

Can someone please explain the correct way to set the Ackerman angle on a steering system. It is my understanding that the angle should meet at the center of the rear axle. What would be the effect of an angle that's too steep or too shallow?

Pat Lowery, Wabeno

That is correct. If you run a straight line through the kingpin and steering links, they should meet at the center of the rear angle.

The purpose of the Ackerman angle is to allow the wheels to travel different distances when cornering. As you know when turning, the inside wheel follows a smaller radius, and the outside following a larger radius. When the wheels are properly set up, they will account for this, and turn the proper degrees to follow both radii. When it's not set up properly, you will get too much tire scrub, or side wear.

One good resource I have found is <http://www.rc-truckncar-tuning.com/ackerman.html>

It's an rc car website, but explains it real well.

That is one of the best sites I have seen explaining that concept! Very good!

Also, Another angle that can be built in (not sure the terminology) is with the Kingpin's vertical angle. Many of us build the Kingpin straight up & down. Automobiles use Kingpin's that are angled to meet the wheel at where the wheel meets the ground. One of the things this does is it allows for the vehicle to "want" to come back to center/straight when driving. It does cause the driver to have to "lift" the vehicle as they turn a bit, but helps keep the vehicle going straight. It also helps with tire scrub.

I am sure there are other benefits, but that is why there are parents and engineers that explain these concepts better than I do to students... If anyone has a good site for this, I am all eyes! (The best I can do is page 16 of the Electrathon America Rules book)

http://www.electrathonamerica.org/handbooks/handbook_07_08.pdf

Jesse Domer, Watertown High School

Pat,

If you go to the following page, you'll find an article that I wrote for my automotive students on the results of incorrectly set Ackerman Angle. Hope this helps.

<http://teachers.oregon.k12.wi.us/way/ackerman.doc>

Randy Way
Oregon High School

Thanks Randy,

We're building a vehicle (not an Electrathon car) with front A- arms, suspension, brakes, etc. from a four wheeler. We're using a frame that is much longer than the original four wheeler wheelbase. If I understand your article correctly, the steering would be "loose" with the current Ackerman angle.

Also, Jesse's point about angling the kingpins is very valid. The steering "wanting" to go straight is very important even though it causes the outside edge of the vehicle to lift slightly.

Thanks for the good info.

Pat Lowery

Wabeno High School

A little bit of video showing excessive wheel shimmy would be good for showing students to think about dynamic loads on their static design thinking.

Dynamic forces! It's a whole different ballgame when the vehicle is running at 30 MPH. A few years ago, a first year team came to Fox Valley with their Electrathon vehicle. On the first race, the front steering allowed the vehicle to shimmy so violently, that the driver barely made one lap. He wisely pulled in to the pits before attempting another lap. The culprit, those cheap rod ends sold for go karts. Please, make sure you are using higher quality rod ends from either McMaster-Carr or Grainger. These are not as expensive as the rod ends sold for race vehicles, but they are more than adequate for an Electrathon vehicle.

Hi,

I've created an Excel file that will calculate outside wheel steering angle compared to inside wheel steering angle. It's basically a mathematical model of toe out on turns. The file is available at:

<http://teachers.oregon.k12.wi.us/way/Ackerman%20Steering%20Spreadsheet.xls>

I wrote a packet that explains the math behind it. The explanation ended up being a bit labored, but if you want to know how the file works, or if you have a kid that doesn't believe you need math to work on cars, you can take a look at:

<http://teachers.oregon.k12.wi.us/way/Ackerman%20Steering%20Formula%20Derivation.doc>

I am still working on a packet that discusses toe in, and will be releasing that in the future. As with everything posted on my website, feel free to use, plagiarize, alter, etc. Thanks!

Randy