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60 Year Old Drawing Helps Rolling Mill Meet Tight Timeframe



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Paul Konkol, Business Unit Manager at Ameridrives Couplings describes the benefit of keeping manufacturing drawing data on older plant, in this case a gear coupling in a rolling mill.



New Ameridrives replacement coupling featured crowned gear teeth and tangential keys and grooves cut into the bore to accommodate a customer-supplied seal

A challenge many plant engineers face when addressing large, high-horsepower processes is where to turn when replacements or upgrades are needed. Many metals processing, mine operations, power plants and similar facilities in North America have core processes designed and built 50 or more years ago. Given the specific nature of these processes many key components are unique and are not off-the-shelf type products.

Such was the case for a large North American aluminium rolling mill company supplying aircraft-grade aluminium product that was updating a core process in their facility to maintain competitiveness in the new century. A worn 70+ inch gear coupling was part of the primary drive train. The original coupling had been designed and built by Poole, Engineering & Machine Co., formerly based in Baltimore and a company now long out of business. Fortunately, the facility was partnered with a distributor who brought the challenge to Ameridrives Couplings, part of Altra Industrial Motion. Several years ago Ameridrives / TB Wood's purchased the intellectual property of Deck Manufacturing and the assets of The Sier Bath Deck Gear Corp. Many of the drawings for Poole couplings including the drawings for this worn coupling were part of that acquisition.

"Having access to the original Poole drawing was a big benefit because it was the only document available with customer interface dimensions required to design replacement spindles," said Jim Sherred, Mill Products Engineer, Ameridrives. "Without the Poole drawing, used spares would have needed to be shipped off site for detailed examination and assumptions regarding wear to inspected surfaces and tolerances would have been required."

According to Sherred, "Having the drawings saved at least a month of inspection and engineering work. Even with a detailed inspection, an engineer would have to use judgment to determine actual fits used by an engineer in 1942." Armed with the design details of the original Poole coupling, Ameridrives engineers worked closely with the customer's facility engineers. Together they identified two key features of Ameridrives current, state-of-the-art gear coupling technology that could be incorporated into the original 60 year old design to bring added value to the aluminium plant process.



Material change offers enhanced strength and ductility

The original Poole coupling was based on a #28 gear, which was rated at 32,773,000 inch-pounds. The customer requested a torque rating of the new coupling design to meet or exceed the rating of the Poole coupling, which had been in service for decades. The actual material used by Poole in the 1940's was a 40-50 carbon cast steel. Since Forged AISI 1045 material has a better strength and ductility than cast 40-50 carbon steel, Ameridrives engineers calculated the capacity of the Poole gear coupling assuming it was manufactured with the stronger forged AISI 1045 material at 43,119,000 inch-pounds. The higher calculated value using the AISI 1045 material, rather than the Poole rating, was used as a design target for the replacement coupling to ensure that decades of coupling life would be matched.

Crowned tooth design provides greater misalignment tolerance

The original Poole coupling was manufactured with straight-sided teeth and no misalignment capability was provided. Poole literature from the 1940s stated "the greatest care must be exercised in making perfect alignment, both parallel and angular." For the replacement coupling, Ameridrives utilised a fully crowned tooth design which is less sensitive to misalignment while operating effectively with up to half a degree misalignment. In this case, where misalignment was held the same, the coupling should achieve longer life (check back in 50 years and we'll all find out). The crowned gear tooth design also prevents end loading of the gear teeth when operated within the rated misalignment. The tooth design minimises wear within the gear mesh. A straight-sided tooth will end load with the slightest misalignment and some form of a crown will begin to wear into gear mesh. Metallic particles worn away from gear mesh will contaminate lubrication and increase the wear rate of the coupling.

The advantages of stronger material together with the crown tooth design allowed for a smaller coupling to be used saving both space and expense. Ameridrives provided a modified F224 coupling manufactured from forged AISI 1045 material with optimised gear geometry and a torque rating of 43,119,000 inch-pounds.

The result of the collaboration between Ameridrives' and the customer's engineers was a gear coupling that will meet the customer's performance requirements for decades to come. This teamwork, combined with the availability of the original Poole drawing and the latest manufacturing technology, proved to be essential in streamlining the development process so the new coupling could be delivered within the tight timeframe needed to bring this core process back on line quickly.

About Altra Industrial Motion

Altra Industrial Motion (NASDAQ:AIMC) is a leading multinational designer, producer and marketer of a wide range of electromechanical power transmission products. The company brings together strong brands covering over 40 product lines with production facilities in nine countries.

Altra's leading brands include Boston Gear, Warner Electric, TB Wood's, Formsprag Clutch, Wichita Clutch, Industrial Clutch, Ameridrives Couplings, Kilian Manufacturing, Marland Clutch, Nuttall Gear, Stieber Clutch, Twiflex Limited, Bibby Transmissions, Matrix International, Inertia Dynamics, Huco Dynatork, Ameridrives Power Transmission, Delroyd Worm Gear and Warner Linear. For information on any of these technology leaders, visit www.AltraMotion.com or call 815-389-3771.



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