Durablue's X-33 Axle

What is the X-33 axle?

The x-33 axle was designed and developed in 1986. In the pursuing twenty one years of testing and evolution, the x-33 is second only to the Durablue Eliminator axle as the most thoroughly tested aftermarket axle in history. The x-33 was conceived as an axle that would **improve** upon and **reconfigure** the way an ATV axle would function.

Proprietary Design:

Standard configuration axles use a conical shape from the bearing area to the wheel flange attachment spline. This conical design was developed by Durablue and used on the Durablue Eliminator axles from 1979 to the present day. This configuration has been subsequently copied by every other aftermarket manufacturer of ATV axles. **It is that good!**

The conical design allows the axle to **flex under load**. This is a very important feature as the axle is like a spring in the rear suspension. The more load it can absorb, the less shock load is transferred to the chassis and rider. In a perfect world, the perfect axle would absorb all loads by flexing yet not exceed its yield and tensile strengths. This is impossible, of course, but an axle that absorbs the most loads and yet does not permanently bend or break is the best axle.

The Correct Chemistry:

As good as the Durablue Eliminator axle is, there are moments when the shock loads can overwhelm the basic strengths of the material. The X-33s steel has certain characteristics and abilities. It is not magic, but chemistry and physics. Steel, with the correct chemistry, can change dramatically when subjected to heat or cold. This process is called heat treating and is the real key to the physical characteristics of the axle. Anyone can buy steel, but the heat treating process is an important element and kept in strict confidence. The wrong heat treating formula can yield a very rigid inflexible shaft subject to cracking and breaking. The right heat treating formula can create a **strong yet flexible** product as well, all with the same steel. Heat treating takes a lot of experience and testing to find the right combination of grain structure, yield and tensile strength. That is why you want to purchase from the company that has the **most experience in testing and evolution**. You simply cannot copy and shortcut this process.

The X-33s' Goals:

The goal of the x-33 is to **increase surface area**, add material where needed and **improve the wheel hub mounting area** while **adding adjustability** that is beyond every

other axle on the market. Our design goals have been accomplished to a very high degree as witnessed by fact the Durablue x-33 was chosen as the axle to be used on the **worlds fastest ATV (over 160 mph).**

The wheel hub mounting spline on most ATV's is less than 1" in diameter and about 1 3/8" in length. This means the axle must taper down to this small diameter which limits strength. In most applications, it is adequate, but we at Durablue wanted something better. We decided to maximize the shaft diameter from the swing arm area out to the wheel hub. The wheel mounting area went from under 1" in diameter to 1 3/8" in diameter and 2" in length. This design increases surface area substantially (more than double). To improve the hub mounting even more, we split the hub and clamped it to the shaft. The clamping function eliminates all movement in the flange. The standard method of mounting the flange involves a slip fit assembly, so there is always some small amount of space in the splines. This can lead to movement which can cause wear and, eventually, spline/hub failure. The Durablue wheel hubs designed for stock fitment use a heat treated splined insert to minimize the wear factor. The x-33 wheel hub requires no insert as it is clamped with the same force that is used to mount a wheel on an automobile.

The larger diameter wheel hub mounting area allows us to keep the x-33 shaft much larger in diameter from the bearing carrier area to the end of the shaft. This increase in diameter decreases the unit loading, that is, it allows the shaft to handle more load due to the increased diameter. An easy way to think of this is by comparing a tree trunk to a twig. The tree truck will obviously handle more load than the twig.

Design and Suspension Effects:

The increase in diameter does add weight to the axle. This is rather undesirable because it is "unsprung weight". Unsprung weight slows the response time of the suspension, making it feel "heavy**". To remedy this issue, the x-33 is hollowed out on the ends** (sometimes called rifling). This accomplishes two things. It removes material in the center of the shaft, thereby decreasing weight. It also creates more surface area along the shaft length. Surface area increases are associated with strength and load carrying increases. You can think of this as increasing the outside diameter (increased surface area) and creating an inside diameter (increased surface area). If you look at the way bridges and building are built, you will notice that the supporting members are not solid, but relatively thin sections forming several angles. This shape is to create surface area. The x-33 does the same thing.

Marketing vs. Reality:

Durablue is amused by an aftermarket axle company who has chosen a questionable advertising campaign in an attempt to make their product appear better by bad mouthing others. Ignoring the questionable ethics, obvious bias and lack of methodology, I would

say that it appears the **Durablue axle is superior due to its ability to flex.** This is exactly what the Durablue Eliminator is designed to do.

Why the X-33?:

Many riders insist on using the X-33 axle. One rider in particular favors Durablue's X-33 axle for the pin drive system in lieu of the standard splined axle and hub setup. The reason for this is due to wobble: After a while, the splines begin to crush allowing for imperfect fit between the axle and the hubs causing wobble. With the X-33, the hubs slide onto the end of the axle and are held in place by a pin that runs through the hub and the axle where they are bolted together. There are no splines to crush, so the X-33 provides a **wobble free** operation for life.

The rider also puts more faith into the X-33 because the strength of the axle is furthered by the fact that it does not taper down where the hub attaches. Where the axle tapers down to the smallest diameter is where it is the weakest, thus that's where most axles bend. With its constant diameter, the **X-33 has no inherent weak point.**

The X-33 is the **world's #1 axle**. Just ask Terry Wilmeth, another real rider and the declared Guinness Book of World Records holder for the fastest ATV on the planet. Terry was successful due to the tremendous amount of pressure the X-33 can withstand! He sped over 160 plus miles per hour!

Check out Terry's testimonial on **www.durablue.com.**

As the aforementioned technical information and real riders exemplify, the X-33 definitely is made for **hard-core racing!**

For more information, please call 949-770-5533