TECH OFFER

Recycled Mixed Polymer Modifiers in Bituminous Materials

KEY INFORMATION

TECHNOLOGY CATEGORY:
Sustainability - Sustainable Living
Waste Management & Recycling - Industrial Waste Management

TECHNOLOGY READINESS LEVEL (TRL): TRL8
COUNTRY: SINGAPORE
ID NUMBER: TO175233

OVERVIEW

The use of plastic waste is severely restricted due to high levels of contamination, expensive sorting processes, and the non-homogeneous nature of the materials. These challenges contribute to low recycling rates both locally and globally, with most plastic waste being disposed of through landfilling or incineration, leading to further environmental concerns.

This technology aims to create sustainable products and processes for infrastructural applications by transforming mixed plastics from municipal solid waste (MSW) into raw materials like fibres, aggregates, and polymer modifiers, which can be incorporated into bituminous mixtures. It is the first of its kind to enable the direct use of MSW mixed plastics without the need for extensive sorting. The as-received mixed plastic waste is processed into standardized forms commonly used in the construction industry. Given the large scale of infrastructure projects, this technology can absorb significant volumes of plastic waste, reducing the demand for landfill space and eliminating greenhouse gas emissions (such as CO_2) and toxic pollutants (like dioxins) from incineration.

The technology owner is looking for collaborations (R&D, test-bedding and/or licensing) with oil industry companies, road paving companies, building and construction industry players, waste management centres, institutes of higher learning (IHLs), and government agencies.

TECHNOLOGY FEATURES & SPECIFICATIONS

The technology incorporates several proprietary systems designed to efficiently process mixed plastic waste. These include:

- **Sink-float vessels:** Provide high separation efficiency, allowing for the effective separation of mixed plastic waste based on density.
- **Calibration library:** Offers accurate real-time measurement of the composition of as-received mixed plastic waste, ensuring precise processing.
- **Compositional adjustment/standardization unit:** Standardizes the composition of mixed plastics to meet industry requirements for infrastructure applications.
- **Advanced Mechanical Recycling (aMR) process line:** A cutting-edge process line that converts mixed plastics into usable raw materials, such as polymer modifiers, for incorporation into bituminous mixtures.

These technical features enable the transformation of contaminated, mixed plastic waste into standardized, valuable products for the construction industry.

POTENTIAL APPLICATIONS

- Substitute for commercial polymer-modified bitumen in asphalt road pavements.
- Substitute for commercial polymer modifiers in waterproofing materials.
- Coatings and paints for marine, floating, coastal protection, and underground structures.

UNIQUE VALUE PROPOSITION

- **First-of-its-Kind Technology:** Allows direct use of as-received mixed plastics from MSW without the need for costly and complex sorting processes.
- **Standardized Materials for Infrastructure:** Processes mixed, contaminated plastics into standardized materials used in construction, such as polymer-modified asphalt.
- **Consistency Through NIR Calibration Model:** Uses a Near Infra-Red (NIR) calibration model and machine learning based on NEA's plastic composition data to ensure consistent quality of mixed plastic waste.
- **Enhanced Bituminous Mixtures:** Improves technical properties of bituminous mixtures by creating a 3D cross-linked polymer structure within the matrix, enhancing durability.
- **Cost Savings:** Offers 15%-25% cost savings compared to conventional polymer-modified bitumen.
- **Environmental Impact:** Reduces waste going to landfills and incineration, providing a sustainable solution for the construction sector.