ZA-12 Die Casting Steers Gravely to 90% Savings

Gravely International Inc., Clemmons, NC, manufacture the famous Gravely line of lawn and garden tractors and ancillary equipment. Renowned for quality and endurance, Gravely's engineers go all out in testing new designs so that performance and longevity are not compromised. When they switched to a new ZA-12 steering shaft support casting, the new design passed the most rigorous evaluations. The result was a cost reduction from a $9.09 fabricated assembly to a $0.90 ZA-12 die casting.

Here is what happened. Gravely's rack and pinion steering (on their 12 hp to 19 hp lawn tractors) was supported by a steel plate fabrication with a spherical ball bearing insert. The assembly was a good design but costly. Gravely then read about Eastern Alloys' high strength ZA-12 alloy and its excellent bearing and wear resistant properties. The upshot was a new simpler ZA-12 casting design for the assembly which eliminated the spherical ball bearing and allowed the steering column to wear directly against ZA-12. Plaster mold cast ZA-12 prototypes were made, installed and tested. and boy were they tested!

The static steering test was easy. One of Gravely's long frame 8000 series tractors equipped with a 19 hp twin cylinder engine was weighted down on the front end with 180 lbs. plus 200 lbs. in the operator's position. The ZA-12 bearing support part was lubricated one time. Sitting on a concrete floor, air cylinders cycled the steering system back and forth for 10,000 cycles. There was no measurable wear on the ZA-12 bearing support.

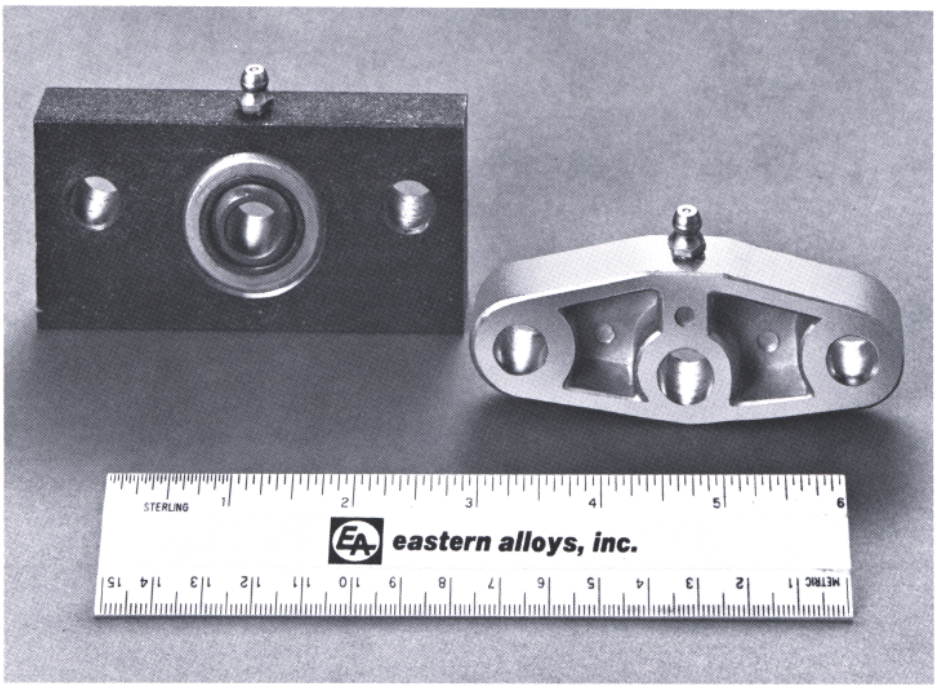
Next ZA-12 passed the old "run-it-off-thecurb" test. For two hours a hapless driver tried in vain to destroy the part by running the tractor off a concrete curb at high speeds and then turning around and crashing into the curb at a 45 degree angle.

Finally a dynamic steering test subjected the steering system to even harsher treatment. The loaded tractor was mounted on a dynamometer test rig with both sets of wheels on 18" diameter drums.

The front wheel drum was outfitted with two sets of staggered 1 ¼ x 1 ¼ angle irons so that each front wheel would be impacted independently from the other. At the same time air cylinders rotated the steering back and forth from stop to stop. The tractor was run in 5th gear at a low throttle setting with weighted rear wheels driving the dynamometer test rig.

The test rig pounded the tractor front end for 93 hours (187,400 cycles). During the test the steering system broke down and a new shaft and coupling were installed; front king pin weldments required several repairs and the tractor frame cracked in two places. Thesedesign failures were subsequently corrected. The ZA-12 steering shaft support on the other hand took the pounding with minimal wear resulting (0.004-0.008" wear in a 0.510" diameter hole). The steel steering shaft was polished smooth and wore only 0.002" in one location.

Gary Patridge, Project Engineer, summed up Gravely's feelings, saying "No new alloy gets a free ride here at Gravely. We estimate our combined testing on this project simulates 10 years of rather abusive field use. Although ZA-12 showed some signs of wear, it was not enough to be concerned with. Considering the severity of the tests there is no doubt in our minds that ZA-12 will give us the long service life and durability we are looking for. The fact that we saved $8.00 on a $9.00 assembly, makes the simpler ZA-12 design very attractive."



The top photograph shows the replaced fabricated assembly and the new ZA-12 casting which saves Gravely 90% of the part cost. Bottom photo is one of the Gravely tractor models that utilizes the ZA-12 steering shaft support casting.

Gravely went to a ZA-12 die casting for the application because die casting was the most cost effective process for their quantity requirements. It was the combination of high strength plus bearing performance which won the application for the ZA alloy. No other die casting alloy system gives you this combination at the low cost of ZA. ZA materials (ZA-12, ZA-27 & ZA-8) can also be sand, permanent mold, and precision graphite mold cast. If you want to learn more about ZA alloy properties and how the new alloys can lower your manufacturing costs, call the experts at Eastern Alloys. Eastern pioneered the introduction of ZA alloys. We're available for project and value analysis reviews by contacting Derek Cocks.

eastern alloys, inc.
Box Q Maybrook, N.Y. 12543 (845) 427-2151