



Automated Creation of Existing Conditions Modelling

Using Artificial Intelligence (AI) for Creation of Existing Conditions Modelling (ECM)

Existing Conditions Modelling using AI technology

Emerging into a digital construction era, the Highways Department has been actively exploring the use of innovative technologies to enhance operational efficiency and achieve a greener and more sustainable construction environment. A case in point is our initiative to widely adopt Building Information Modelling (BIM) technology with the use of existing conditions models to represent ground features (such as kerb and lamppost) in a three-dimensional form in various road works projects. To further leverage the BIM technology in improving the quality and efficiency of road construction and maintenance works, we are recently conducting a pilot study to develop an AI-based approach for automating and streamlining the field data acquisition and computer modelling in the ECM creation process. With the aid of AI-trained models, the automated ECM creation process will identify, measure, and map road features from the point cloud data acquired in field for creating their respective ECM.



targeted to complete in
end-2024 tentatively



improves operational efficiency of
modelling by about **70%**

Environmental Benefits

Adoption of the AI-based ECM creation technology not only improves operational efficiency of modelling by about 70% but also promotes the environmental performance by reducing the fuel consumption and carbon emission in field data acquisition and processing. Moreover, with more accurate and detailed ECM, engineers could reduce the number of design revisions which would help save the associated energy, paper and time consumption. In overall terms, this AI-based ECM creation process aligns with our commitment towards sustainable development and use of innovative technologies in supporting construction works. The pilot study is targeted to complete in end-2024 tentatively.

ECM Creation Workflow

1 Field data acquisition

Point cloud data captured by
laser scanner



2 Computer modelling

Road features identified
from point cloud data by AI
technology



3 ECM creation

Road features automatically
mapped to form the ECM



Precast Concrete Paving Units with Recycled Plastics

The Highways Department has been striving for developing environmentally friendly paving materials for footways. Since 2004, the use of recycled aggregates, which are crushed concrete or rocks generated from construction or demolition works, in concrete paving units (eco-pavers) has been mandated. We have taken further initiative on eco-pavers by mandating the use of recycled glass cullet contributing 20% to 25% by weight of the total aggregates of eco-pavers in road maintenance contracts since 2010. To facilitate the upcycling of various recyclables, we are conducting site trials of precast concrete paving units with recycled plastics.

According to the Monitoring of Solid Waste in Hong Kong 2021 published by the Environmental Protection Department in December 2022, the quantity of waste plastics disposed of in Hong Kong was 2,616 tonnes per day which was the second largest constituent of the quantity of municipal solid waste. Of the 2,616 tonnes of waste plastics, 2,331 tonnes were disposed of at the landfill (89%) while only 285 tonnes were recycled (11%).

All seven types of waste plastics (namely PET, HDPE, PVC, LDPE, PP, PS and other) can be upcycled as constituents in manufacturing the precast concrete paving units with recycled plastics. In terms of environmental benefits, producing a plan area of 100 square meters of precast concrete paving units with recycled plastics can consume 2,000 kg of upcycled plastics which is equivalent to the waste plastics amount of 200 washing machines.

Should the site trial results be satisfactory, we will consider establishing the criteria for general application of precast concrete paving units with recycled plastics as eco-pavers.



Recovered waste plastics



Shredded waste plastics



Precast concrete paving units with recycled plastics



100 m² of paving units with recycled plastics can consume **2,000 kg** of upcycled plastics



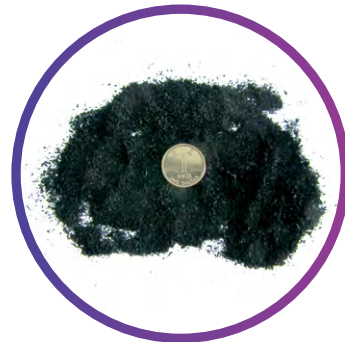
the waste plastics amount of **200** washing machines



Rubberized Bituminous Pavement Materials



Waste tyres



Ground recycled crumb rubber



Crumb rubber modified bitumen in laboratory



Rubberized bituminous pavement



2 feasibility studies completed



All 42 trial road sections completed

In Hong Kong, disposal of waste vehicle tyres has been a very difficult problem for decades. With the vision to tackle this problem and bring in both environmental and engineering benefits, we collaborated with the Hong Kong Polytechnic University and completed two feasibility studies on the use of rubberized bituminous pavement materials in Hong Kong road network. The studies concluded and confirmed the technical feasibility of adding crumb rubber into conventional bituminous pavement materials, including wearing course, base course and road base, and the recyclability of the rubberized bituminous pavements at the end of their service lives. We commenced a site trial programme in 2021 to test its performance in public roads. All of the 42 trial road sections have been laid with rubberized bituminous pavement materials by end-2023. We will endeavor to complete our site trial programme and conclude the site trial results for wider application by 2024.



Rubberized bituminous pavement materials laid at Cheung Sha Wan Road