

The use of PFA at Celtic Manor Resort in preparation for the 2010 Ryder Cup

Introduction

Set in 1400 acres of panoramic parkland at the gateway to South Wales, to the east of Newport, The Celtic Manor Resort will host the 2010 Ryder Cup at the new Twenty Ten course, which was opened in July 2007. In preparation for the event Pulverised Fuel Ash (PFA) has been used to raise areas of the course to build the television compound, a driving range and a practice area. This will be used by the world's top golfers, the media and thousands of visitors from across the UK, Europe and America during the event.

This work involved in excess of 200,000 tonnes of PFA being supplied from Aberthaw and Uskmouth power stations, supplied by RWE Npower and Hargreaves CCP respectively. Additionally, in collaboration with the site operators GD Environmental, Hargreaves CCP supplied the placing and compaction plant used for the contract.

History

Sir Terence Matthews (OBE), a Welsh telecommunications entrepreneur, bought the 19th century Celtic Manor house in 1980. He turned the site into one of the best facilities in the world for golf having three golf courses, two hotels, health clubs, a spa and world class club houses and restaurants. The new Twenty Ten course is the first course in history to have been designed specifically for hosting The Ryder Cup. The course is a par 71, measuring 7,493 yards. It features nine brand new holes that have been developed along the floor of the Usk Valley, as well as nine holes from the former Wentwood Hills championship course that have been extensively remodelled to match the new design.

PFA used for part of the remodelling

PFA was used as a fill material to raise and level off the ground to enable a television compound, a driving range and practice areas to be constructed, see Figure 1. A textile capillary break was employed to prevent saturation of the ash from sub-surface water. The ash was then covered in top soil to the final levels.



Figure 1 - The raised ground for the driving range, practice area and television compound

The PFA was all supplied by road as conditioned ash in sheeted tipping vehicles, then after tipping it was levelled out on site using a Komatsu 65PS dozer and compacted to a 150mm thickness using a Bomag vibrating roller, using the methods described in Technical Datasheet 2.



Figure 2 - The PFA was bladed out at 200mm thickness and then compacted to 150mm

GD Environmental supplied the site personnel, who found PFA to be an easy material to place and compact, using readily available equipment. The ground was designed to be basically a level site. However, to prevent ponding of rain water, a slight fall is needed in order to give proper drainage. Without such drainage, the low permeability of PFA results in ponding even with minimal rain.

With the size and design of the area involved and the high levels of rainfall experienced during 2008, some ponded and saturated areas of PFA were inevitable. PFA, when saturated, like all fine grained materials can become very slippery, similar to wet clays. Where this happened the wet PFA was removed and formed into piles to drain and when sufficiently dry was reused in the construction.

The PFA supplied from Uskmouth contains higher levels of lime than is normally found within UK ashes. This is because of the lime injection system used to reduce sulfur emissions, which is retained in the PFA. This lime is able to initiate the pozzolanic reaction that can make PFA as a fill material have higher strength and greater stability than would be normally found. Additionally this reaction will reduce permeability and

leachability of the embankment and in the fullness of time as the pozzolanic reaction continues, it will produce a very stable solid base for the subsequent construction works.

As with all ash applications, unbound PFA should never be left exposed. It must be covered with construction, capping or topsoil as quickly as practicable. In this case topsoil to a minimum layer of 300mm was used to encapsulate the PFA and to establish the final levels.

Conclusion

PFA has been used successfully to provide the desired profiles for the 2010 Ryder Cup. The material has been proven easy to lay, readily available in the quantities required and flexible.

Using PFA in projects such as this is more environmentally friendly and sustainable than the extraction of virgin aggregates. The overall emissions are significantly reduced as PFA is a by-product and by retaining virgin aggregates for more critical applications, the long term sustainability is improved.

Further details on how to use PFA in embankments can be found in Technical Datasheet 2 and Best Practice Guide 2.



Figure 3 - Tipping PFA

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In general usage the term 'fly ash' is used for pulverized coal ash but it can also cover ash from burning other materials. Such 'fly ash' may have significantly differing properties and may not offer the same advantages as ash from burning pulverized coal. UKQAA datasheets only refer to PFA / fly ash produced from the burning of predominantly coal in power stations.

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