ibadan, Nigeria

Introduction

These single-use clinical plastic wastes are incinerated, contributing to global warming, or go to the landfill, contributing to resource depletion. Plastic leakage is a major threat to the environment. For holistic systemic sustainability, this linear plastics economy model, take-make-dispose, must be replaced by a circular plastics economy, i.e., sort plastic wastes, wash, decontaminate, recover materials, blend with bio-based compounds as needed and circulate recyclate plastics. While there are numerous environmental drivers for a circular plastics economy, there are numerous uncertainties in the economic attributes, with electricity price, labour cost and chemical cost being the primary ones influencing the cost of production of secondary or recycled plastics, necessitating government and policy support, such as a gate fee on plastic waste from generators to recyclers.

Low oil and gas prices, which influence recyclate plastics and electricity prices, are an essential macroeconomic condition for techno-economically (or micro-economically) feasible plastic waste recycling. To stimulate the circular economy, it is critical to de-fossilize the economy by decoupling renewable electricity generation from natural gas consumption and fossil-independent biopolymer production displacing fossil-derived plastics. This research provides a thorough and reliable technoeconomic analysis of mechanical recycling of clinical plastic wastes into secondary plastics recovery [1].

Description

Global plastics production has increased from 2 million tonnes to 2 billion tonnes. The clinical or medical plastics industry has the worst accountability and management. Clinical plastics have replaced ceramic or glass in the healthcare and laboratory sectors because their durability, non-breakability, tenacity and multi-faceted functionalities provide superior health and safety performances. However, their pollution poses a significant threat to the environment. They primarily consist of single-use plastics. Single-use clinical plastics pose significant environmental and sustainability concerns due to the loss of fossil resources when landfilled and the potential for global warming when incinerated. The biochemical hazards of single-use clinical plastic wastes may prevent them from being recycled for material recovery. Low-hazard level single-use clinical plastic wastes can be recycled for secondary material recovery or plastic remanufacturing if separated at the source

However,sorting and segregating single-use clinical plastic waste is difficult in the healthcare sector because doctors and nurses' top priority is saving lives. All single-use clinical plastic waste is discarded in an unsorted manner, making recycling difficult. Secondary material recovery takes precedence over tertiary recovery, which includes chemical recovery and quaternary recovery, which includes energy recovery from incineration and landfilling. Secondary material recovery by mechanical recycling, essentially returning remanufactured plastics into the value chain, is the most preferred option for the environment and sustainability if reuse of single-use clinical plastic wastes is not an option. However, in addition to the challenge of segregation at the source, another challenge is the low-grade quality of recovered secondary plastics due to contamination and potential decontamination methods [2].

All of these obstacles render the economics of single-use clinical plastic waste recycling unviable, necessitating public, government, or policy support. The problem requires systematic scoping and techno-economic feasibility analyses, neither of which have been addressed in the literature. The goal of this research is to assess the technical and economic feasibility of remanufacturing/mechanical/secondary recycling of clinical plastic waste in order to create conditions for a clinical plastics economy that is circular. The presented analysis is extremely valuable because there is currently no reliable economic data on clinical plastics [3].

The processing steps for recycling plastic waste using a secondary or mechanical recycling method are well established; however, using a secondary or mechanical recycling method to recycle clinical plastic waste is novel. Washing, sterilisation, drying,shredding and micro-extrusion into recyclable plastic pellets are all part of the secondary recycling process. A fundamental assumption is that source segregation protocols and strategies are in place in the healthcare and laboratory sectors. The processing steps are adaptable due to the flexible unit sizes and capacities, allowing adjacent recycling facilities to the clinical plastic waste generation source. Alternatively, washing, sterilisation and drying could be done on-site at the point of waste generation and transported to a site with extrusion facilities to appropriately blend additives to pelletize the plastics.

To ensure that the remanufactured plastics are recyclable, a comprehensive analytical testing suite must be used in addition to the processing steps. All these processing steps and research and development capabilities must be costed in to determine whether a single-use clinical plastic waste recycling project is viable or not and which post-use clinical plastic products are recyclable by which processing steps at what cost. This research question is not addressed in the literature. A high-level macro-scale economic analysis based on material flow analysis concluded that reducing illegal or mixed disposal of medical plastics in China via incineration with energy recovery could result in environmental and economic benefits [4,5].

Conclusion

Clinical/medical plastics in the healthcare and laboratory sectors outperform glass or ceramic counterparts in terms of health and safety. These plastics, on the other hand, are made of single-use polymers derived from fossil fuels. 95% of post-use clinical plastics are incinerated or disposed of, contributing to resource depletion. Plastic waste can remain in the environment indefinitely, causing harm to a variety of species. When reuse is not an option, secondary or mechanical recycling or remanufacturing is the least destructive and most effective method towards a circular plastics economy. The method consists of washing, sterilisation, drying, shredding and micro-extrusion with blending as appropriate with bio-based compounds to meet property standards of recyclat. These pellets are made from recycled or secondary plastics. For standardisation and marketability, their chemical constituents and other properties are investigated. To meet the required product properties while lowering the economy's reliance on fossil resources, bio-based fossil-free environmentally benign compounds can be added to secondary plastics. With time, more virgin polymers would be replaced by biopolymers and all reagents,

***Address for Correspondence:** Calvin Lakhan, Department of Mechanical Engineering, University of Ibadan, Ibadan, Nigeria, E-mail: lakhancal25@gmail.com*

Received: 02 August, 2022, Manuscript No. arwm-22-83753; **Editor Assigned:** 04 August, 2022, PreQC No.P-83753; **Reviewed:** 18 August, 2022, QC No. Q-83753; **Revised:** 23 August, 2022, Manuscript No. R-83753; **Published:** 30 August, 2022, DOI: 10.37421/2475-7675.2022.7.245

energy and materials required throughout the life cycle would be renewable or fossil-free renewable and bio-based resources. At the plastic product design stage, environmental design must be applied to allow for post-use segregation, remanufacturing and indefinite life cycles, thus assembling and disassembling material constituents on demand. Plastics recycling economic analysis includes capital cost, operating cost and discounted cash flow analyses.

Acknowledgement

None.

Conflict of Interest

There are no conflicts of interest by author.

References

1. Rosenboom, Jan-Georg, Robert Langer and Giovanni Traverso. "Bioplastics for a circular economy." *Nat Rev Mater* 7 (2022): 117-137.
2. Ozimek, Jan and Krzysztof Pielichowski. "Recent advances in polyurethane/POSS hybrids for biomedical applications." Molecules 27 (2021): 40,
3. Lee, Byeong-Kyu, Michael J. Ellenbecker and Rafael Moure-Eraso. "Analyses of the recycling potential of medical plastic wastes." *Waste Manag* 22 (2002): 461-470.
4. Geyer, Roland, Jenna R. Jambeck and Kara Lavender Law. "Production, use, and fate of all plastics ever made." *Sci Adv* 3 (2017): e1700782.
5. Dharmaraj, Selvakumar, Veeramuthu Ashokkumar, Rajesh Pandiyan and Heli Siti Halimatul Munawaroh, et al. "Pyrolysis: An effective technique for degradation of COVID-19 medical wastes." Chemosphere 275 (2021): 130092.

How to cite this article: Lakhan, Calvin. "Economic Conditions for Clinical Plastics Circularization." Adv Recycling Waste Manag 7 (2022): 245.