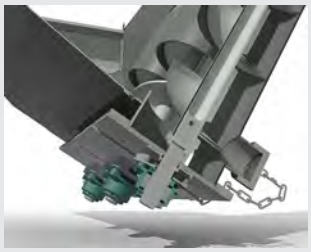

Cut-Away View of Inlet End Showing Roller Bearings, Seals and Drain Ports

Special Tolerance Screws for Metering Frac Sand and Proppant for Freemyer Industrial Pressure

General Description of the Application

Hydraulic fracturing refers to the process of creating fractures in rock formations by injecting a mixture of sand and water into the cracks to force the underground formation to open further. The fractures allow more oil and gas to flow out of the formation and into the well bore, from where it can be extracted. Hydraulic fracturing has resulted in many oil and gas wells attaining a state of economic viability, due to increased production. Hydraulic fracturing has been utilized since the late 1940s. Fractures also exist naturally in formations, and both natural and man-made fractures can be widened by the hydraulic fracturing process. Thus, more oil and gas can be extracted from a given area of land.

Frac blender units are designed to blend a slurry of water, sand, dry chemicals and liquid chemicals to provide the desired fracturing components. Sand Delivery System screws meter frac sand and other dry proppants from a large in-feed hopper into a large mixing tub with an impeller which provides the correct mixture for the fracturing process. This mixture is then pumped by Triplex or Quadraplex pumps under very high pressure down the well bore and into the formation which produces fracturing of the rock formations.

Freemyer Company was founded in 1988 with an emphasis on acidizing oil wells. By 1999, the company had expanded into five different divisions. In 2000, Freemyer Industrial Pressure (FIP) was formed. Their Hurricane Blenders utilize either two or three sand screws as part of the Sand Delivery System. The screws are located at a 45-degree angle to move the frac sand mixture from the in-feed hopper into the mixing tub. Freemyer was seeking a screw conveyor manufacturer that could help them properly design the screws for the Sand Delivery System and manufacture the screws to very close tolerances. KWS had experience with other oil field service companies with the same application and could meet any challenge that Freemyer presented.

Design Parameters of Application

Product Type: Frac Sand and Proppants
Material Density: 60 to 90 Lbs. per Cubic Foot
Conveyor Capacity: 100,000 Lbs. per Hour
Duty: 24 Hours per Day, 7 Days per Week

Advantages Provided by KWS

Accurately metering frac sand and proppants at high speed on a steep incline requires experience and know-how. Engineers from KWS visited Freemyer to discuss and understand the application. KWS helped Freemyer redesign the Sand Delivery System to achieve maximum accuracy and feed rate. A close clearance of 1/8-inch was needed between the screw OD and the housing ID.

Design Engineering Manufacturing

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www.kwsmfg.com

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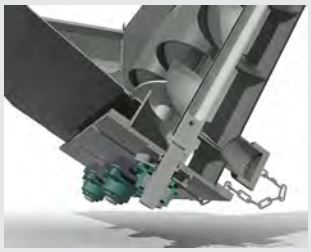

Cut-Away View of Inlet End Showing Roller Bearings, Seals and Drain Ports

Special Tolerance Screws for Metering Frac Sand and Proppant for Freemyer Industrial Pressure

Special Features of KWS Design

Freemyer had initially designed the tubular housings for the Sand Delivery System using standard 12-inch diameter Schedule 20 pipe. Unfortunately, the tolerances on standard pipe can vary up to 15-percent of the pipe diameter. Standard pipe would not work for this application. KWS revised the design and used 13-inch mechanical tubing. Mechanical tubing is produced with much closer tolerances than pipe and the close clearance of 1/8-inch was now achievable. Understanding tolerances is very important to the proper fabrication of the Sand Delivery System hopper and screw feeder housings. Since all KWS welders are certified to ASME and AWS standards, holding proper tolerances and controlling weld distortion were not a problem.

The screws were designed with very close tolerance on the OD. The close tolerance on the screw OD was achieved by grinding the OD to the final dimensions. Very slight rubbing between the screws and housings was preferred by Freemyer. Once the screws were used in the field the rubbing would go away. KWS built a test fixture so the screws could be turned in the housings during shop testing.

Testimonial

"KWS is very responsive to our requirements; both design and delivery. Freemyer Industrial Pressure appreciates vendors like KWS! Additionally, all KWS equipment is manufactured in the US.

- Michael Metzler, Customer Service – Freemyer Industrial Pressure

Sand and Proppant are Precisely Metered Up Incline to Blend Tank

Triple-Screw Feeder with Inlet Hopper

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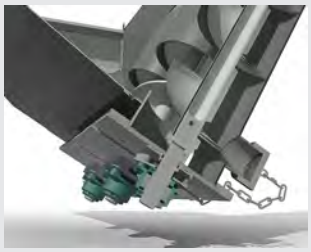
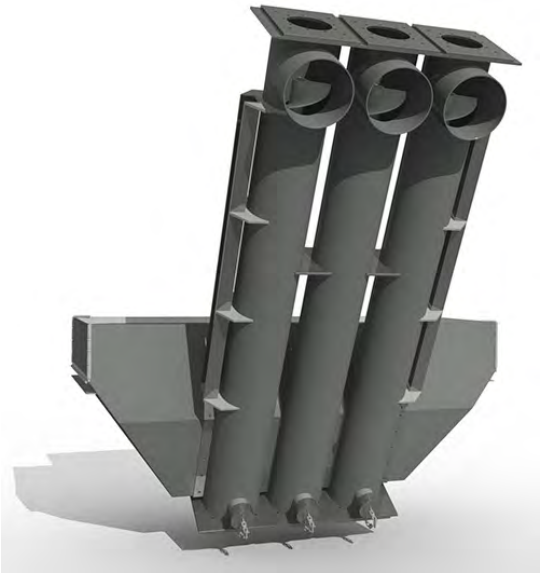


Cut-Away View of Inlet End Showing Roller Bearings, Seals and Drain Ports



Back Side of Triple-Screw Feeder Showing Discharge Ports

Cut Away View of Triple-Screw Feeder

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