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BUILD REPORT:

Rebuilding Apollyon, Again

● by Mike Jeffries

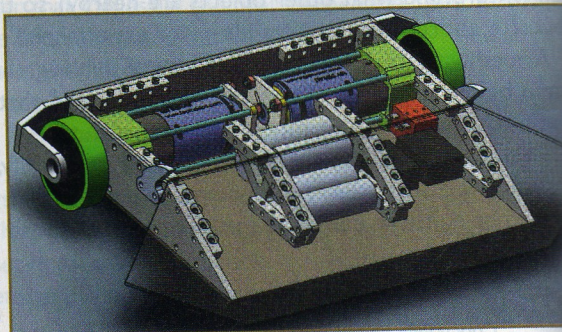
Since the last build report was written, Apollyon has competed at Motorama. Apollyon took terminal damage there while achieving a 3-2 record, and yet again needed a complete rebuild. With the third build, I decided to focus on reducing complexity and using the internal space more effectively.

The major technique change used in this build was a switch from primarily tapped holes in the frame of the robot to a mostly waterjet cut chassis held together by a product called "Nutstrip" that is sold at **Kitbots.com**.

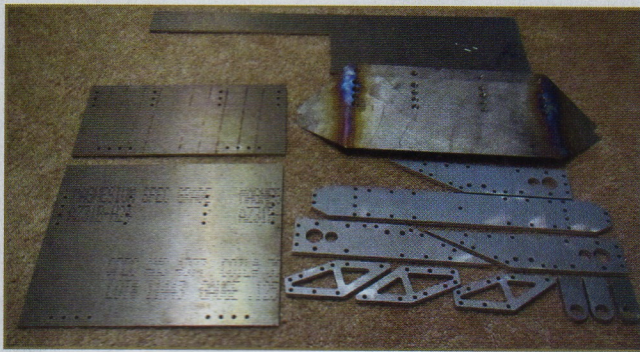
Nutstrip is a piece of square stock with a series of perpendicular holes drilled and tapped in it which allows

parts to be easily bolted to it at 90 degree angles. Another benefit is that it is much less expensive and time-consuming to replace than an entire section of frame.

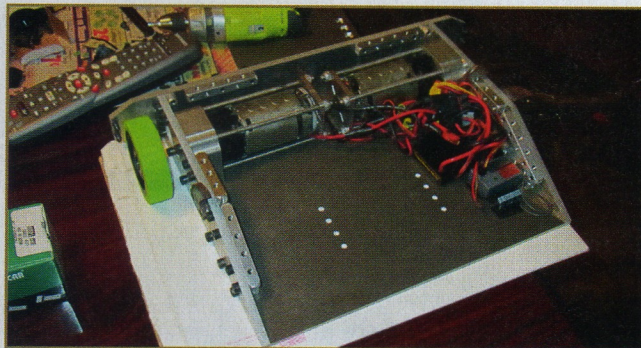
In addition to this construction methodology change, the materials had to be altered to provide better protection while not adding weight. Where the previous version used a 3/32" 4130 steel wedge, the new version uses 1/8" grade 5 titanium. Instead of aluminum and garolite for the top and bottom armor respectively, the new armor is



CAD model of the new Apollyon showing nutstrip and new chassis layout.



Parts as delivered from Team Whyachi. Materials are AZ31b magnesium, grade 5 titanium, and 7075 aluminum.



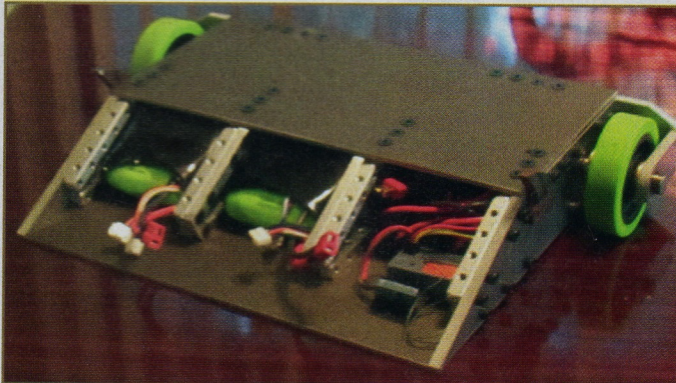
The entire electrical system has been crammed into one side of the chassis to keep wire lengths to a minimum.

AZ31b magnesium which is lighter and stronger than aluminum. These materials came at a higher cost than the last chassis from a material standpoint, but the machining methods resulted in an overall drop in the manufacturing costs.

Using magnesium in the chassis delayed the build by almost a month, as there are not many common suppliers for 1/8" magnesium plate. The time delay did not alter the competition plans since the drawings were sent to Team Whyachi well in advance of any intended competitions. In addition to waterjet cutting, they also handled the bend on the titanium wedges that worked so well in the first build of Apollyon.

The electrical system from the last build of Apollyon was not disassembled, allowing for a very short build time for the latest incarnation. I am still using the same six cell A123 packs from Battlepacks, 18V Dewalt drill motors, and Holmes Hobby BR-XL

Optional battery configuration when competing in classes with a weight limit higher than 12 lbs.



speed controllers. Keeping the electrical system together meant that the build time between having a pile of chassis components and a drivable machine was less than a day.

Apollyon does not always compete as a 12 lb robot. The original Apollyon competed at Battlebots in the college 15 lb class, and the newest version was used in a robot hockey competition with a 15 lb weight limit. To take advantage of this room, the gap between the inner supports and outer rails was kept uniform. This allows a second 2,300 mAh battery pack to be installed and used when longer run time or higher current capacity are desired. A special adaptor is used to allow both packs to be plugged into the main power lead in parallel.

In addition to competing in the bot hockey competition, Apollyon competed in the 12 lb class at Robot Battles 42 which took place in Atlanta, GA during Dragon*Con.

Apollyon finished the tournament with a 5-0 record winning the 12 lb class. The floor at Robot Battles consisted of several movable stage pieces placed together to form the combat surface. This unique floor results in large seams and a great deal of flatness issues that would normally render a low wedge like the one used on Apollyon useless. To compensate for the floor, I added large washers to the front bolts that lifted the entire wedge 1/8" off the ground. This combined with the increased traction due to the carpeted surface allowed Apollyon to lift the wedge off the ground under acceleration and drive smoothly over the floor seams.

Video from Robot Battles, as well as many other events can be found on my YouTube page which is located at www.youtube.com/user/mikencr. **SV**

Apollyon after Dragon*Con 2011 with the wedge lifters still attached.

