

**Industry:** Marine - Workboat

**End User:** Triple-Screw Workboat Operator on the Mississippi River, USA

**Application:** Tiller & Jockey Bar Steering Linkage System

**Thordon Grade:** ThorPlas-Blue

**Date of Original Installation:** 2016

### Challenge:

The Mississippi River is the second longest river in North America, and the workboats are often operating for thousands of hours in the abrasive waters. On one such workboat, the original bushings in the steering gear system were greased bronze.

The workboat operator was looking for a grease-free and corrosion-free tiller linkage capable of withstanding greater vertical movement of tiller pins. It is typical of these Mississippi River workhorses to drydock frequently to replace their greased sleeve type bushings. These metallic bearings are unable to tolerate angular misalignments resulting from deflection or improper mounting, which can place considerable stresses on the steering system. This causes high levels of vibration, corrosion and, in some cases, pollution. The nature of the work done by these vessels and the environments in which they operate also means that metal-on-metal bearings are more susceptible to damage and rapid rates of wear, which can increase operational costs.



**Solution:**

Thordon's ThorPlas-Blue material was recommended for this, as the material is life-time lubricated, requiring no grease. The lubricants formulated in the homogeneous polymer ensure a low, stable coefficient of friction, even as the bearing wears, while offering long bearing wear life with no maintenance. The ease of machining the ThorPlas-Blue material also allows the bushings to be finished quickly so that repairs and retrofits can be completed on time and without costly drydocking.

To create a completely grease-free steering system, a ThorPlas-Blue retrofit typically involves replacing hydraulic power units and cylinders. It also requires the team to carry out quadrant modifications, as well as machining all quadrant and jockey bar bushings. Mactech, one of Thordon's authorized distributors based in Minnesota, USA, has the proper tools, experience, and processes to complete the job in place without removing all the steering components from the boat. Performing the machine work in place also allows you to machine the components in operating position and maintain tighter clearances between bushings and pins.

Without Mactech's onsite capability, it would require many more man-hours since all the steering components would need to be removed from the boat and transported to a shop for the machining. The steering components would then have to be transported and loaded back onto the boat for reassembly.

**Result:**

The ThorPlas-Blue installation took place in 2016. Prior to the retrofit project, Mactech measured and recorded all as-found bushing data before creating a mock-up steering linkage, as they do for all retrofit projects. The steering system for the retrofit vessel consisted of three steering quadrants, six flanking quadrants, two dummy flanking quadrants, and associated jockey bars. New bushings were machined to size before fitting to quadrants and jockey bars. New wear plates were then manufactured for each pin joint and the steering system was reassembled with new pin retainers.

The flanking quadrants were very close to the floor and allowed for limited space for machining them as the welding, electrical, and machining work happened simultaneously in a small area. Every bore in the system had to be machined to a nominal size. Mactech's equipment was very flexible and worked well in difficult spaces with innovative fixturing. The company's unique processes of controlling bore sizing were essential for the duration of the project. Good planning, staging, and communication to accommodate other crafts working in the same area added to the success of the project.

The commercial benefits of no longer having to replace metal-on-metal bearings every one or two years, or purchase, store, and apply lubricating greases are obvious, but the crew also remarked that the tiller flat is a cleaner, safer working environment. Since the linkage system is completely grease-free, there is no chance of slipping on greasy decks.

At various times the vessel's steering gear was spot checked by pulling the tiller pins and measuring the internal diameter of the bushings. Based on measurements taken by Mactech and the customer, the bearings have experienced "no measurable wear."

As a result of the performance of Thordon bearings on this vessel, the customer opted to retrofit ThorPlas-Blue to 10 additional workboats.