

BMX Materials Part II

Last month we looked at common BMX materials. I explained basic material properties and we compared the data and drew some conclusions. This month I am going to show you some experiments in which you will visually see how the BMX materials react to forces.

Experiment 1:

This experiment will compare Steel, Aluminum and Titanium. The test is setup so that geometry of the all the materials is exactly the same. We will be using 1/8" (0.125 inch) rod which is fixed at a length of 6.375 inches. We apply a load to the end of the rod by hanging a 2.75lb weight on each rod (see picture)

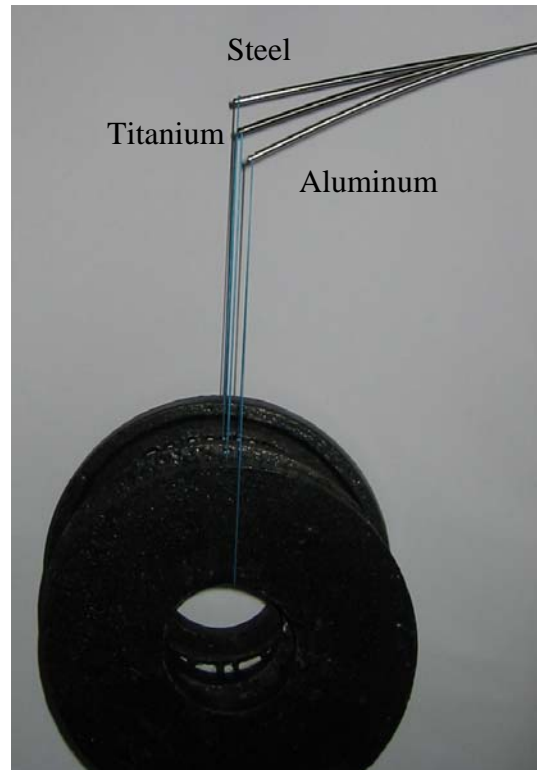


Figure 1 Material comparison test

From the picture you can see that the three different rods deflect a certain amount for the given material type. From last months article we can see why this makes sense. There was a material property called **Modulus of Elasticity** and I mentioned how this is a measure of how springy (Flex) the material is. Here we can see that steel is the stiffest spring followed by Titanium and then Aluminum. Here's a refresher of the numbers:

(Steel) Modulus of Elasticity = 205,000,000,000 Pa (29,700,000 psi)
(Titanium) Modulus of Elasticity = 113,800,000,000 Pa (16,510,000 psi)
(Aluminum) Modulus of Elasticity = 71,700,000,000 Pa (10,400,000 psi)

Experiment 2:

This experiment will compare 7075 vs 6061 AL. This test is designed to show you the difference in material grades. Again it is setup same as before with same geometry and load but there is before and after pictures to pay attention to.



Figure 2 Top View



Figure 3 Load Test



Figure 4 Post Test Result

From this test we can see how the 7075 rod could withstand the load applied while the 6061 rod failed and became permanently deformed as can be seen by Fig 4. This is due to the **Yield Strength** difference of the two materials; again as a refresher here are the numbers:

7075-T6 Yield Strength = 503,000,000 Pa (73,000 psi)

6061-T6 Yield Strength = 255,000,000 Pa (37,000 psi)

The grade makes a big difference in strength. This is the main reason why we at Rennen use 7075-T6 in our chainrings, gears and cogs. The proof of this can be seen in these tests.

I hope you enjoyed this latest article, next month we will begin to break down the dynamics of racing.