A Note about Axles for CO2 CARS

There are three questions to ask and I like the students to find the answers to them for themselves (with our help, of course!) by playing around with possibilities.

1. What will I make my axles out of?
2. What way will I configure the axles on the body of the vehicle?
3. What can I use to reduce friction at the point of spin on the axle shaft?

WHAT WILL I MAKE MY AXLES OUT OF?

Possible materials for use as axles are:
Steel rod
Welding rod
Stainless steel rod
Carbon fibre rod
Certain types of hard plastic
Brazing rod (brass)
3 " nails steel joltheads NOT GALVANISED
3" nail gun nails
(Any other you come across – let me know!)
You could have a selection of these to show and talk with them

The idea is that the students have their own input here by making choices that will affect the speed of their cars, one way or the other. They can decide what material they will use for axles and it could be that they are given opportunities to play around (experiment) with a variety of rod like materials before they decide what they will use. They could look in Dad's shed and/or pester people they know in search of what they think will do the job best.

You could set up trial blocks of pine already drilled that they can use to insert that axle materials they are testing and then ramp test different materials.

The rod they choose needs to have a diameter of around 3mm.

In my experience, the way the wheels are set up on the car HAS A BIGGER EFFECT ON ITS PERFORMANCE THAN EITHER THE DRAG COEFFICIENT (AERODYNAMICS) OR VEHICLE WEIGHT (but don't tell the kids that!)

You could also standardize the materials by having them just use one material e.g. nail gun nails, that you supply if you wish. It depends on time you have set aside for the project because any testing regime can take up a good chunk of it. In saying that however, such testing/trailing has obvious benefits from a technology education viewpoint.

HOW WILL I CONFIGURE THE WHEELS ON MY CAR?

Two ways:
(1) Axles fixed in body of car and wheels spinning independently on end of each axle…
Or,
(2) Wheels attached to axles and the two wheel and axle units spinning inside the body of the car.

Method (2) is easier than method (1) mainly because method (1) requires a system to hold the wheels onto the axles, like four locking nuts or some form of clip. With method (2) you just friction fit the wheels to the axle shafts.

Either way, the critical thing seems to be the size of the hole where the spinning takes place. If the hole is too big, the wheels wobble and this affects the speed of the car. The car that travels smoothly along the floor from a push or off a ramp seems to do well on the dragster track.

Have drills in metric and imperial available.
(GOOD SIZES TO HAVE ON HAND ARE: 3mm, 3.5mm, 4mm, 4.5mm, 1/8, 6/64, 5/32, 11/64, 3/16…)

Use callipers to check the diameter of the axles and then drill the holes slightly bigger, test – then re-drill if necessary.

If you decide to use method (2) above, you can pack the hole in the body of the car with a shim made from a plastic drinking straw. You will need to drill the hole slightly bigger to take the thickness of the straw. Cut the straw to length, split it long-ways and allow it to fold in on itself to its natural diameter. Slip it into the hole and place the axle inside it.

There is enough plastic at the hub of the wheels supplied to drill them out as needed. You can use washers at strategic points to keep the wheels from rubbing on the car body but keep in mind that the rules say there is a limit to the number of washers you can use.

AND FRICTION REDUCTION?

Try pencil lead dust, graphite, silicon spray (but spray it into a small container and have the kids apply it by dipping a match into it), corn flour, and chalk dust. Don't use CRC it's messy and not that effective.

Shine and polish the axle. Nails have a series of ridges up near the nail head. They need dealing with.

A crooked or bent axle is a disaster… discard it!

Finally, make sure the wheels have those little plastic bumps on the rims that form when they are extruded, are sanded or pared off. Cars that bump along perform poorly.

I hope this doesn't sound as though I am talking down to you. Have fun…

Bruce McKenzie

As an extra thought… axle holes need to be at right angles to the length of the car so it is best to drill them BEFORE any timber is removed from the balsa block. This way the kids can ensure a perpendicular drill-hole by using the block sides as guides to sit flat on the drill-press plate. A car that veers to any great extent in a test run down a ramp is at a disadvantage.