Artificial Turf recycling using Circular Economy with Machine learning application

Shilpa akula[1]

[1]Department of Environmental Engineering, BitsPilani, Hyderabad, TS.

ABSTRACT

Circular economy is an Economic system purposed to reducing waste and making the most of resources. A rise in the world population and growing resource consumption and negative environmental effects, it has become crucial issue near future.
This paper aims to give current understandings of the definitions circular economy concept. The circular economy concept is commonly discussed among the scholars and practitioners and has become important topic nowadays. The study concludes the various definitions of circular economy and its Recycling of Artificial turf.

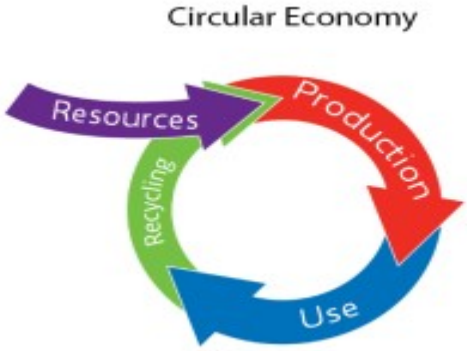

FIGURE 1

KEYWORDS

Circular Economy, Machine learning algorithm, artificial turf, application.

1. INTRODUCTION

The circular solar ecosystem has three foundational factors that need to be developed – technological expertise, economic maturity, and regulatory support. At present, circular solar economy is largely a theoretical concept with little on-ground progress. Only a handful of companies are engaging in buy-backs or refurbishment of solar panels after the end-of-life is achieved. The market is also at a nascent stage at present since the number of retired solar panels is very low. However, this may soon change.

2. CIRCULAR ECONOMY ARTIFICAL TURF

While using artificial turf for sports pitches offers several benefits when compared to natural grass, disposing of it when it becomes worn out can create significant environmental issues. However, artificial turf pitches can now become fully circular products thanks to a process that separates the turf back into the original raw materials, which can then be used instead of virgin materials in new production cycles or to make new pitches. Using artificial turf is a popular option for indoor and outdoor sports pitches, stadiums, arenas etc, as it offers a range of benefits when compared to natural grass. In 2020 alone, 14,000 worn-out artificial turf pitches were either incinerated or sent to landfill. The plastic components of these pitches alone are equivalent to 19.5 billion plastic bags. Furthermore, it is estimated that 52,000 pitches will need to be replaced in 2030. These numbers highlight the need to find a viable solution to the challenge of making the use of artificial turf more sustainable and a truly circular product.

2.1. FINDINGS FROM THE STUDY

Ground-breakingtechnology separates worn-out artificial turf back into the original raw components, which can then be used in new pitches or in other production cycles. The challenge is what to with the artificial turf when it needs to be replaced (normally after 8-12 years). Sending the worn-out turf to landfill or incinerating are typical, but not ideal, solutions. This is because incinerating the turf results in 400 tonnes of CO2 being emitted 1 and sending the turf to landfill bears the risk of chemical waste and micro plastics entering the groundwater, as well as subjecting the owner to expensive disposal fees. Moving the turf to a new location and installing it only delays the problem.

Artificial turf cannot be recycled effectively without separating the different plastics used in the product. These plastics – polyurethane or latex for the secondary backing, PET blades, and polypropylene fibres – have different viscosities and melting temperatures. Some, like the thick polyurethane or latex backing material, are not even thermoformed plastics at all.

The project aims to develop waste processing methods that separate the material necessary for artificial turf recycling. The delivery partners will focus on this project's chemical separation methods, enabling them to recover distinct plastic materials from artificial turf waste. Chemical recycling processes under scrutiny for artificial turf in this project are biological or enzymatic degradation and, for the polyurethane backing, chemical recycling or glycolysis. Polyurethane recycling, in particular, is becoming increasingly important due to factors including land and water pollution and exhaustion of raw materials. Mechanical and chemical processes are currently used to recycle this material. However, biodegradation may become more viable for polyurethane. Following are the points:

- 10,000 lorries
- 116,000 tonnes of waste
- 520 million plastic bags, and
- 000 tonnes of CO2

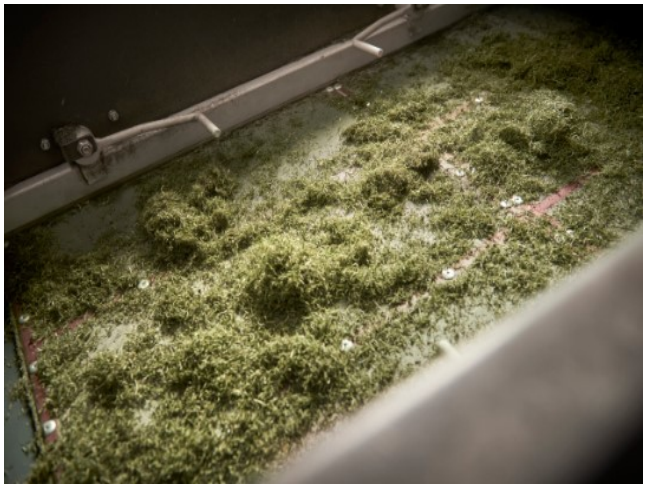

FIGURE 2

2.2. GREY AREAS/LIMITATIONS AND SOLUTIONS:

Artificial turf pitches have changed dramatically since their introduction more than 50 years ago. Those first synthetic playing fields - hard, unyielding, prone to warming and relatively short-lived - have long given way to highly-engineered turf systems with a performance that comes close to that of natural grass. Although more durable than their earlier versions, artificial turf playing fields still only have an estimated useful life of between 12 and 15 years, after which they are disposed of in a landfill or incinerated. Also known as thermally recycled. While formally complying with the legal requirements applying today, neither is a particularly sustainable end-of-life solution.
According to new the new Climate Protection Act: It stipulates that products should be environmentally friendly and energy-saving over their entire life cycle," she added. Artificial turf included. In contrast, at least 20 other states have passed laws to attract new advanced recycling projects, helping spur a wave of innovation that will be vital to meeting the surging demand for products made with recycled material. There are at least seven advanced recycling facilities operating in the U.S., with the potential for billions of dollars in additional investments.
Artificial turf is composed of:

- An under layer, which can be re-used without further treatment if it is in good condition;
- The mat, which can be crushed and extruded as a secondary material;
- The filling, the components of which must be separated and cleaned.

3. RECOMMENDATIONS AND CONCLUSION

When considering replacing an old field with a new one, or embarking on a brand new project, the question of whether to use synthetic turf or grass comes up early and often.

Grass requires costly and intricate maintenance that makes upkeep difficult for many institutions and municipalities to keep their fields in a playable condition that is safe enough for its players. Synthetic turf requires more limited maintenance and it provides a very playable surface for years. There is no watering, no mowing, and no fertilizers or pesticides needed to maintain synthetic turf, conserving resources, including millions of gallons of water yearly, and budget.

Synthetic turf also enables longer play deeper into colder seasons, and extended hours of use given the lack of recovery time needed—leading to further revenue generation from renting the field. The cost of installing and maintaining a synthetic turf field is three times less expensive than the cost of a grass field over the same period of time.

The rubber recycling industry also boosts local economies and creates manufacturing jobs across the country. The industry generates more than $2.5 billion in economic activity annually and contributes more than $295 million in federal, state, and local tax revenue. Moreover, the recycled rubber industry employs more than 12,000 people nationwide, providing more $500 million in employee wages each year.

TurfDataForNFLBigDataBowl2020.html

4. ACKNOWLEDGEMENTS

For this document I highly appreciate the support from everyone!

5. FUTURE SCOPE

The report offers an in-depth analysis of recent developments, changes in market regulations, product approvals, product launches, and the market behaviour across segments such as distribution channel (offline and online), application (sports and leisure and landscaping), and geography (Europe, North America, APAC, South America, MEA, Europe, North America, APAC, South America, and MEA). This report helps businesses create strategies to make the most of future growth opportunities.Applied Machine Learning model on Turf data for Stadiums pollution its causing to environment is quite less and could be reprocessed. Recycle could help us solve further issues.

6. REFERENCES

[1] "AIMPLAS' New Project to Boost Recycling of Artificial Turf." (2021). *Special Chemistry*. [Online.] https://omnexus.specialchem.com/news/industry-news/aimplas-recycling-artificial-turf-000223978.

[2] Kemona, Aleksandra, and Małgorzata Piotrowska (2020). "Polyurethane Recycling and Disposal:
Methods and Prospects." *Polymers*. [Online.] https://doi.org/10.3390/polym12081752.

Authors

Working towards as an Application Developer to build robust applications and transform technology.