

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

AN UPDATE

Introduction

Set in 1400 acres of panoramic parkland at the gateway to South Wales, to the east of Newport, The Celtic Manor Resort hosted the 2010 Ryder Cup on its Twenty Ten course, which was opened in July 2007. In preparation for the event Pulverised Fuel Ash (PFA) was used to raise areas of the course to build the television compound, a driving range and a practice area used by the world's top golfers.

This work involved in excess of 200,000 tonnes of PFA being supplied from Aberthaw and Uskmouth power stations, supplied by RWE Power International and Power Minerals respectively. Additionally, in collaboration with the site operators GD Environmental, Power Minerals 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 and turned the site into one of the best leisure facilities in the world. It has three golf courses, two hotels, restaurants, health clubs and a spa and the Twenty Ten course was the first course to have been designed specifically for hosting The Ryder Cup.

PFA used for part of the remodelling

PFA was used as a fill material to raise and level off the ground, 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 during construction and completed works

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 UKQAA Technical Datasheet 2.



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

GD Environmental supplied the site personnel, who found PFA 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 was needed 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 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 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 initiates the pozzolanic reaction that can make PFA, as a fill material, have higher strength and greater stability than would normally be found. Additionally this reaction reduces 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 any subsequent construction works.

As with all ash applications, unbound PFA should not 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 was used successfully to provide the desired profiles for the 2010 Ryder Cup. The material proved easy to lay, was readily available in the quantities required.

In projects such as this, the use of a by-product such as PFA as opposed to virgin aggregates results in improved sustainability and an overall reduction in emissions and retains virgin aggregates for more critical applications.

Further details on how to use PFA in embankments can be found in UKQAA 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.

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