

Redesigned Screws for Feeding Damp, Abrasive Lignite Coal at Great River Energy in Underwood, ND

General Description of the Application

Great River Energy (GRE) is a not-for-profit cooperative that provides wholesale electricity to more than 1.7 million people through 28-member distribution cooperatives in Minnesota, covering roughly 60 percent of the state. Approximately one-third of the people of Minnesota receive their electricity from the cooperative. The GRE Coal Creek Station plant is located just south of Underwood, ND and provides 1,100 megawatts (MW) of power.

As part of a clean energy initiative, GRE pre-grinds and dries lignite coal so it will burn cleaner and much more efficiently. KWS provided the original coal handling system in 2007. The system has been working continuously and successfully but improvements were desired. GRE contacted KWS wanting to improve the reliability and performance of the screw feeders that are part of the coal handling system.

Moist lignite coal was continually sticking the surfaces of the screw flights and center pipe, causing a reduction in capacity and disrupting power generation operations. During scheduled preventive maintenance days, the maintenance personnel had to remove the old coal from the flights with jack hammers so that the screw feeders would meter the required amount of coal to the boiler. Also, the screws were wearing out prematurely from handling the abrasive coal and GRE Engineering wanted to extend the life of the screws.

Design Parameters of Application

Product Type: Lignite Coal

Material Density: 43 Lbs. per Cubic Foot

Conveyor Capacity: 4814 Cubic Feet per Hour

Moisture Content: Approximately 15%

Duty: 24 Hours per Day, 7 Days per Week

Advantages Provided by KWS

Engineers from KWS discussed the application with the GRE Performance Reliability Engineer. KWS had a very good understanding of the operating conditions at GRE and proposed using ½-inch thick abrasion resistant (AR400) material for the screw flight material to reduce wear. The wall thickness of the pipe for each screw was increased from schedule 40 to schedule 80 for added stiffness. KWS also recommended changing from full flights to ribbon flights. Ribbon flights are excellent for conveying sticky materials because the open spacing between the flights and pipe eliminates collection and build-up of sticky materials.

The original coal handling system utilized both left and right hand screws of different lengths which required a GRE to keep a minimum of four spare screws on hand at any time. GRE wanted to reduce the number of spare screws. KWS worked with GRE on several design changes and was able to reduce the number of spare screws.



KWS Manufacturing

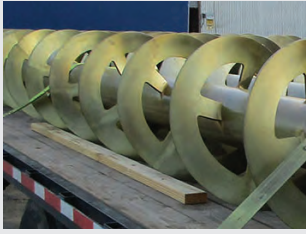
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Special Features of KWS Design

KWS polished the AR400 ribbon flights and the outside diameter of the pipe to a 150-grit finish so the moist lignite coal would be less likely to stick to the screws. The carry surface width of the ribbon flights was determined by performing capacity calculations and verifying through product testing. After polishing the screws, KWS coated the entire exterior surfaces with rust inhibitor so the screws would not rust and could be stored for long periods of time.

The screws were welded by ASME certified welders. Every weld was continuous and full penetration. The screws were straightened to within 0.015-inches TIR at the bearing locations on the shafts to ensure smooth and reliable operation.

Testimonial

"GRE has installed the screws and they are running well!"

Bill Kerzmann, Outside Sales - Motion Industries



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