

Gilsonite Emulsion – Sunscreen for our Pavements

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1. Introduction

Asphalt pavement has a limited lifespan due to the effects of traffic loading and environmental factors such as sun and rain.

This pavement deterioration results in it needing to be replaced approximately every 12-15 years due to moisture penetration and oxidation of the bitumen binder. The oxidation causes embrittlement and cracking, ultimately resulting in the need to replace the pavement.

Continual replacement of asphalt pavement surfacing is costly and time consuming; however, there are ways to extend the life of pavement surfacing. One such method is by the application of bituminous emulsions, also known as Surface Enrichment Spray Treatments (SEST).

This poster aims to highlight the existence of Gilsonite and its use in SEST products.



2. What is Gilsonite?

Gilsonite can be used in SEST products to help the longevity of asphalt surfaces.

Gilsonite, or North American Asphaltum, is a natural, resinous hydrocarbon. This natural asphalt is similar to hard petroleum asphalt and is often called Asphaltite, Uintaite, or Asphaltum.

Gilsonite is a shiny, black substance similar in appearance to the mineral Obsidian. It is brittle and can be easily crushed into a dark brown powder.

A unique feature of Gilsonite is its high nitrogen content. The low oxygen content relative to nitrogen suggests that Gilsonite is more resistant to free radical oxidation.



3. Bringing Gilsonite Down Under

The Christchurch International Airport has an established Annual Pavement Maintenance Works (APMW) programme which is driven by their asset management team.

The airport has 820,000m² of pavement surfacing, comprising 66% of asphaltic surfacing which never receives any aircraft traffic loadings. The APMW team believed that the oxidation-resistant properties of Gilsonite would provide significant benefits to the pavement preservation. The preferred solution for achieving this was via application of a Gilsonite-based SEST product to the pavement surface; similar to a coating of sunscreen.

Before committing to the application of Gilsonite, AECOM's New Zealand-based engineers undertook extensive research into the performance of Gilsonite as an emulsion product. This involved attending the American Society of Civil Engineers' May 2013 conference, which included presentations on Gilsonite emulsions by the Federal Aviation Authority.



4. Sustainable Outcomes

There is significant mounting evidence from the USA to suggest that bituminous treatments early in the surface's lifecycle considerably improves longevity.

Especially in low usage zones/pavements where the primary mode of deterioration is environmental weathering.

- Extended pavement life results in:
- Reduced maintenance cycles and costs
 - Reduced raw material usage
 - Enhanced qualities of existing surfacing materials
 - Improved liveability of our end users



5. Application of Gilsonite at Christchurch International Airport

Over the past year, Gilsonite-based SEST has been applied to almost 400,000m² of pavement surfacing at Christchurch International Airport.

- Extending pavement surfacing life will result in:
- Reduced interruptions to aircraft operations
 - Increased safety and reliability for airline passengers and airport construction workers

Points to note



A typical emulsion spray tanker can be used to apply the product, making application very rapid.



The product goes down a dark brown and, depending on weather conditions, was found to "break" in approximately 15 to 45 minutes, forming a dry black surface.



With a 1:1 product to water ratio, the emulsion is very thin, allowing the product to percolate into any voids within the surfacing. The surface retains a tackiness once broken. However it was discovered that a light dousing of water *a la* light drizzle of rain, three to four times after it has broken, is effective in removing this initial tackiness.



Operational constraints exist as the Gilsonite-based SEST requires some time to cure off to an acceptable level for operations to recommence (circa 1 week).

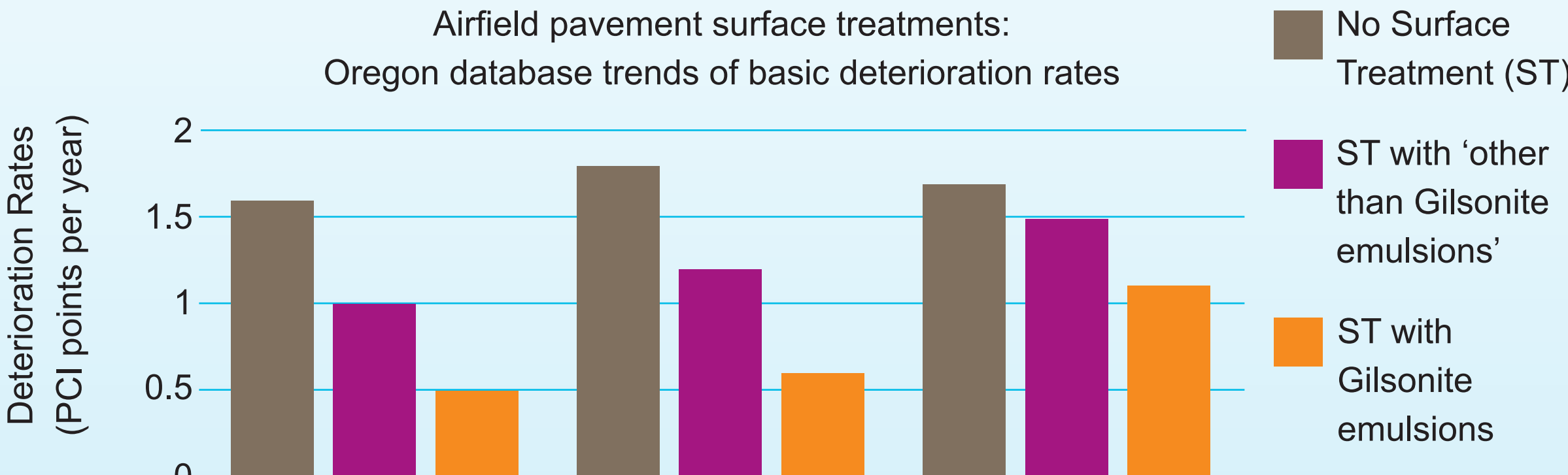
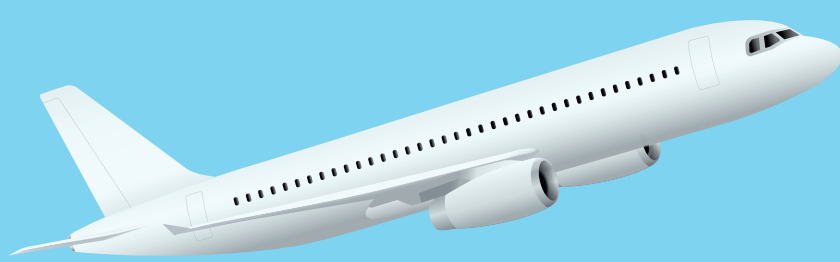
However with a managed approach and appropriate planning, the effects on operations can be mitigated.



6. Parting Thought

With the success of Gilsonite-based emulsion is there scope to broaden the horizons?

Could Gilsonite be a viable option to extend the life of pavement surfacing within New Zealand's road network?



The Gilsonite based SEST used at Christchurch International Airport has undergone a full life-cycle assessment and is the first emulsion to gain Green Circle Certification.

