

Lots of information about ROLLERS

- **Translating rotational motion:**
 - Do not attach the rollers directly to the motor.
 - Make sure that the motor's position is adjustable to fix the tension of the following.
 - **Chain -**
 - Use sprockets to attach to axle
 - 2 types: #36 (bigger and stronger; harder to adjust, used for strength and heavy applications) and #26 (smaller; easier to adjust, used for speed and lighter applications)
 - Master links and half links used to connect chain and close gaps
 - NEED LOTS OF GREASE
 - Pros: strong; if it breaks, you can just replace one link; length is adjustable (master link and half link); sturdy
 - Con: heavy, slow, not as smooth
 - **Belt -**
 - Use pulley/cog to attach
 - made of plastic, sprockets are metal so you can't use them with belts
 - because they are made of plastic, the cogs can't be in a location where they could be hit during a match) > less durable
 - requires hubs, the same as chains
 - Pro:
 - speed > instant transfer of speed, no jerk when the motor begins
 - doesn't require as much tension
 - Cons:
 - not as strong
 - less durable
 - if it breaks, you have to replace the whole thing
 - not adjustable – only comes in specific sizes, so you have to plan around that
 - **Polycord -**
 - No cogs/sprockets or hubs, instead they use pre-etched drums
 - have to be soldered together, but they won't come apart
 - Used by most big teams
 - Pros:
 - adjustable (cut the cord and solder it back together)
 - strong
 - MALLEABLE (wraps around object, unlike belts or chains which become rigid with tensions) > can use friction to push game pieces (balls) up
 - Cons:

- harder to make
- **Motors:**
 - cut a groove below the motor so it can be moved and tension can be adjusted if necessary
 - **CIM**
 - Pro:
 - speed
 - can get some gearboxes
 - Cons:
 - huge
 - Banebots motor can get the same speed in half the space
 - not made for strength
 - multi-step transmission is harder to assemble
 - **Servo**
 - Pros:
 - great for small specific movements because programmable
 - small applications
 - adjustable angles
 - single step transmission
 - Con: not a lot of power (why we don't really use them in FRC)
 - **Window/denso**
 - half-decent strength
 - pros:
 - mainly used to save space
 - easily mounted > have premade holes
 - come in left and right
 - single-step transmission
 - **Fisher price**
 - pros:
 - VERY thin (save space)
 - in the middle in terms of speed vs. strength,
 - gearbox included
 - single-step transmission
 - **Van door/Bosch**
 - HIGH strength, but VERY slow
 - typically would use this if your robot had to do a pull-up or lift itself
 - we have one
 - **Banebots**
 - Pros:
 - great price;
 - small (for its speed and power)
 - can get MANY gearboxes for many different uses, so it is very VERSATILE

- same application as cim but smaller (save space, easier to mount)
 - can be modified for strength or speed > 1600 rpm can be geared down or not
 - Con: we haven't really used this (this isn't a good reason to not use it)
 - Banebots motor is very fast (much better than CIM), but is still pretty small (about same length as CIM, but much thinner and shorter)
 - **1 vs 2 motors**
 - 1 motor use can cause spikes and drain the power
 - 2 motors relieve these issues and the other motor
 - Don't let motors go over ¾ of their stall torque
 - stall torque > when the motor can't turn anymore because a force is countering it
- **Gearboxes:** > changing the output of the motor, transfer the power between the torque and the speed
 - Many gearboxes for Banebots motor to suit various purposes (speed, power, etc...)
 - Andy mark gearboxes for CIM motors suit various purposes (speed, power, etc...), but these are bigger and heavier than the Banebots motors and their gearboxes
 - Although gearboxes can be really helpful, they can also take up space and weight
 - vex pro > buy in stages so that you can customize your gear ratio
- **Wheels:**
 - Friction is important in having a grip on the game piece to move it.
 - **KOP**
 - tough plastic > not a good gripper
 - **Traction/Performance**
 - **Praction v Performance**
 - praction are performance wheels but with plastics interiors
 - NEVER use praction > they will break during the game
 - **Omni** <wheels that allow strafing (driving side to side without turning)
 - **Banebots**
 - All spongy plastic wheels > traction
 - Can be combined → gaps between wheels act like traction in tires → very good gripping → great for shooting and receiving balls (remember how the tape didn't really grip on the 2014 roller...)
 - All sizes and cheap
 - Provide hubs for all their weird sized wheels
- **Axle connectors:**
 - Hubs - connects the wheel, gear, or sprocket to the axle shaft
 - Keys -
 - Set screws - easy to attach, make the axle flat so that it does not come loose



- Couplers - attaches two axle sizes together, use keys and set screws to attach
- **Bearings:**
 - flanged > exposed to allow the axle to go through



- - non- flanged > not exposed has a backing at one end



- - $\frac{1}{2}$ or $\frac{3}{8}$ sizing, circle or hex shapes