

**Boedeker Plastics, Inc. Helps the Johns Hopkins University Blue Jay Racing Baja SAE Team with Hydlar® Z and Ertalyte® TX Bushing Stock to Enable Top 10 finishes at International SAE Oshkosh and Oregon Competitions.**

**Intro:**

Inspired by the Baja 500, SAE (Society for Automotive Engineers) organizes three annual off-road races in which universities worldwide build single-seat off-roaders. These are put through grueling 4-day competitions involving rock crawls, hill climbs, suspension and traction tests, maneuverability courses, sled pulls, and (most heavily weighted) a 4-hour endurance race. Each car is custom designed and built from the ground up by their teams and must be capable of excelling under challenging environments such as deep mud, shifting dust and sands, boulder mounds, and other custom obstacles. Simultaneously the cars must be quick and efficient at high-speed tight cornering to outcompete the other roughly one hundred top engineering programs’ teams at each race. The off-road vehicle must be able to tolerate truly punishing loads.



**Challenge: Design and Manufacture Bushings Durable Enough to Last the Lifespan of the Competition Season**

Various components within the Blue Jay Racing, particularly within the suspension subsystem, utilize bushings through which a bolt may travel and permit rotation. In prior competitions, these bushings were designed and manufactured from extruded natural nylon.

However, due to loading scenarios such as landing a jump and cornering in a rut, these bushings would fail and deform during the endurance race. As such, there would be resultant unfavorable suspension characteristics that would hamper the car's ability (and, in extreme cases, require part swapping). For instance, when the lower (H-arm mount) bushing in the rear upright experienced minor deformation, there was a significant rear steer that the driver would have to try to account for. In cases where the bushing experienced significant deformation or was torn out, that part assembly would have to be swapped. As such, the team would lose time on the track and drop places



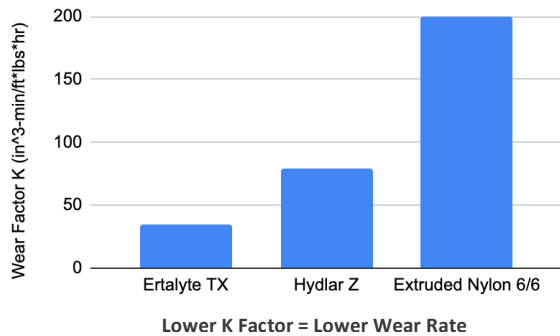
in the endurance race. To address this problem, Blue Jay Racing needed a material with a higher strength/toughness, low friction coefficient, and wear resistance.

**Solution: More Durable High-Performance Bushings with 4X Longer Life (Ertalyte® TX & Hydlar® Z)**

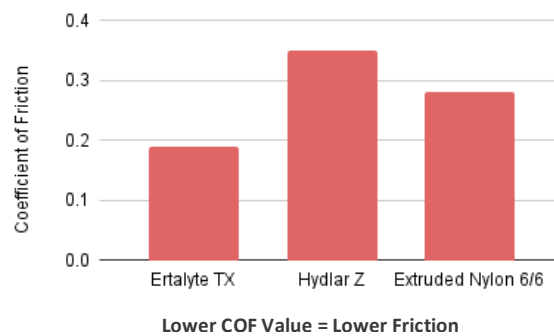
Blue Jay Racing contacted Boedeker Plastics, Inc's Brie Grissom (Technical Services - Application Development) to gain access to higher-performing plastics. The team was interested in alternatives to extruded natural nylon and initially considered Nylatron® NSM, Nylatron® GSMB, as well as the Ertalyte® TX and Hydlar® Z. Following additional information/assistance from Boedeker's Jim Hebel (Technical Services Manager), the team obtained Hydlar® Z and Ertalyte® TX materials. Ertalyte® TX offered the benefits of being internally lubricated and more wear resistance than the alternatives. Due to the uniformly dispersed solid lubricant, Ertalyte® TX showed a lower wear rate and coefficient of friction. Hydlar® Z offers a variety of benefits, given its Kevlar-reinforced nylon structure. It has high strength, extreme wear resistance, and is non-abrasive to the mating surface.

Due to the lower wear factor (demonstrating better durability) of both Hydlar® Z and Ertalyte® TX (as shown in the below graphs), these materials replaced all the previously extruded nylon bushings in the car. Ertalyte® TX's lower coefficient of friction played a crucial role in enhanced bushing performance, which allowed for more significant rotation in the inboard suspension linkages, pedals, and steering column. In contrast, the demanding outboard linkages and rear upright employed the tough Kevlar reinforced nylon Hydlar® Z.

Wear Factor of Each Material



Coefficient of Friction For Each Material



Compared to the previous competition season, bushings tended to fail after each competition (<10 hours of driving time). This season bushings across the system were much more effective. After tens of high-intensity hours and hundreds of miles (at Kairos Off-Road Resort, UMBC Baja Course, Oshkosh Baja SAE competition, and Oregon Baja SAE), we only saw mild bushing deformations in one component. **Boedeker allowed us to transform our bushings from effectively competition consumables to those which would last our racing team the entire season (almost quadruple the driving lifespan). The higher-performing plastics allowed the team to be on the course longer in the endurance races, permitting two top-10 finishes.**

*Boedeker delivered both materials quickly (within 1.5 weeks) and consistently provided great support - assisting the team with any challenges and questions that arose (usually with same day response time).*

