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Spotlight

Our R&D vision is to be one of the leading chemical companies for sustainable solutions

Plastic Extrusion

We aim to use advanced recycling technologies in our extrusion lines

"We are investing Rs.4,500 Cr to meet the growing demand in India"

Navanit Narayan, Wholetime Director & Chief Executive Officer talks about how he is taking personal interests in transforming the supply chain, achieving cost leadership, improving operational reliability, diversity, sustainability and strengthening talent management at Haldia Petrochemicals.

Harnessing Artificial Intelligence and Machine Learning to Revolutionise Management of Plastic Waste

With rapid urbanisation driving a surge in waste generation, traditional waste management practices often fall short of addressing the mounting environmental concerns. The article explores the critical role of artificial intelligence and machine learning in revolutionising plastic waste management.

By Anantshree Chaturvedi, Vice Chairman and CEO, Flex Films International

Plastic waste poses a significant global environmental challenge, demanding innovative solutions for effective management. One promising avenue is the integration of advanced technologies, such as artificial intelligence (AI) and machine learning (ML), to optimise the collection and sorting of plastic waste.

In countries like India, where rapid urbanisation drives a surge in waste generation, traditional waste management practices often fall short of addressing the mounting environmental concerns. According to projections, Mixed Solid Waste (MSW) is slated to reach 165 million tons by 2030. However, waste collection suffers due to inadequate garbage collection infrastructure. The absence of adequate infrastructure and source segregation practices exacerbates this challenge. Organic and recyclable materials (plastic, paper, metal) are mixed in MSW, and only 30 per cent of collected waste is sorted correctly.

If this practice goes unabated, by 2047, India will need 340,000 cubic metres of landfill space every day (1,240 hectares per year).

Managing household waste poses a significant challenge due to the common practice of mixing organic and inorganic waste, resulting in a heterogeneous mix that is difficult to segregate efficiently. Waste workers

often manually sort this waste to salvage recyclable materials, but this process is labour-intensive and inefficient. Addressing these challenges requires comprehensive strategies that promote waste segregation at the source and improved waste collection systems.

In India, as opposed to its counterparts in the western world, optimal source segregation and efficient collection of waste might take another 15-20 years. To leapfrog to a better scenario, it is critical to invest in AI and ML to optimise the collection and segregation of MSW and explore biodegradable packaging as a solution for uncollected waste.

AI-driven systems, equipped with volumetric and weight-based sorting capabilities combined with optical differentiators, can automate the precise categorisation based on size, weight, visual characteristics, and even material composition. These advanced sorting techniques enable seamless identification and separation of recyclable materials from mixed waste, significantly enhancing the efficiency of recycling operations while eliminating the need for manual sorting.

Machine learning algorithms can optimise recycling processes by constantly analysing data and adapting sorting criteria based on evolving waste compositions and characteristics. The various challenges associated with the manual sorting of waste and efficient segregation of mixed waste can be addressed by leveraging AI and ML-powered solutions. Waste management facilities can improve sorting accuracy and efficiency over time, ensuring more effective resource utilisation and waste diversion.

Work has already begun in this direction, and machines enabled with this technology can process as many as five tons of garbage every hour. Additionally, brands can incorporate watermarks or QR codes on packaging to enhance AI's ability to segregate waste effectively and optimise sorting.

The implications of integrating AI and machine learning into plastic waste management processes are profound. Automated sorting can more accurately separate different types of plastics, leading to less contamination in recycling streams. Cleaner waste streams result in higher-quality recycled products.

Additionally, AI and ML can help track recycled materials through the supply chain, ensuring transparency and accountability. Through efficient sorting and recycling, more value can be extracted from waste, leading to tangible economic benefits.

Furthermore, adopting these technologies can pave the way for a circular economy, where waste is repurposed and reused, mitigating the reliance on virgin materials and significantly reducing environmental impact.

While technological advancements provide a crucial foundation for transforming plastic waste management practices, fostering a culture of responsible plastic waste disposal and source segregation remains paramount. Policies to incentivise the establishment of recycling facilities and promote sustainable practices can further bolster efforts to combat plastic pollution. People must embrace these changes: without that, technology, no matter how advanced, will achieve little.

In one of my favorite Star Trek episodes, Spock tells the team that good technology is only a tool for those explorers who know how to use it.

In conclusion, we are at a crucial juncture for mankind, where we can pledge to "Live long and prosper." Integrating artificial intelligence and machine learning represents a transformative opportunity to revolutionise plastic waste management. By leveraging these technologies effectively, we can pave the way for a more sustainable and resilient future, where waste is viewed not as a problem but as a valuable resource to be repurposed and reused.

UPDATE

UFlex Limited releases a report on the Proposed National Standard for Scientific Estimation of Recycled Content

UFlex Limited released a report on the "Proposed National Standard for Scientific Estimation of Recycled Content" for EPR reporting at an event organised and hosted by the Plastic Packaging Research and Development Centre (PPRDC).

Speaking on the occasion, Ashok Chaturvedi, Chairman and Managing Director of UFlex Limited said, " Sustainability is the cornerstone of our corporate strategy. As a global leader in packaging, we have made significant investments in recycling technologies to keep plastic in the economy and out of the environment. Currently, we recycle close to 30,000 MT of Multi-Layer Plastic (MLP) waste annually across India, Poland, and Mexico, and our goal is to reach 100,000 MT of recycling annually by building additional global recycling facilities.

We laud the Indian government's plastic waste management (PWM) and extended producer responsibility (EPR) regulations that will transform the waste management ecosystem in India and accelerate the pivot to sustainable development and a circular economy. However, there is a need to measure recycled content in packaging accurately and avoid inconsistencies in EPR reporting. The study report by PPRDC, supported by CIPET and BIS, is a step in the right direction. It proposes the development of a standardised measurement of recycled PE content in packaging by producers, importers, and brand owners to deliver on their individual and industry EPR objectives."

The School for Advanced Research in Petrochemicals (SARP) – Laboratory for Advanced Research in Polymeric Materials (LARPM) at the Central Institute of Petrochemicals Engineering & Technology (CIPET) in

Bhubaneswar conducted a study that explains a method of determining rPE content in packaging materials. The study recommends FTIR spectroscopy and DSC-based thermo-analytical techniques to develop a national standard or operating/audit process to assess and regulate the recycled content of PCR plastic packaging. This helps discourage practices like green-washing and waste fraud that diminish circularity and erode public trust in plastic recycling.

This study report builds on previous findings of SARP-LARPM, CIPET, in collaboration with the Foundation for Innovation & Technology Transfer, IIT-Delhi, for the method of determination and estimation of mechanically recycled PET content in packaging materials. Earlier, these institutes recommended using a UV-Vis Spectrophotometer to accurately predict the recycled content in v-PET/rPET composites.

In addition to the launch of the study report, government and industry representatives discussed a wide range of topics including the scope and status of EPR implementation in India and the challenges faced by producers, brand owners, and importers in complying with EPR guidelines, among others.