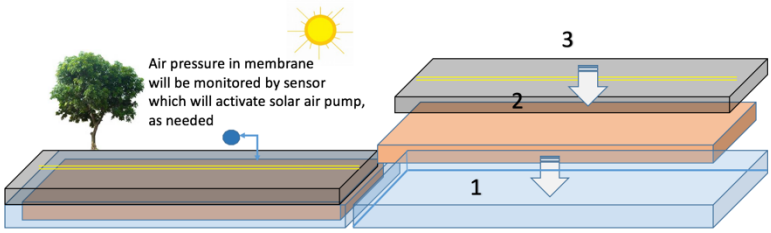
Building Air Roads

Today, roads connect our world through freight transportation, personal travel, emergency services, and more. At the moment, the basic method of construction of roadway pavements has not changed over. A significant amount of aggregates (generally obtained from quarries or river beds) and manufactured materials such as asphalt, and cement are utilized in this process. Extraction, crushing and drying of aggregates, and the production of asphalt binder from crude petroleum require a very high amount of energy; whereas the production process of cement has been identified as one of the top emitter of greenhouse gas. Furthermore, transportation of aggregates require a significant amount of energy and lead to emission of pollutants and greenhouse gases. As aggregate availability is dwindling there is a need for the aggregates to be transported over longer distances, leading to more spending of energy and emissions. From a global perspective, this means a radically different procedure that can cut down the use of natural materials and reduce energy and emissions from the transportation process is highly desirable.

To meet this challenge, a novel approach of using customizable, air pressurized paving layer has been developed by researchers at Worcester Polytechnic Institute (WPI). The concept uses air pressurized membranes, confined by traditional pavement materials on all sides, and thin prefabricated slabs to build temporary and permanent roadways that will lead to a significantly longer life of the pavement.



The membrane can be inserted within an existing or new temporary or permanent pavement, and pressurized to suitable air pressure, or, pre-pressurized air bags could be placed on the bottom layer, as shown in the figure above. The air pressure will be monitored by a sensor and to attach an on-site solar powered air pump, which could be activated by the sensor.

The technology has potential application in temporary repair of roads in areas that are affected by natural disasters such as flooding or munitions and where a functional surface is required to accommodate emergency vehicles. Instead of having to bring materials and compact it, one can fill it in with a suitable size bag, and pump it up with a compressor or get the bag filled up and place it there. Alternatively, a damaged area can be cut to the available bag size, and the same procedure could be used. The bag can have the top part with chip seal (pre-applied), so that paving is not required for temporary purpose. The same product could also be utilized for filling potholes in urban areas.

Key Features

-Road construction alternative
-Customizable based on traffic flow
-Built in solar pump and sensors to maintain proper pressure
-Dual air bags to ensure safety
-Potential market for emergency relief

Available in two forms:

1) Rolled up fabric
2) Pressurized rigid structure

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