



Bronze Bushing Order Leads to Critical Design Improvement



[CCTY Bearing](#) manufactures high-quality bearings and assemblies, as well as unique solutions for OEM partners.

“Everything flexes, which is why the right-sized bearing is critical to each application. We found that a shorter bearing with the correct tolerance would absorb the load while providing a long life for the bearing – and shaft.”

Rich Perlberg, Lead Design Engineer

Executive Summary

A new bulldozer design required an array of aluminum bronze bushings measuring from 3-1/2 to 5-1/2 inches. CCTY Bearing reviewed the application, its loads and the mating components of the requested bushings. Concern was raised that the design lengths of the bushings were too long relative to the application loads on the shafts. The kind of loads that might create excessive shaft deflection within the bushings length.

CCTY Bearing requested a FEA – finite element analysis – of the shafts focusing on the amount of shaft deflection within the given length of the bushing. Excessive shaft deflection will deform the edges of the aluminum bronze bushing reducing its ability to perform as needed over time. The FEA results confirmed CCTY’s concern, so the length of the bushings were reduced to 2/3 the original design length.

The Challenge

After receiving an inquiry about bulldozer bushings and learning more about the application, CCTY Bearing's engineers questioned the generous design length of the bushing.

Initially, the bushing length appeared to be necessary for heavy application loads on the dozer's shafts. The belief was that a longer bushing would provide a bigger load zone and reduce the PSI on the bushings surface.

An FEA confirmed the concern of CCTY's engineers. It proved the additional length would not provide the load support as originally specified. The challenge was finding a way to accommodate the same loads with a bushing only 2/3 the original design length.

The Solution

Having an in-depth background in bushings and finishes, CCTY Bearing's engineers suggested that the right press fit with a closer bushing inner diameter to the outer diameter of the shaft would lead to an increased load zone, which would reduce the PSI on the bushing.

Press fits, manufacturing tolerances, tolerance stack-ups, concentricity's, surface finishes, lubrication methods, chamfers and materials were evaluated. The necessary adjustments were made, increasing the load capacity of the shorter bushing enough to satisfy the application.

Competing bushing designs were evaluated by the OEM's engineering group including composite Teflon bushings backed with woven fiber and epoxy. CCTY Bearing's design was chosen because it proved to be the best solution to handle the application loads without galling the shaft's surface.

"Sample requests allow us to work directly with the OEM and share our bushing expertise. In this situation, our team found an opportunity before it became an issue in the final product. This example showcases how CCTY Bearing works directly with customers to improve design applications."

*John Sweetwood
Strategic Sales Manager*

The Results

Backed by results from the FEA and field tests, the OEM's team implemented the shorter bronze bushing with CCTY Bearing's tolerance recommendations.

The correctly engineered bushing fully protects the expensive shaft and handles the rigorous application loads generated from bull dozing.

CCTY Bearing's solution proved to be:

- An enhanced design that eliminated premature bushing failure
- Greater protection for an expensive component
- Reduced cost with the shorter sized bushing

The client is now able to manufacturer the bulldozers with a part that is the right fit for the application.