Kiewit

CASESTUDY

PLUM POINT POWER STATION
OSCEOLA, ARKANSAS

Application: To meet increasing energy demands in the region, St. Louis-based LS Power Group chose to construct a new 665-MW station on agricultural land in northeast Arkansas. However the site presented challenging ground conditions. The moist-to-wet fine-grained soils, extremely flat terrain (poor drainage) and shallow groundwater were far from ideal for repeated pounding of heavy construction equipment and continuous streams of 100-car coal trains.

Plum Point's cotton fields are transformed into high capacity working surfaces by Tensar Geogrids, sand subbase and crushed limestone base.

The Challenge: Construction needed to proceed as quickly as possible to ensure substantial completion of work and the station's commencement of commercial operations by mid-2010. Time restrictions and weather vagaries (i.e., prolonged rainy periods) eliminated any practical possibility of improving on-site, silty soil structural support values by scarification and drying. Wet, spongy silts meant low strength. In-situ Dynamic Cone Penetrometer (DCP) and vane shear (i.e., Torvane) testing confirmed a design California Bearing Ratio (CBR) value of 1.2 at the surface and 0.7 in the undercut pit of the power block. These poor support values translated into substantial aggregate fill requirements to handle Kiewit's preferred high-capacity, heavy construction equipment. Less expensive remedies were necessary.

Alternative Solutions: A 2005 geotechnical report recommended a layer of geotextile fabric beneath construction roads and high traffic areas prior to adding embankment fill or gravel base. The report said temporary roads might require up to two feet of crushed rock roadbase – even more depending on traffic. But saturated silts are notorious for clogging fabrics. The resulting trapped water beneath would lead to pumping, further weakening the road and thus requiring even more aggregate fill. Chemical treatment with lime wouldn't fare much better since lime requires soil plasticity and silt has practically none.

PROJECT HIGHLIGHTS

Project:
Plum Point Power Station

Location:
Osceola, Arkansas

Installation:
Spring 2006 - Spring 2009

Design Section:
Most of the acreage received sections comprised of two layers of Tensar Geogrid sandwiching ~16 in. of sand topped by 8 in. of crushed limestone.

Quantity:
1,450,000 sq yds Type 1 Biaxial Geogrid
250,000 sq yds Type 2 Biaxial Geogrid

Owner/Developer:
L S Power Group, St. Louis

Design Engineer for Working Surfaces:
Steve Saye, Kiewit Engineering Company

Contractor:
Plum Point Power Partners, a joint venture of Gilbert Central Corp, H.B. Zachry and Black & Veatch

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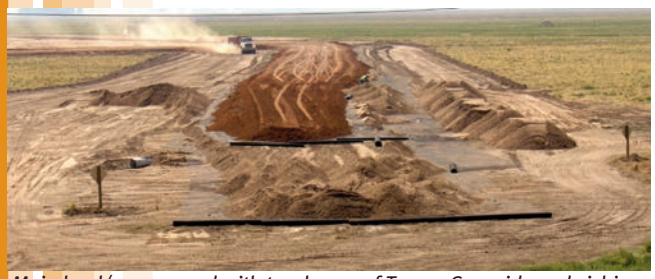
The Solution: : KECo and Tensar engineers were able to demonstrate that aggregate fill requirements could be dramatically reduced by using Tensar Geogrid reinforcement. Furthermore, over half of this aggregate fill was available locally – for a fraction of the cost of crushed limestone – in the form of bank-run river sand. When confined by dimensionally stable Geogrid, the abundant, uniformly clean, medium-fine sand created a superb subbase for the myriad working surfaces on the project.



Main haul/access road with two layers of Tensar Geogrid sandwiching sand subbase and topped with crushed limestone base.

Geogrid at the sand/silt interface (and gravel/sand interface) not only eliminated the need for fabric (virtually none was used at Plum Point) and its clogging issue, it minimized thickness requirements by creating stiff and yet drainable composite beams of sand and crushed limestone. Piping analyses confirmed there was no potential for upward silt particle migration and otherwise weakening of working surface sections. Virtually every working surface on the project was built with varying types of Tensar Geogrid, sand, and/or crushed limestone: high- and low-volume haul roads, crane pads, pit access areas, laydown yards, parking lots, and pond liner foundation. Multiple layers of Geogrid were also applied as embankment and subballast reinforcement within the 3.5-mile rail spur loop around the station. In the words of Kiewit Project Superintendent Keith LaCrosse, "Access is important, without this (Tensar Geogrid) there was utterly no way to get around on this job". Moreover, at two locations on the property, plans for permanent roads were realigned to coincide with nearby haul roads, and Kiewit was compensated as if they were new construction.

Performance: Don McCloud, Kiewit's first on-site earthwork superintendent, reported that the working surface sections held up well to heavy, repeated construction equipment loading and required only nominal maintenance. He cited increased productivity associated with rapid and uninterrupted flow of traffic, and less wear-and-tear on equipment – particularly Kiewit's articulated haulers. In 2007, and again in 2009, Tensar personnel returned to examine exhumed sections, perform DCP testing, and evaluate the structural condition of the working surfaces. These evaluations confirmed that the sections are performing – internally – exactly as designed. Indeed, this performance data from Plum Point has already been applied to subsequent Kiewit projects in Louisiana and elsewhere – thereby delivering value to many other working surfaces, particularly those required over weak ground and where sand is locally available.

Main haul/access road held up well to high volumes of articulated truck traffic.

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