



RESEARCH

Natural replacement seashells in porous asphalt mixture for parking lot pavement

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PAYA BESAR, 12 January 2022 - Water is a major factor contributing to road pavement damage, especially in parking lots.

Water will diffuse and produce moisture and cause a saturated aggregate layer.

Therefore, to overcome this problem, a study titled Seashell Porous Asphalt - Sustainable Road Construction by a researcher and lecturer of the College of Engineering (KKEJ), Universiti Malaysia Pahang (UMP), Associate Professor Dr. Ramadhansyah Putra Jaya, 42, was successfully carried out to evaluate the effectiveness of seashells in porous asphalt as a natural replacement material (aggregate).

According to Associate Professor Dr. Ramadhansyah, the main use of porous asphalt pavement is for parking lots that allow water to drain through the pavement surface into the stone recharge bed and infiltrate the soils under the pavement.

SEASHELL POROUS ASPHALT: SUSTAINABLE ROAD CONSTRUCTION

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Patent
 PI 2021007108 filed 26/11/2021

1] Product Background
 Conventional Porous Asphalt + Seashell = Seashell Porous Asphalt

2] Objective
 To produce high quality of the porous asphalt incorporating seashell.
 To study the image processing of porous asphalt containing seashell.

3] Novelty/Originality/ Inventiveness
 Reduce seashell waste.
 Save cost compared to the conventional pavement.
 Reduce traffic noise.
 Reduce the slipperiness.

4] Environmental Impact
 Can perform well as compared to the conventional porous asphalt.
 Beneficial Usefulness/ Applicability.
 Improved storm-water management.
 Potential for noise reduction.
 Improved skid resistance.
 Reduction of harm to drivers and pedestrians.

5] Marketability & Commercialisation
 The growth of population and city development, required infrastructure development.
 Innovative infrastructure development.
 Improve drainage system.

6] Methods
 TRL 6
 FINAL PRODUCT

7] Product Image and Product Characteristics/Results
 Results, tables and charts showing performance metrics.

8] Collaboration with
 Riland, etc.

9] Cost Analysis

	Seashell Replacement	JAKR / Contractor
Processing cost of seashell size 14mm	RMB 0.03/kg	-
The optimum percentage of seashell size 14mm used	93%	-
Consider 1km length road of width 3.75m (Square 14mm aggregate approximate 1500kg)	New Work + Seashell	New Work
Cost of 14mm aggregate	484.21kg	484.21kg
14mm aggregate required for work (Approximate)	932 kg/km	1600 kg/km
14mm seashell required for road construction in new work	RMB4400/km	RMB3200/km
Cost of 14mm aggregate saved (10% seashell used)	RM 937/km	-

10] Achievement/Award
 Gold Medal CITREX 2021

11] Conclusion
 Can perform well as compared to the conventional porous asphalt.
 Can be proved that the porous asphalt that containing seashell as aggregate replacement shows a different result.
 The surface of seashell able to bond with bitumen.

12] Publication

“So far, seashells has never been used in porous asphalt pavement engineering.

“Seashells have great potential to be used as an aggregate replacement in the design of pavement mixtures to improve road performance, especially in areas that receive heavy rainfall.

“This research started in July 2020 and completed in June 2021,” said the researcher hails from Banda Aceh, Indonesia.

He said aggregate usage in building construction and road pavements is very high at the moment.

“The large use of aggregates will create environmental problems such as the deterioration of natural earth resources.

“Therefore, this study uses seashells as an aggregate replacement material in porous asphalt mixtures.

“It is one of the alternatives to reduce the use of natural earth resources,” he said, who received his doctoral degree from Universiti Sains Malaysia (USM).

The study was conducted with a postgraduate student, Nicole Liew Siaw Ing and assisted by three lecturers, Ts. Dr. Khairil Azman Masri, Dr. Noram Irwan Ramli and Associate Professor Dr. Mohamad Idris Ali from the Department of Civil Engineering, KKEJ, UMP.

He said seashells are mixed into the main components of porous asphalt pavements as aggregate replacement materials to increase the strength and durability of the pavement.

“The use of seashells as an aggregate replacement material is expected to improve the performance of porous asphalt pavements, especially in areas that receive heavy rainfall.

“It can also be expanded in other constructions such as pedestrian walkways and concrete drain covers.

“We are also collaborating with Rland Technic Resources as a building materials manufacturer.

“Collaboration with government agencies is being worked on with the Public Works Department (JKR Malaysia) to expand the use of seashells as replacement materials for road pavement,” he said.

This research won a gold medal at the CITREx 2021 competition and a gold medal at ITEX 2021.

He also conducted research titled Waste Cooking Oil as Bio Asphalt and Waste Plastic as Green Road.