Road Gold Company, LLC
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PRODUCTION OF FUEL OIL FROM WASTE ASPHALT AT AIRPORTS THROUGH BIOCONVERSION.

From Road

To Gold

SarvaOil(Asp)

Road Gold Company, USA

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Summary

Airplanes are heavy machinery and leave a small footprint. They weigh even more when you consider the weight of the people and luggage in the aircraft. When the pilot is operating the plane over the runway during a takeoff or landing, the vehicle's full weight is on the runway. The runways are made of thick pavements to slow down the aging process and fatigue cracking. The maintenance and replacing the damaged runways are very important, thus producing large amounts of waste.

Most of the available methods for recycling large amounts of waste are not environmentally friendly. The only known process is to mix the waste partially into conventional Hot Mix Asphalt (HMA) at high temperatures to form Recycled Asphalt Pavement (RAP) prior to resurfacing. This is not acceptable by the Federal Airport Authority (FAA) of the USA and elsewhere. The large amounts of waste generated are sent to landfills.

The proposed process of producing fuel oil is environmentally friendly and is a complete solution. It follows the three main principles or 3R's namely recycle waste, recover fuel oil and reuse cleaned aggregates for the pavement. The process is carried out at ambient temperature and generates revenue for the airports. Further, the process reduces carbon footprint considerably.

The oil recovered during the process on analysis has been found to be comparable to Low Sulfur No. 4 Fuel oil that can be used on ships as per the guidelines by International Maritime Organization (IMO). The aggregate is clean and free from asphalt for reuse during resurfacing.

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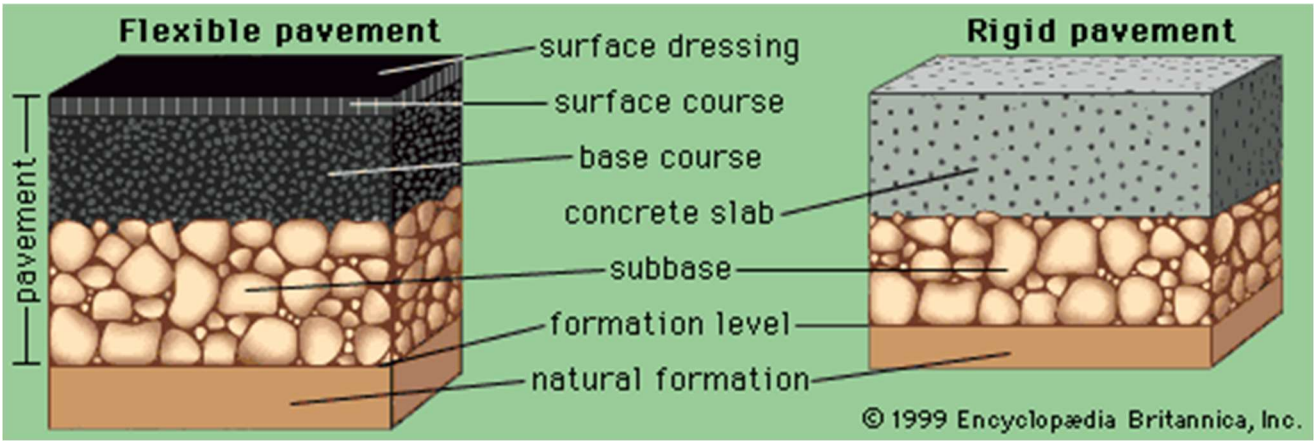
Introduction

Typically, the pavement at airports is made up of the following four components as shown below. There are two types of surfaces namely rigid and flexible. The flexible surface is made of solvent resistant asphalt or bitumen. The construction of runways is planned to last for at least 20 years. The pavements are constantly subjected to preventative maintenance to improve their life expectancy.

The runway provides a safe surface for the operation of aircraft. The surface should be smooth, durable and free of any Foreign Origin Debris (FOD). The thickness of flexible pavement varies between 15 cm to 50 cm of Hot Mix Asphalt (HMA). The runway should be able to withstand sun, rain or snow and should have an effective drainage system.



Foreign Object Debris (FOD) is of critical concern for airports worldwide, as even small objects on a runway can have disastrous consequences for aircraft and passenger safety. One often-overlooked source of FOD is broken asphalt and pavement on airport runways, taxiways, and aprons. Small fragments of asphalt can cause extensive and costly damage to aircraft engines, tires, and other components, not to mention the potential risk to human lives. In the United States, the Federal

Aviation Administration (FAA) has strict requirements to ensure the safety of everybody aboard the aircraft.

Pavements may require rehabilitation for a variety of reasons. for example 1) to correct surface conditions that affect airplane performance (roughness, surface friction, and/or drainage) 2) to repair material-related distresses or 3) to repair localized structural damage due to overloading. Generally, pavements are rehabilitated in full-width sections. When removing existing HMA surface, either remove the entire course or leave sufficient surface material to maintain the integrity of the layer. Leaving less than 5 cm of surface course may result in the creation of a thin layer that is susceptible to delamination under construction traffic. Large amounts of waste asphalt is generated during preventative maintenance and resurfacing existing runways.

Description of the FOWA process:

The process is identified as Fuel Oil from Waste Asphalt or FOWA in short and is shown in the image below.

Prototype FOWA showing Green Reaction vessel connected to an Oil Water Separator (Black) through bottom drain

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The processing unit or FOWA is comprised of two components namely a) a reaction vessel and b) that is connected to an oil water separator. The feed stock or waste asphalt is charged in the reaction vessel and is followed by sequential sprays of three consumables. 1) a reactive solvent in this case it is commercially available diesel selected due to its availability universally, 2) Bioremediation product VaporRemed® which is comprised of a consortium oil eating bacteria. VaporRemed is unique in that it acts almost instantly on any fuel oil odor after any fuel oil releases. ***VaporRemed is neither a deodorizer, a fume suppressant, nor an air freshener. It effectively eliminates fumes by treating the source of the fumes - the oil.***

The main objective of VaporRemed is to arrest the production of VOC and dissolution of the asphalt. The diesel prepares the asphalt surface to the reaction of VaporRemed or acts as a catalyst. VaporRemed acts in two different ways, namely arrest and mitigation of diesel emissions and secondly convert the reactive asphalt into fuel oil through bioremediation. 3) The fuel oil produced is entrapped within the asphalt aggregates and is removed using excess water. Water is the best medium for transporting oil that is lighter than water.

Reaction vessel with waste Oil coming from oil port Clean Aggregate

The above process is carried out in the following ratios. The diesel is sprayed lightly over the surface of the waste asphalt and is immediately followed by spray of VaporRemed three times the volume of diesel. As soon as VaporRemed is sprayed, one can see dark oil coming out from the waste. Water is sprayed immediately to carry the oil produced. Water also acts as a diluent for VaporRemed and prevents the

excess consuming the freshly produced oil. It may be a surprise to know that using the above process, the first batch of oil is produced and released in less than 60 seconds. The above process in the sequence of 1,2, and 3 must be repeated multiple times till all the asphalt adhering to the stones and aggregates in converted into oil. The process is similar to sand washing where the sand is washed multiple times till sand is clean. Here the material with asphalt is cleaned multiple times till the aggregates are clean of asphalt. The process is therefore automated for continued operation.

The water carrying fuel oil is passed through the bottom drain into an oil water separator. The oil water separator unit employed in the present process has been proven to separate almost 99% of the oil from water and is thus free from any free water. The water that is discharged through the water portal is almost free from any residual oil. This water is collected in a storage tank for re-use in the process. The fuel oil is collected into a flame proof container for analysis and transport to a larger storage facility. The oil collected on analysis has been found to be comparable to "Low Sulfur No. 4 Fuel" or Bunker fuel used by ships. The low sulfur bunker fuel meets the standards set for marine fuel introduced in 2020 by the International Maritime Organization. However, this has added an extra expense for the ships. According to the Maersk, the new directive would add $ 2.0 billion to the cost of shipping. The shipping giant Maersk has signed a contract with a company in Rotterdam for supply of 2.3 million metric tons of IMO-2020 compliant fuel for their ships. This contract meets just 20% of the total requirement. Maersk has requested the customers to bear the cost.

The current process produces the IMO-compliant bunker fuel from waste asphalt and does not require any further refining. This would reduce current cost of IMO-Compliant fuel for the Indian Merchant Marine. Shipping Corporation of India may be the single largest customer of the fuel produced from waste asphalt through bioconversion.

The fuel produced through our bioconversion process is named "SarvaOil (Asp)" to represent the source as Asphalt pavement. This is to identify fuel oil produced from waste containing asphalt. Fuel oil produced from waste asphalt roof shingles

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common in the USA and Canada is identified as SarvaOil (Shi). We have also produced fuel oil from oil sands of Canada and have called SarvaOil (Osd).

The amount of low sulfur bunker fuel oil produced by each of the sources is different depending on the amount of asphalt used in each. Waste asphalt pavement produces fuel oil in the ratio of 1:1 or 1 ton of waste asphalt produces almost one ton of fuel oil. This is almost equivalent to 7.5 bbl of ready-to-use fuel oil. Although we have identified shipping as a main source for the fuel produced, it can be used for other purposes also. Another important use for the fuel for the power generation at data centers which require in-house energy. Thus, sources for revenue are unlimited.

Bucket full of oil

SarvaOil (Asp)

The plants producing fuel oil can be set up at airports thus reducing the cost of transportation of waste and monitoring revenue generated in the process. **Proposed waste to energy process would lead the country to self-sufficiency in oil.**

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