Ferrybridge power station, West Yorkshire

Project case study

Hanson
HEIDELBERGCEMENTGroup

Product
Hanson concrete incorporating Regen GGBS

Volume
34,000 cubic metres

Client
Multifuel Energy Limited (MEL), a joint venture between SSE and Wheelabrator Technologies Inc.

Main contractor
PJ Carey

Overview

A large scale, technically complex slipform operation has been successfully used to construct a 30-metre-high turbine hall for a new power station in West Yorkshire

Project description

Ferrybridge Multifuel 2 is a second waste-derived generating facility at the former Ferrybridge Power Station site in West Yorkshire. When complete it will have a generating capacity of around 90MW – enough energy to power 160,000 homes – and is expected to treat an average of 570,000 tonnes of waste material each year that may otherwise be disposed of as landfill.

To construct the main turbine hall for the power station, Hanson Concrete supplied a continuous 4,400m3 slipform concrete pour over 11 days, working 24 hours a day. The slipform rig used to place the concrete was one of the largest of its kind in Europe, measuring 60 metres long, 30 metres wide and reaching a height of 24 metres. It rose on 178 jacks with 120 construction workers manning its working platforms.

The concrete was supplied in more than 600 deliveries from three batching plants: the bulk of the material was supplied by the purpose-built on-site plant with supplementary deliveries from off-site plants at Castleford and Wakefield.

The ambient temperature range was -4°C to +8°C during placement and a range of bespoke mixes was developed to cater for the challenges the temperature differential placed on the setting pattern in each layer of the continuous lift. To add to the technical challenge, each layer required in excess of 100m3 placed at four pumping locations spread around the rig.

Each delivery had a target consistence of 180mm +/- 20mm and a minimum 5°C placing requirement without the use of hot water.

Contractor PJ Carey engaged early with Hanson Concrete to implement a plan for delivering the complex requirements of the mix. As a result, a range of five different compositions was developed to give the contractor the flexibility to change the mix to suit the live pour conditions and also provide a contingency should unforeseen delays occur.

Using minor variations in the percentage replacement of Regen GGBS (ground granulated blastfurnace slag), and by utilising both polymer and lignosulphonate admixture technologies, each of the five compositions could be interchanged to enable the controlled

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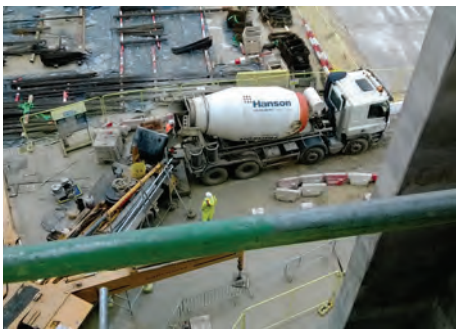
Energy sector construction



supply of concrete and deliver the required rate of rise.

In addition to the technical challenges associated with the sheer size of the slipform rig, Hanson Concrete had to pre-plan 24-hour delivery of raw materials. Supply plants, delivery drivers and technical teams were split into two continuous 12-hour shifts to meet the project's requirements without affecting quality parameters.

Conventional slipform contracts usually rely on a range of three mixes — slow, medium and fast — to accommodate placing and hydration rates. Due to the scale of the slipform used on this contract, intermediate mixes were also used within the normal range. Based on an agreed cementitious content and free water binder ratio, a varying cocktail of admixture technologies were employed to speed up the initial setting time or retard it sufficiently to allow the rig to slide at the required rate. Maintaining a consistent and robust rheology across the mix range was also of importance.

Each layer in the lifting cycle required in excess of 100m^3 of concrete. All mix compositions were designed to remain workable for at least four hours before initial setting began to occur in order to achieve the required placement and compaction. To enable sufficient self-supporting weight, and allow sliding to progress, the concrete had to support a minimum of 0.2N/mm^2 before confidence in sliding could commence — typically six hours after the concrete arrived on site.

In addition to the slipform construction, Hanson is also supplying 30,000m^3 of concrete to the rest of the power station site. Mixes typically range from C32/40 DC4 to Pav 2 external paved areas.