The Who'sCTEKS

2014 6" AM Wheel Upgrade

Team 716 – Housatonic Valley Regional High School
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The 2014 season gave us a wide open playing field and lots of motors to choose from. We decided to run two CIMs and one Mini CIM for each side of our robot and run them through a single speed gearbox with 6-HiGrip-am-0940 wheels on the front and 6-2008 wheels on the rear at theoretical geared speed of 17 FPS. This combination of power and speed led to an issue of breaking wheels during matches.

We like the AM Grip Wheels for three reasons: great traction, easy to mount sprockets and bearings and great cost. After breaking four at the WPI District and six more at the Hartford District we decided the wheels needed an upgrade.

Most of the wheels we pulled off the robot had broken spokes both at the rim and at the hub. Our driver would drive to the end of the match so the damage seen did not give us an indication of the root cause of failure. We surmised that the rims were breaking first which led to catastrophic failure of the spokes when the wheel lost structural integrity. An examination of the wheels we finished the Hartford District on and those from our 2013 robot backed this up. These wheels did not break any spokes but do have multiple breaks in the rim.

Our solution is to add inserts in between all the spokes. For the HiGrip wheels we added inserts to both sides. For the 2008 wheels we added them to one side. This upgrade allowed us to run the entire District Championship without a single wheel failure.

The inserts are 1/8" polycarbonate. The detail drawing is shown in figure 1. I have included g-code for a single insert in figure 2. To save time, I cut them six at a time on my CNC router laid out as shown in figure 3.The inserts are glued to the wheels. A thin bead of Devcon Plastic Weld is laid on the wheel webs and the insert is pressed into place. I applied glue for all six inserts of one side and placed the inserts. I then let them set overnight before gluing the other side.

This project was designed using Draftsight. The .dxf file was imported into Cut2D for conversion into g-code. I included tabs to hold the part to the base material. I am running TurboCNC on my cnc router. Main parameters used are 1/8" router bit, 30,000 rpm spindle speed, F30 ipm, 1/16" DOC.

References

Polycarbonate – McMaster-Carr, 8574K26, Polycarbonate Sheet, 1/8" Thick
Glue – McMaster-Carr, 66215A26, Devcon, 14320 High Strength Acrylic
Draftsight - http://www.3ds.com/products-services/draftsight/
Cut2D - http://www.vectric.com/products/cut2d.html
TurboCNC - http://www.dakeng.com/CNCconvert.html

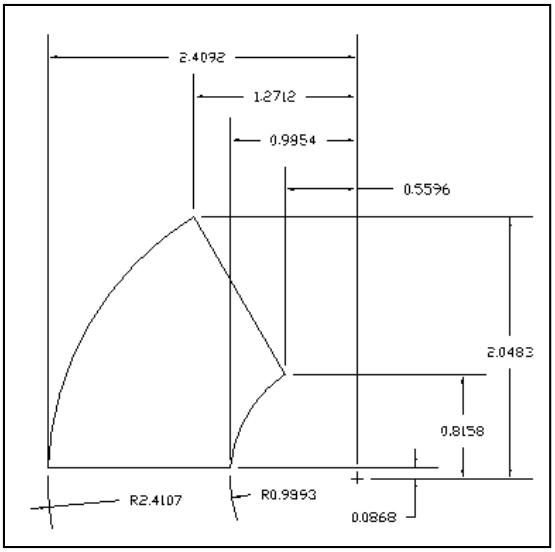

Figure 1

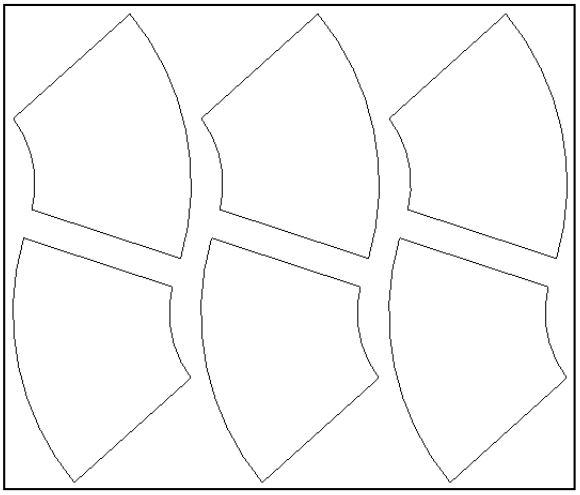

Figure 3

```
( Profile 1 )
(from Vectric )
( Material Size)
(  X= 2.000,  Y= 2.500,  Z= 0.125)
()
(Toolpaths used in this file:)
(Profile 1)
(Tools used in this file: )
(1 = End Mill {0.125 inch})

N180 G00 Z0.8000
N190 G00 X0.0000 Y0.0000
N200 G00 X0.0128 Y0.2715 Z0.2000
N210 G01 Z-0.0650
N220 G02 X1.1802 Y2.2839 I2.4716 J-0.0890
N230 G02 X1.2673 Y2.2620 I0.0330 J-0.0531
N240 G01 X1.4931 Y1.8709
N250 G01 X1.6806 Y1.5461
N260 G01 X1.9789 Y1.0295
N270 G02 X1.9601 Y0.9467 I-0.0541 J-0.0313
N280 G03 X1.5612 Y0.2637 I0.5243 J-0.7642
N290 G02 X1.4989 Y0.2067 I-0.0623 J0.0055
N300 G01 X0.9103 Y0.2067
N310 G01 X0.5353 Y0.2067
N320 G01 X0.0752 Y0.2067
N330 G02 X0.0128 Y0.2715 I0.0000 J0.0625
N340 G01 Z-0.1300
N350 G02 X1.1802 Y2.2839 I2.4716 J-0.0890
N360 G02 X1.2673 Y2.2620 I0.0330 J-0.0531
N370 G01 X1.4931 Y1.8709
N380 G01 Z-0.1100
N390 G01 X1.6806 Y1.5461
N400 G01 Z-0.1300
N410 G01 X1.9789 Y1.0295
N420 G02 X1.9601 Y0.9467 I-0.0541 J-0.0313
N430 G03 X1.5612 Y0.2637 I0.5243 J-0.7642
N440 G02 X1.4989 Y0.2067 I-0.0623 J0.0055
N450 G01 X0.9103 Y0.2067
N460 G01 Z-0.1100
N470 G01 X0.5353 Y0.2067
N480 G01 Z-0.1300
N490 G01 X0.0752 Y0.2067
N500 G02 X0.0128 Y0.2715 I0.0000 J0.0625
N510 G00 Z0.2000
N520 G00 Z0.8000
N530 G00 X0.0000 Y0.0000
N540 M30
%
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Figure 2