SHAWNEE FOSSIL PLANT HOPPER REPLACEMENT

Description

Industry: Energy & Power | **Service:** Hopper Replacement

THE CHALLENGE

DS Engineering was approached by Power Techniques to design structural modifications to the two existing hoppers feeding Conveyor BC-9 at Shawnee Fossil Plant in Paducah, KY. The plant intended to replace the existing reciprocating feeders with new vibratory feeders and replace the existing rack-and-pinion gate with a new, heavier duty gate.
The original intent was for DSI to design the local reinforcement needed for the hopper to support the feeders and to make minor modifications to the bottom of the hopper to allow for proper mating with the new gate. However, after developing the initial layout which incorporated the new feeders and gates into the existing system, it became clear that the modifications would be extensive. Prior to DS Engineeringâ??s involvement, Shawnee Fossil Plant had decided that the condition of the existing hoppers warranted replacement. Because of the state of the existing hoppers and the extent of the modifications required to accommodate the new system, DS Engineering was commissioned to design two new hoppers.

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The biggest challenges to the design were the tight space requirements, complex geometries associated with the feeder supports, and the heavy head loads applied by the stockpile above. The size of the new equipment required the height of the hoppers to be reduced significantly, relative to the existing hopper design. This reduction in height subsequently reduced the hopper wall slope angles. Because of the vibratory feeders below, the reduced slope was deemed acceptable by the plant. The geometry became quite complex due to the location of the new feeder suspension supports. This was overcome using Hollow Structural Sections (HSS)
connected with shear plates and stiffeners to resist the moment and torsion created by the feeder loads. DSI was informed that the
stockpile of coal above the hoppers could reach a height of 40 feet.

THE SOLUTION

According to experimental results reported in articles written by J. Ai, J.F. Chen, J.M. Rotter and J.Y. Ooi, pressure distributions beneath a stockpile can result in nearly 60% of hydrostatic pressure. Applying this to the 40-foot stockpile above the hoppers results in heavy wall pressures, requiring closely spaced reinforcing ribs at the hopper walls. The large head load created by the stockpile also exceeds what is allowed on the feeders below, necessitating DSI to design a triangular-shaped deflector to reduce the head
pressure on the feeders. The deflectors include adjustable liner plates to optimize the flow of material onto the feeders.

RESULT

The result was a completely redesigned hopper system that fit within the plantâ??s limited space, supported the new feeders and gates, and safely handled the heavy coal stockpile loads. Reinforced framing, closely spaced wall ribs, and a specially designed deflector improved structural support while reducing pressure on the equipment below.

Contact DSE to discuss high-angle conveyor engineering for your cement or industrial facility.

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