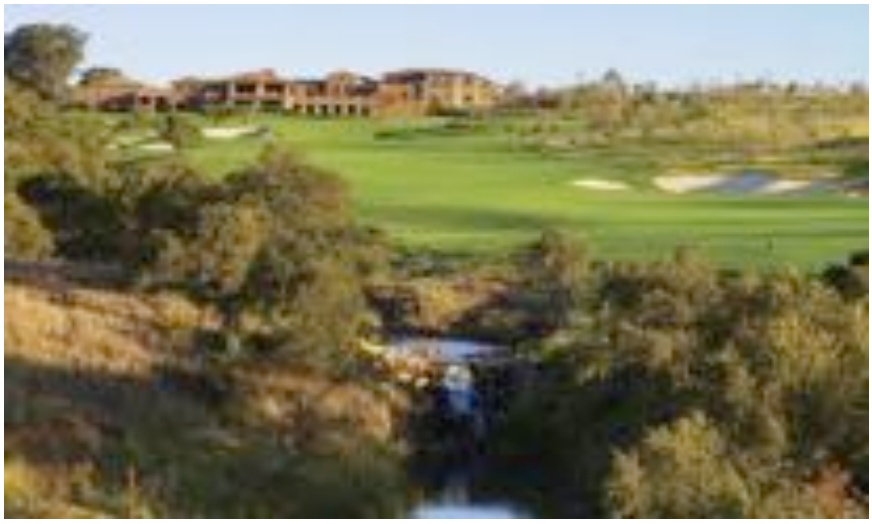

On-Course Solutions
Bunkertac™ Application
Blair Atholl
June –September 2009

This report was compiled by
On-Course Solutions
Tel: +27 87 551 1005
Email: info@on-coursesolutions.com
www.on-coursesolutions.com

Introduction

On-Course Solutions
Blair Atholl
Bunkertac™ Application
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Bunkertac™ is an environmentally friendly and technologically advanced emulsified stabilizer and erosion preventative used for bunker stabilization, sand flashing and contamination prevention on golf courses. The key to the exceptional performance of Bunkertac™ is its linear molecular structure consisting of millions of molecules that are linked and cross-linked together creating a stable bonding matrix.

When used for bunkers, Bunkertac™ will meet the requirements of a flexible bound surface with a high load bearing and shear strength capacity while allowing for drainage; prevent distortion and disfiguration of the bunker's shape; prevent contamination of the sand contained in the bunker and most importantly reduce initial application, repair and maintenance costs.

When used for sand flashing, Bunkertac™ will actually hold the sand in place all throughout the bunker most specifically on the face and along the edges thus improving the aesthetics and ensuring that the original intended design of the bunker has been met.

Bunkertac™ is completely environmentally friendly, safe for animals, wildlife and vegetation and dries clear and transparent; leaving the environment in its natural state. As a result it will significantly decrease the environmental footprint of golf course developments, while at the same time allowing for superior treatment of several areas and significant cost reductions.

Benefits of using Bunkertac™ for the stabilization of bunkers include:

- Providing a flexible bound surface with high load bearing and shear strength capacity while still allowing for proper drainage and germination
- Prevention of erosion, contamination, distortion or disfigurement
- Reduced maintenance costs and ease of maintenance
- Ease of repair to any damaged areas
- Use of an environmentally friendly product
- Reduction or elimination of the washing of the sand
- Enhanced playability
- Improved shot value
- Reduction in the chances of "ball-lie"
- Improved aesthetics

Background

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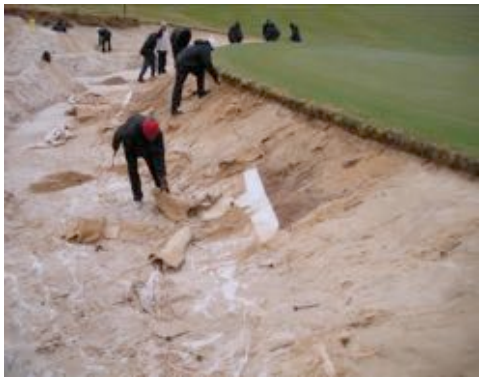
After 16 months in operation and facing numerous challenges with the bunkers including excessive water run-off, erosion of the edge and faces, contamination and algae, exposed fabric and nails from the sand mat Blair Atholl began seeking an alternative method for improving their bunkers. On-Course Solutions was contacted and asked to conduct a site evaluation and then a section of a bunker on hole 4 was selected as a trial area to test the performance of Bunkertac™.

After the successful completion of the trial area of the bunker on hole 4 and subsequent evaluation period Blair Atholl decided to select eleven more bunkers for Bunkertac™ application. The following bunkers were selected:

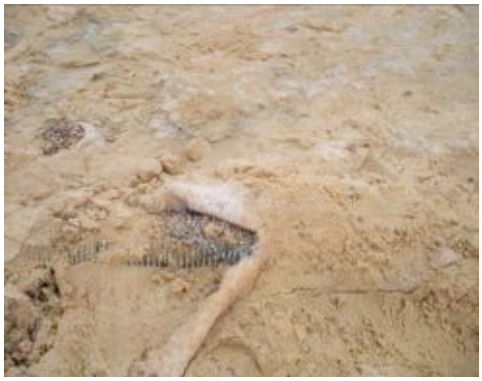
- No.3 Right Hand Greenside Bunker
- No. 17 Front Greenside Bunker
- No.14 Right Hand Greenside Bunker
- No. 15 Left Hand Greenside Bunker
- No. 16 Fairway Bunker
- No. 2 Right Hand Greenside Bunker
- No. 2 Front Greenside Bunker
- No. 10 Right Hand Greenside Bunker
- No. 10 Left Hand Greenside Bunker
- No.11 Left Hand Greenside Bunker
- No.18 Greenside Bunker Clubhouse side

Preparation of the bunkers for the Bunkertac™ application included:

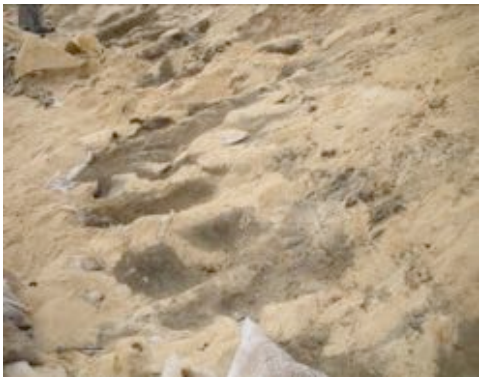
- Moving the existing sand to the middle of the bunker
- Peeling back and removal of the Sand Mat including all nails
- Keeping Sand Mat in place over drainage channels for extra protection
- Removal of existing contaminated sand
- Bowling and re-shaping to create proper slope and smooth surface
- Removal of existing tire marks and tracks from original construction (Bunkers 2 & 15)
- Re-definition of bunker edge by cutting back to the stable grass line
- Trimming of the newly defined edge of all roots and removal of rocks within the edge
- Use of wet top soil to fill any holes or help stabilize collapsing edges
- Re-construction of collapsing edge or entry point using top soil and compaction (Bunkers 3, 11 & 16)
- Re-construction of collapsing slope (Front Greenside Bunker No. 2)
- Cleaning of veld grass area (Bunkers 14,15,16, 2, 11)
- Installation of special drains lined with rocks and crusher stone then covered with shade cloth to catch water ingression from beneath and route it to the existing drains (Bunkers 10 & 18)
- final sweeping and cleaning of the edge, face and surface
- Spraying of Round Up throughout bunker



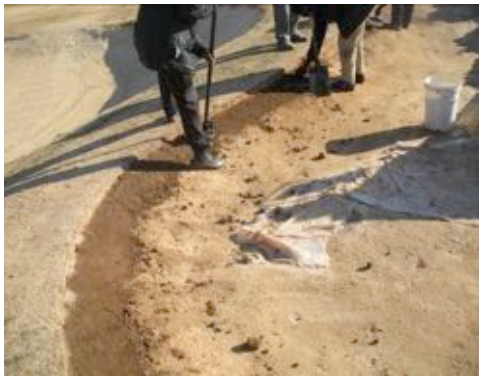
Sandmat removal



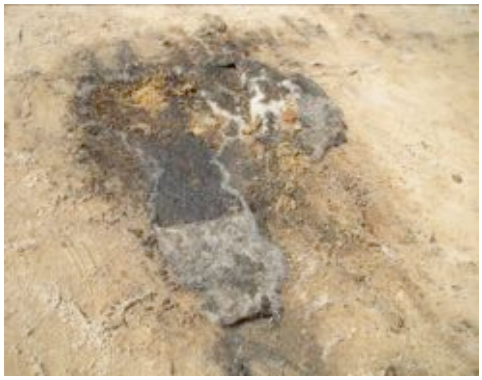
Exposed drainage pipe



Tire tracks from construction

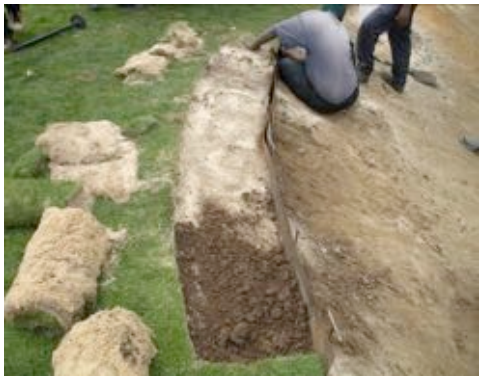


Compaction of top soil

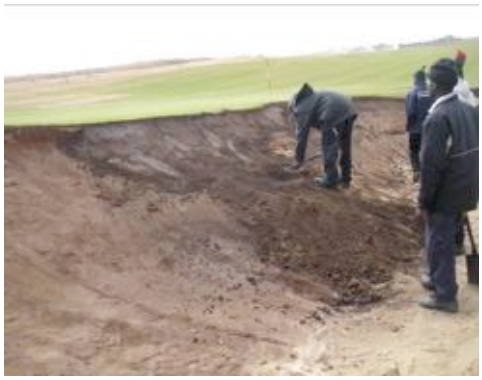


Algae from water ingression

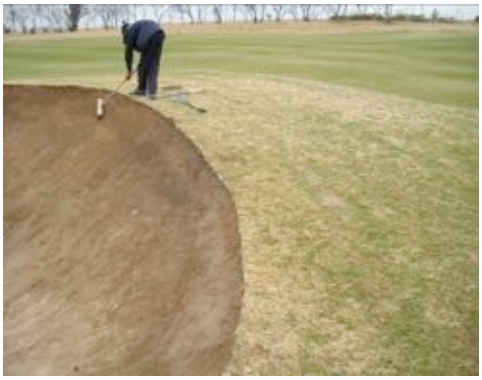
Re-definition of bunker edge



Repair of collapsing edge



Bowling and reshaping



Final Sweeping

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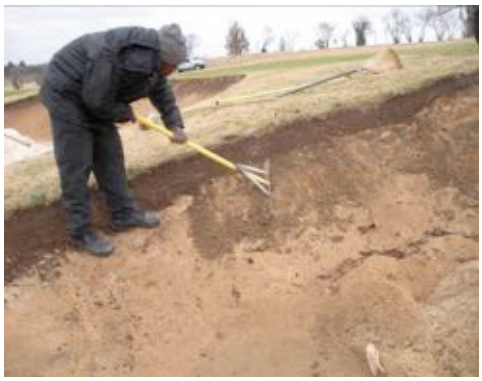
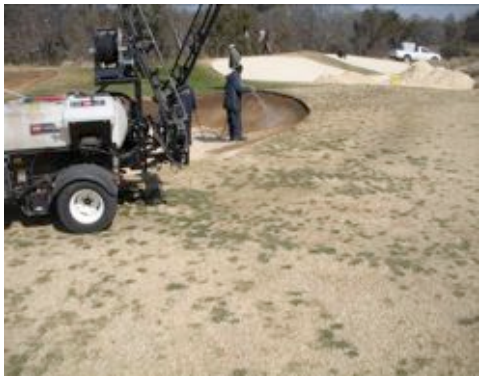


Edge preparation

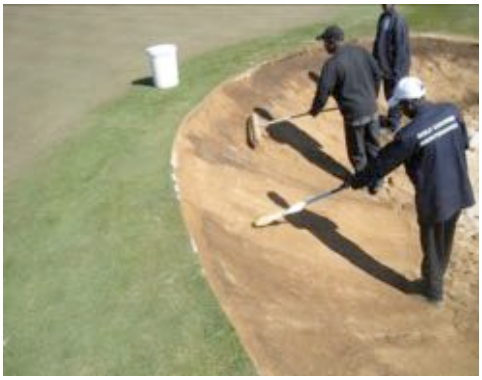
Removal of contaminated sand

Re-build of collapsing slope

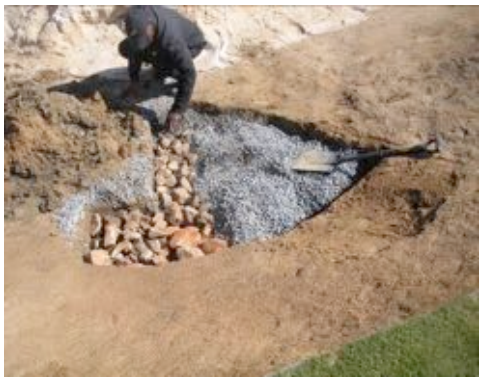


Spraying of Round Up

Cutting of roots

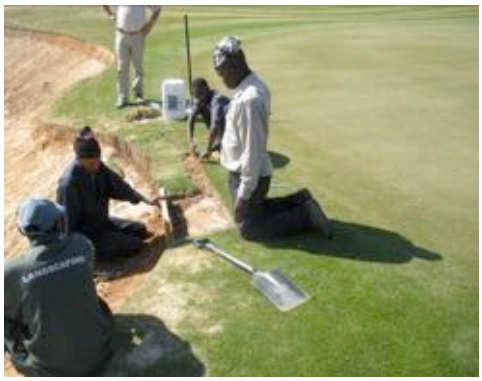


Final sweeping



Installation of subterranean gabion

Covering gabion installation on bunker 10



Repair of collapsing edge

Hole 3 Right Hand Greenside Bunker

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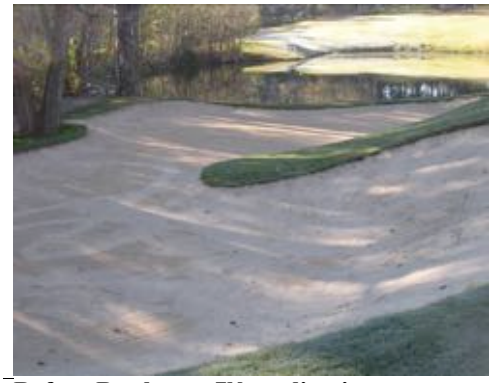
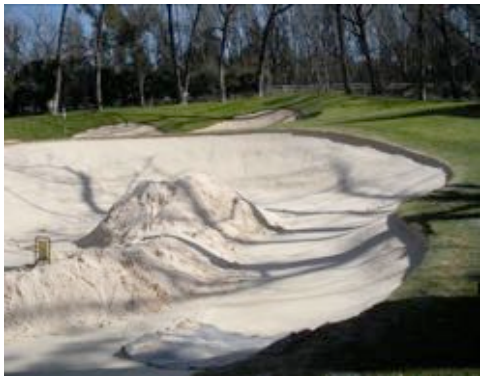
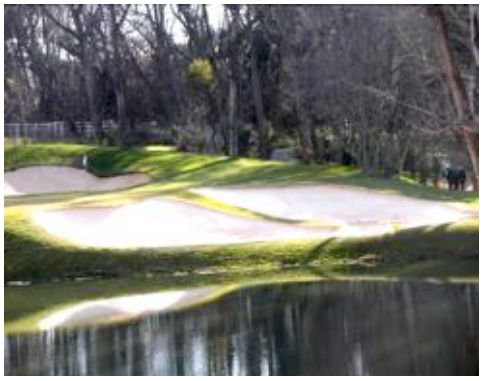
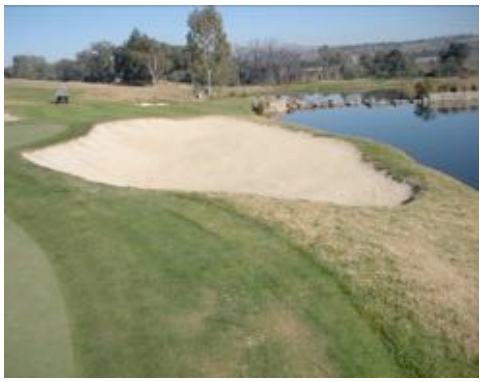

Before Bunkertac™ application

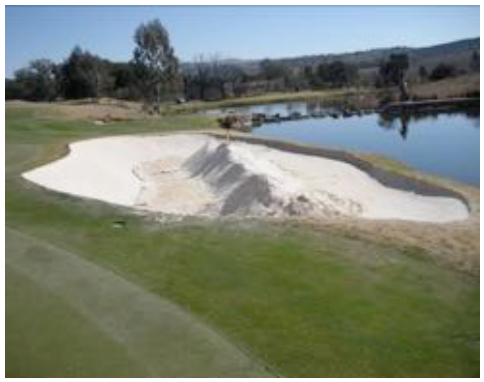

During Bunkertac™ application

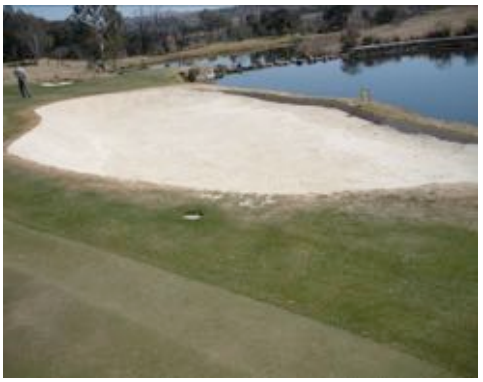

After Bunkertac™ application

For successful application of Bunkertac™ the proper preparation of the bunker to be treated is essential. Proper bowling and shaping of the bunker will lessen the amount of water run-off coming into the bunker. One of the benefits of using Bunkertac™ is that even with considerable amounts of water run-off contamination of the sand is eliminated or minimal even over the steepest of slopes.

Hole 17 Front Greenside Bunker


Before Bunkertac™ application


During Bunkertac™ application


After Bunkertac™ application

The Bunkertac™ application began with pre-wetting of the bunker using a hosepipe to moisten and loosen the tension of the soil, a pre-coat of Bunkertac™ only followed by six coats of Bunkertac™ and sand.

Bunkertac™ was applied evenly over the bunker using several coats with a simple pump and spray system with a specially designed spray lance to control the flow rate and ensure the specified application rate was adhered to.

Hole 15 Left Hand Greenside Bunker

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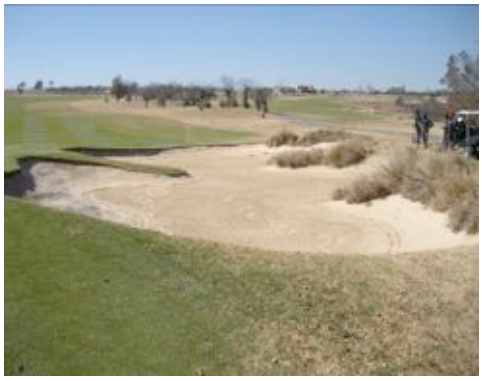
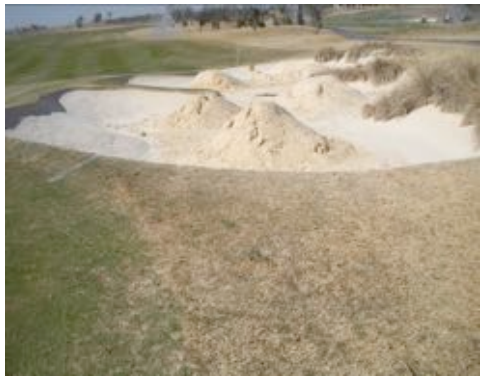
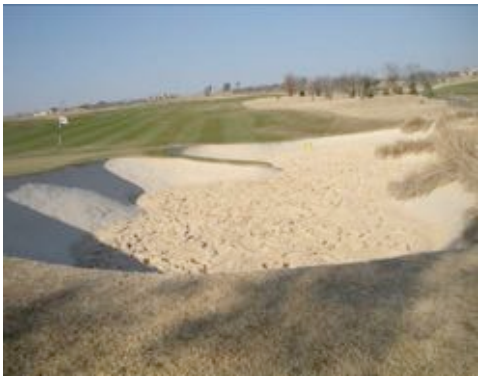

Before Bunkertac™ application

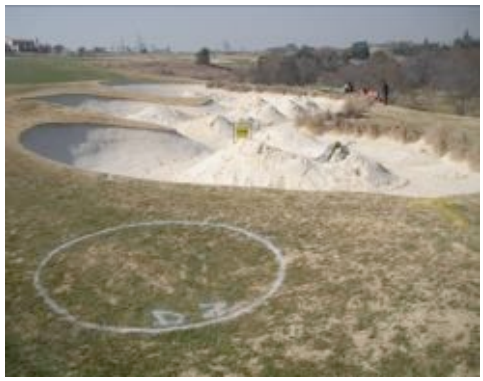

During Bunkertac™ application

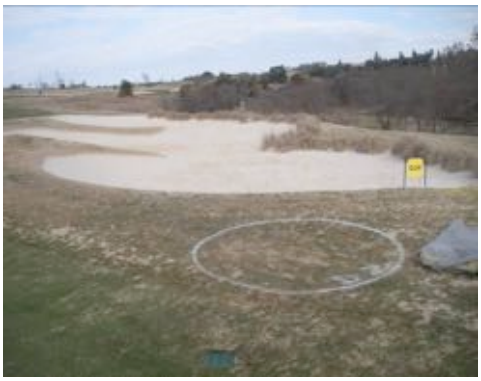

After Bunkertac™ application

During the application process each coat of Bunkertac™ was given sufficient time to penetrate or soak in before applying another coat. In winter this may take up to 24 hours. This will ensure the desired penetration and avoid the formation of a skin or biscuit layer.

Hole 16 Fairway Bunker


Before Bunkertac™ application


During Bunkertac™ application


After Bunkertac™ application

As each coat of Bunkertac™ was applied sand was dusted over the treated area using a knapsack type duster blower in order to force sand into and covering the entire edge of the bunker up to the grass line and to ensure a nice looking smooth finish over the entire treated area. This method of sand flashing is the most effective and technologically advanced and the resulting improved aesthetics are sure to impress every golfer that plays the course.

Hole 14 Right Hand Greenside Bunker

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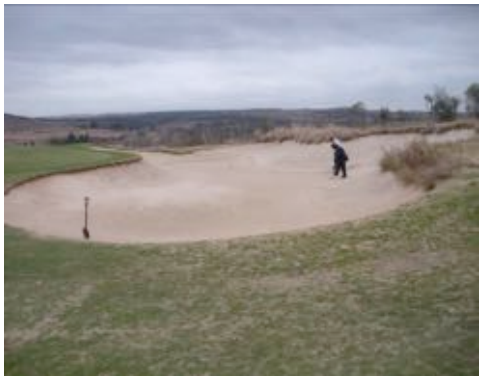
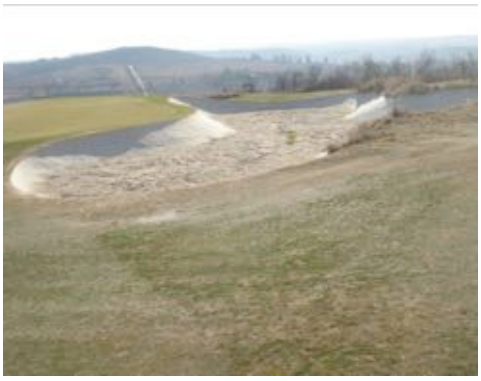


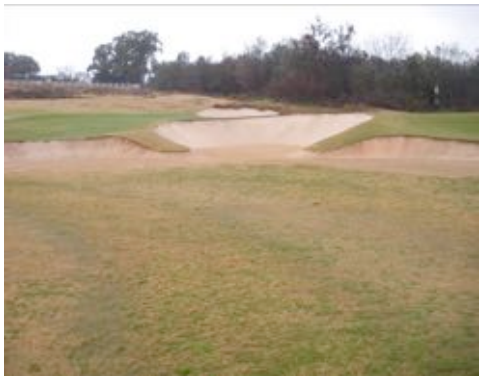
Before Bunkertac™ application

During Bunkertac™ application

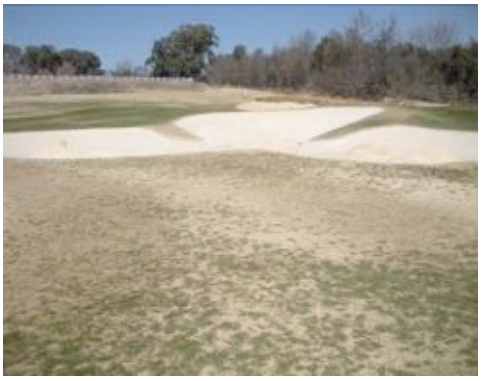


After Bunkertac™ application

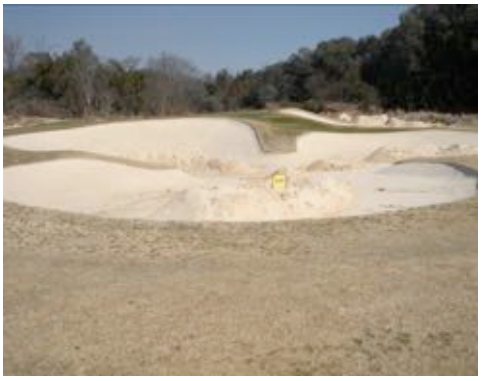
Hole 2 Front Greenside Bunker



Before Bunkertac™ application

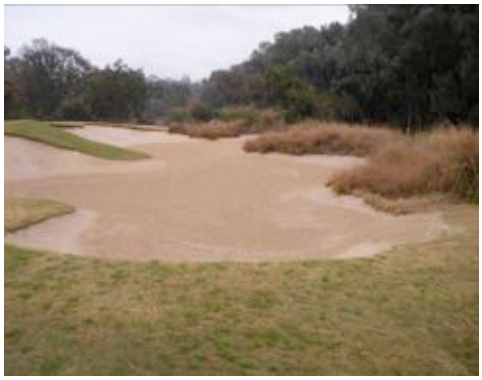


During Bunkertac™ application



After Bunkertac™ application

Hole 2 Right Hand Greenside Bunker



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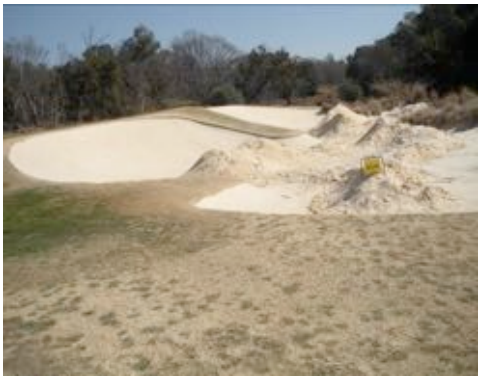
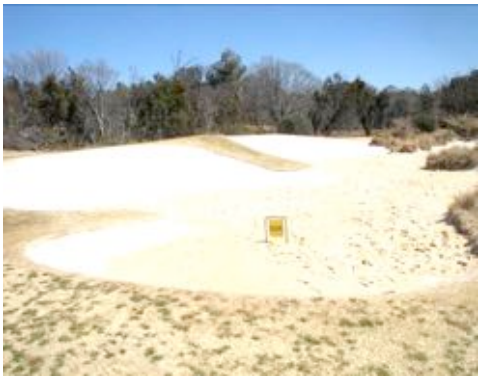


During Bunkertac™ application



After Bunkertac™ application

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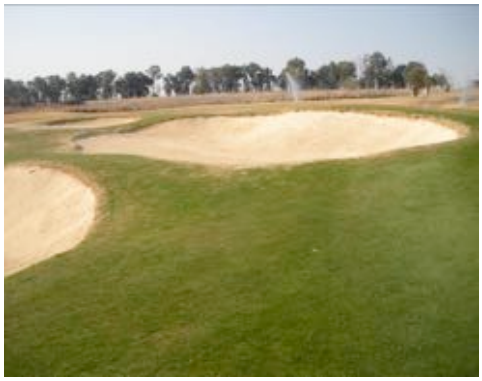
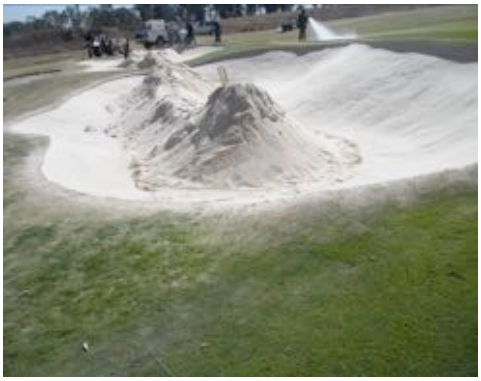
If an area were to become damaged, repair and maintenance of the damaged area is simple, efficient and quick (not labour intensive or time consuming), and can be done simply by pushing the bunker sand toward the base and applying an additional spray coat of Bunkertac™ and re-dusting the sand over the repaired area.

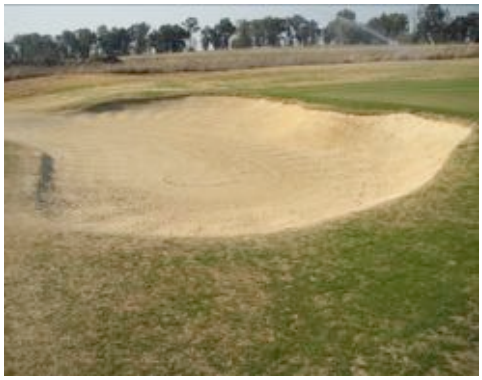
Hole 10 Right Hand Greenside Bunker

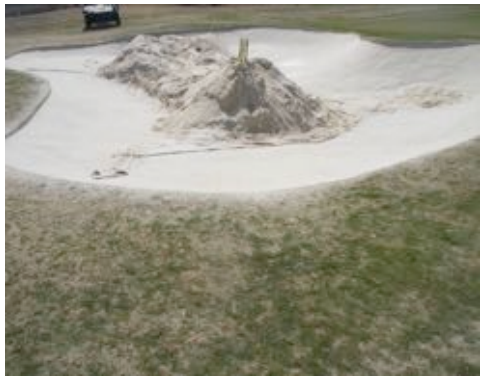

Before Bunkertac™ application

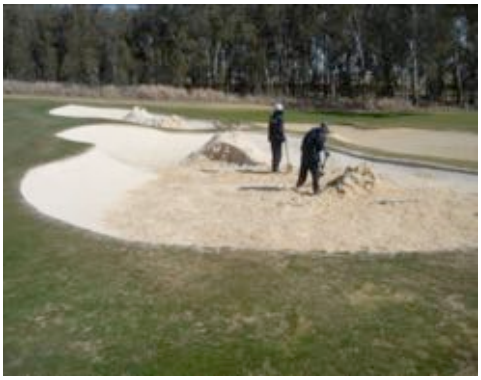

During Bunkertac™ application


After Bunkertac™ application

Hole 10 Left Hand Greenside Bunker


Before Bunkertac™ application


During Bunkertac™ application


After Bunkertac™ application

The use of Bunkertac™ completely eliminates the possibility of any exposed fabric or nails visible to the golfer as it is in liquid form, not a geo-synthetic liner.

Hole 11 Left Hand Greenside Bunker

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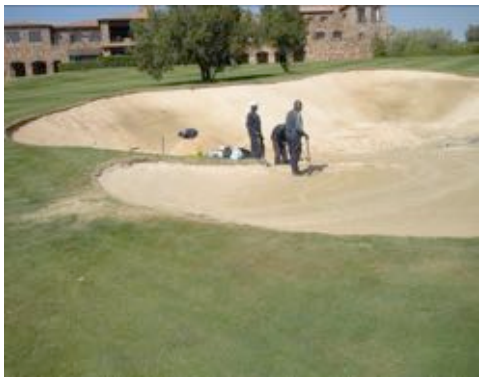
Before Bunkertac™ application

During Bunkertac™ application

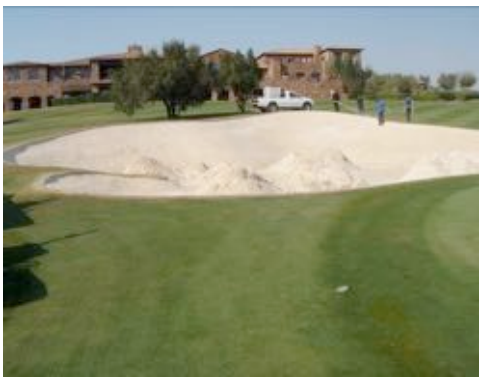
After Bunkertac™ application

Hole 18 Greenside Bunker Clubhouse Side



Before Bunkertac™ application

During Bunkertac™ application



During Bunkertac™ application

Using Bunkertac™ and the application methods developed by On-Course Solutions for stabilization of the edge and face of the bunker, sand flashing and contamination prevention will provide you with not only a more aesthetically pleasing look to your bunkers but improved playability as well as a reduced impact upon the environment.

Observations and Conclusions from Bunkertac™ application

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- Bunker base must be moist (OMC) prior to application of product.
- All equipment must be tested (off-site if necessary) prior to product application to ensure proper functioning.
- Spray nozzles should be set to provide an even spray coat over the bunker with minimal running or draining of the diluted product mix.
- Full and proper preparation of a bunker is essential to ensuring successful results.
- All of any previous product used in the bunker must be removed.
- If drains are in place, the product must not be applied to the marked drainage areas. Covering the drains with shade cloth and sand is recommended.
- When preparing the mix dilution, the Bunkertac™ is added last, directly into the water and circulated through the return valve of the pump.
- During the application each coat must be allowed to penetrate or "soak in" before applying another coat. In winter this can take up to 24 hours.
- Compaction of the bunker should be done 2 to 3 days prior to application if possible.
- All equipment used must be rinsed off thoroughly as soon as possible after application before the product has a chance to dry or cure.
- After application bunkers must remain free of watering, rain and any human traffic for a minimum of 24 hours. (48 hours during winter months)
- Spraying the product around the perimeter and high sides of the bunkers will assist in the prevention of contamination from fugitive material transported from fairways and landscaped areas nearby.
- Bunkertac™ is easier to install than Sand Mat and requires much less maintenance.
- The PGA recommended amount of sand should be placed in the bunker after application.
- Using the knapsack type duster blower for sand flashing will provide the best results and most aesthetically pleasing bunkers.

- If an insufficient amount of sand is placed on the steeper slopes it will likely slide down and possibly wash away as irrigation water runs over it.

- It is best to ensure that all sprinklers used for irrigation surrounding the bunker are set correctly to avoid any unnecessary run off or possible wash from irrigation sitting in one place for too long due to improper functioning.

For more detailed information regarding how On-Course Solutions may assist you on your golf course please contact us today.

We offer training on the process so that your on site crews can perform applications and maintenance.

Contact us directly for further information:
On-Course Solutions
Tel: +27 87 551 1005
Email: info@on-coursesolutions.com
Website: www.on-coursesolutions.com

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