Research & Technology

We make every effort on our research on environmentally friendly technologies, such as application of low noise road surfacing material and Unmanned Aerial Vehicle in our work.

LOW NOISE ROAD SURFACING MATERIAL

Noise impact of existing roads to nearby residents has been a concern to them. To tacle this issue, we have been working closely with the Environmental Protection Department (EPD) in developing more durable low noise road surfacing materials for use in Hong Kong. With our concerted efforts, we have successfully developed the technical application criteria of using Polymer Modified Friction Course (PMFC) through our site trial programme with the relevant guidance notes formally promulgated in 2016.

With PMFC being advisable for use on relatively free flow trafficked bituminous local roads, it is considered not suitable for road sections such as those with steep vertical gradient and with frequent sharp turning/braking. To address these limitations, we have been developing an alternative low noise road surfacing material. We have engaged the Hong Kong Polytechnic University to study the use of 6mm Polymer Modified Stone Mastic Asphalt (PMSMA6) as low noise road surfacing material for local road application. With the promising laboratory test results, we commenced the site trial programme of PMSMA6 in 2019. The selected road sections covered various road characteristics such as stop lines, bus stops, inclined roads and sharp turnings. The trial results generally reveal that the performance of the new material in reducing tyre noise is similar to PMFC while its durability performance is better. For the completed trial road sections, we will continue, in collaboration with EPD, the monitoring of the concerned road surface condition and noise reduction performance. We will endeavor to lay more road sections with PMSMA6 as far as practicable with a view to collecting more data to conclude the study results soon.

▲ PMSMA6 laid at Long Yip Road

PMSMA6 laid at Peng Che Road ▶

APPLICATIONS OF UNMANNED AERIAL VEHICLE (UAV)

We are continuously exploring the application of new technologies to increase the efficiency, effectiveness and quality on one hand, and to indirectly reduce the consumption of natural resources on the other. UAV is a component of an Unmanned Aircraft System, which includes a UAV, a ground-based controller, and a system of communications between the two. With the advancement of technology in recent years, the use of UAV has been rapidly expanding. We introduced the UAV technology to take 360-degree panoramas photos and videos for project planning in 2017. Since then, the use of UAV has been extended to various applications such as condition inspection of bridges, emergency survey and Existing Conditions Modelling for works projects. The technology is able to complete survey works covering a large area with relatively low labour and time cost. Also, the flexibility and ability to collect data in some inaccessible locations are greatly increased.

Inspection of Highway Structures

UAV is also employed to assist in visual inspection of highway structures. In 2020, UAV survey was used in taking videos and photo records of Ap Lei Chau Bridge to facilitate the 6-monthly inspection. Since it is difficult to reach the columns, bearings and soffits to carry out visual inspection, the employment of UAV to take high resolution videos and photos greatly reduces the resource and efforts previously required. A true scale 3D mesh model of Ap Lei Chau Bridge was also created through aerial photogrammetry such that measurements could be conducted anytime in office.

▲ Overview of Ap Lei Chau Bridge

▲ 3D mesh model for measurement

▲ Close-up view (column)

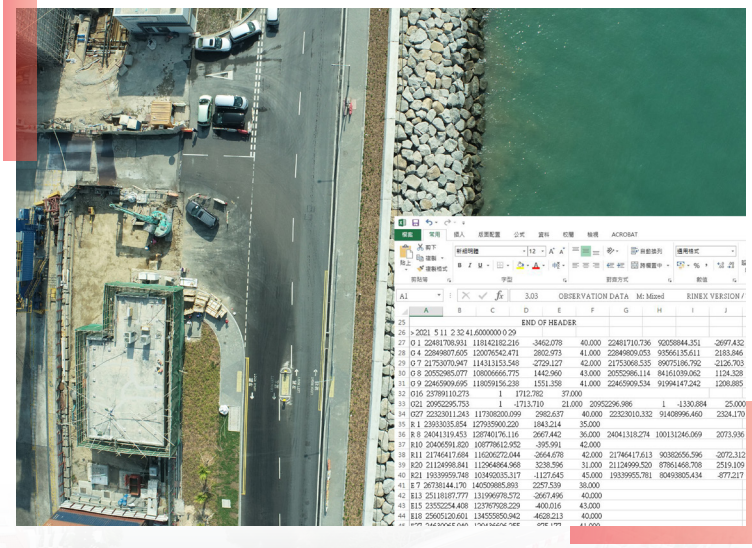
▲ Close-up view (bearing)

Environmental Benefits

In the past, various kinds of heavy machineries, such as crane truck with elevated platform, were employed for carrying out visual inspection. Temporary working platforms may need to be erected when landing area is not available for the heavy machineries. Consumption of fuel by these machineries and emissions of greenhouse gas are inevitable. With the engagement of UAV which uses rechargeable batteries, visual inspection can now be conducted more easily, safely and environmentally friendly.

The application of photogrammetry technology on UAV aerial photos is a very effective means to survey large open areas. The labour resources for field survey, as well as the number of vehicle runs to and from the site can be greatly reduced. The application of UAV also changes the means of data capture. In traditional surveys, paper field books are used for recording both survey data and field notes taken at the sites. In the UAV survey, the 360-degree panoramas photos and videos are captured and stored digitally for further data processing and inspection. Consumption of paper for taking field notes is therefore significantly reduced which in turn is another environmental benefit.

▲ Survey data and field notes in paper form



▲ Survey data and field notes in digital form