The following instructions should help you modify your existing fermentation vessel into a temperature controlled fermenter. The reason I built this setup is because I was tired of my brews getting too hot or too cold during the fermentation process. I wanted to build this without spending the ~$1,800-$2,000 on the ultimate conical you can find on the web (morebeer.com). In all I took my $350 7.3g conical fermenter from Stout Kettles and added ~$150-200 and had the same thing for less than 1/3rd the cost. Now I can ferment any style any time of the year. Most of the things I purchased from my local Home Depot, Tacoma Screw, eBay, or Amazon. I also build my own computers so I had the old PSU from an ancient box. You can use any old computer power supply.

Rob Swanson

***How to modify an existing stainless steel fermenter into a temperature controlled fermenter. Notes from the folks at Stout Tanks and Kettles are noted with STK.***

**Build/Material listing:**

1-Stainless Steel conical fermenter with a thermometer setup.

2-Cold plate blanks (blocks of aluminum). *STK: These are included in the kit offered by Stout Tanks and Kettles. They are milled to match the radius of our fermenters.*

2-CPU heatsinks with integrated fans that "screw" down. *STK: We suggest turning the fan upside down so it pulls air away from the heat sink to improve performance.*

2-Peltier thermo-coolers. I used the TEC1-12709 but you can get bigger ones. They only run a couple dollars for each one (eBay).

1-Old PC power supply (you need the 12v). *STK: To support 2 pcs. 136 watt peltier chips plus two fans, we went with a 400 watt ATX computer power supply.*

1-Sealed heating pad. I had this laying around the house. *STK: We skipped the heating pad – we're looking to cool only.*

1-2 Stage controller (Control Products TC-9102D-HV ~$55). *STK: We found a 120V Johnson Controls unit on Amazon – there are a lot of options for these devices.*

1-2-gang galvanized outlet box with plate for switch & outlet. *STK: We also got some matching clamps to hold the cables snug to the outlet box and the temperature controller.*

1-light switch

1-Outlet (make sure to make each outlet independent by removing the little clips on the side if you are operating a heating pad and cooling kit). *STK: We set ours up to support 2 cooling kits, so we left the clip intact.*

1-Tube of thermal grease which you can get from Amazon or other places that sell computer parts.

1-Bag of zip ties. You really don't need a bag, but just a bunch. I already had the bag from another project.

1-Roll of reflective insulation ~$10.

1-Set of 6"-48" adjustable bungee cords (2-pack) ~$3.

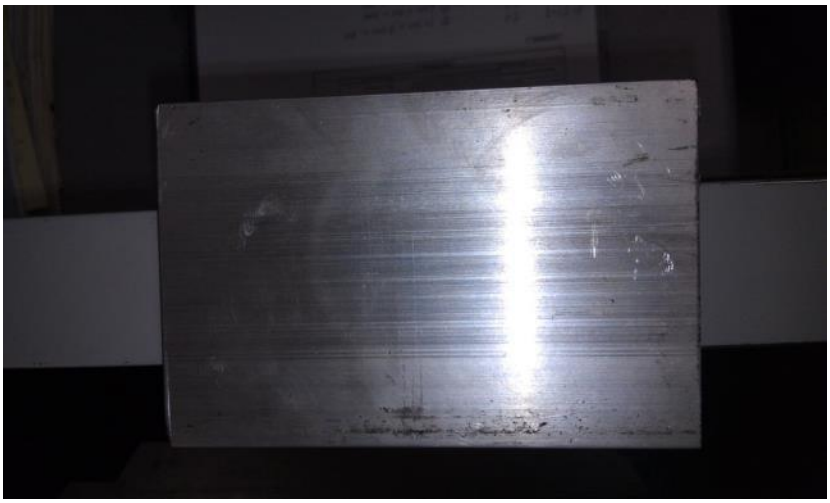
2-AC Plugs and some 14-2 wire. *STK: If you plan to have much distance from your power supply to the peltier chips and cooling fans, you'll likely need to increase the wire gauge size (don't let those skinny wires on the power supply fool you – they're fine for a 4" length, but not for a long run of several feet or more). If your wire gauge is too small, there will be a voltage drop that will affect the cooling performance of your peltier coolers. If you search for "12V DC wire size" on the internet, you'll find plenty of advice. We ended up using 12 gauge stranded wire for ours. We also found a handy "power tool cord replacement" at Home Depot – we used 1' of it for wiring between the switch and the temperature control module and the rest to plug the system into the wall.*

*STK: We also found some connectors on Ebay so we can disconnect the cooling system from the power supply with minimal hassle. If you do this, be sure it can handle the power you are using (e.g., computer type data connectors are probably way too small).*

The instructions below showed how I built my setup, but you might have to use some ingenuity to get around obstacles. Once I had all the parts, it only took me a day or to put it together. Enjoy!

**Making the Cold Plates:** ***STK: Skip the machining steps if you bought our kit***

(2) 1"x4"x6" Aluminum blocks. I bought this at a local welding supply for $20, but you can find it cheaper online or at a scrap yard.



The next step is to mill the aluminum block so that it fits perfectly around your conical fermenter. The best way to do this is to take it to a machine shop with a CNC machine. Bring your conical to them as they will take measurements to ensure a perfect fit.

*STK: We found a local machine shop, but they wanted about $300+ because they needed to program their CNC machine. So we made a batch of them to get the cost way down, which we offer in our kits.*

After it is done milling you can see the curve will fit the conical perfectly.

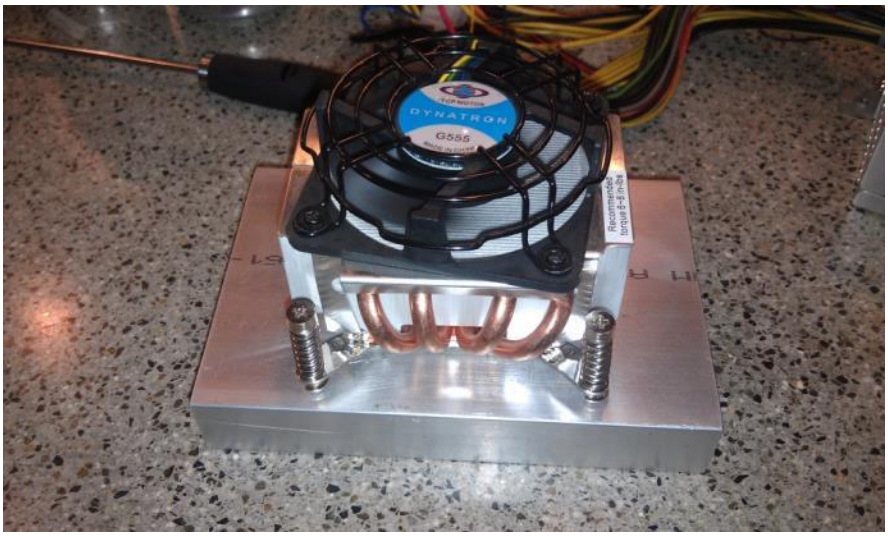
The next step is to tap the aluminum cold plates so that you can attach the CPU heatsinks. The threads on my CPU heatsinks were 3mm so I bought a tap setup for that which cost me ~$18. I used some tape to ensure I only went as deep as necessary as I didn't want to drill through the cold plate. For this I just used my drill press.

I next tapped the threads.  This was a two stage manual process, but was pretty easy as well.  *STK:  This is already done for you on our kit – we sized the block so you can mount two chips and two fans on one block.  We also provide pins and holes to support the chip, so it doesn't slide down due to the vibration of the fans).*

*To install the pins, pinch one end with pliers to crush it and make it as small as possible.  Then insert the crushed end into the hole and press it in.*

*If you lose a pin (they can fly off during the pressing if you lose control of your pliers) you might find a nail or piece of straight wire in your tool box that matches the hole size and you can substitute that.  Worked for me!*

Now that it was tapped, the CPU heatsink screwed right into the aluminum milled block and my cold plate is almost finished!

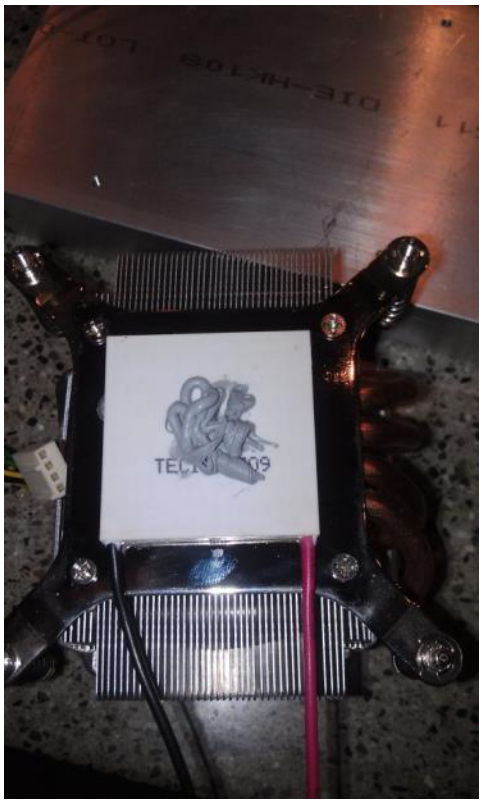



The only issue I had to overcome here was to ensure a tight fit between the Peltier thermo-cooler and the heatsink. One side of the Peltier cooler gets really hot and the other side gets cold (for more information on Peltier thermo-coolers check out Wikipedia). So you have to ensure the heatsink removes the heat and puts the cold on the aluminum. Put lots of thermal paste on the hot side and stick it to the CPU heatsink.

Next attach the cooler to the heatsink. I pre-tested the thermo coolers prior to putting them on by using the PSU. I am glad I did this because the first batch I bought from Amazon did not work. I then bought some new ones from eBay and they worked great. I made sure to write

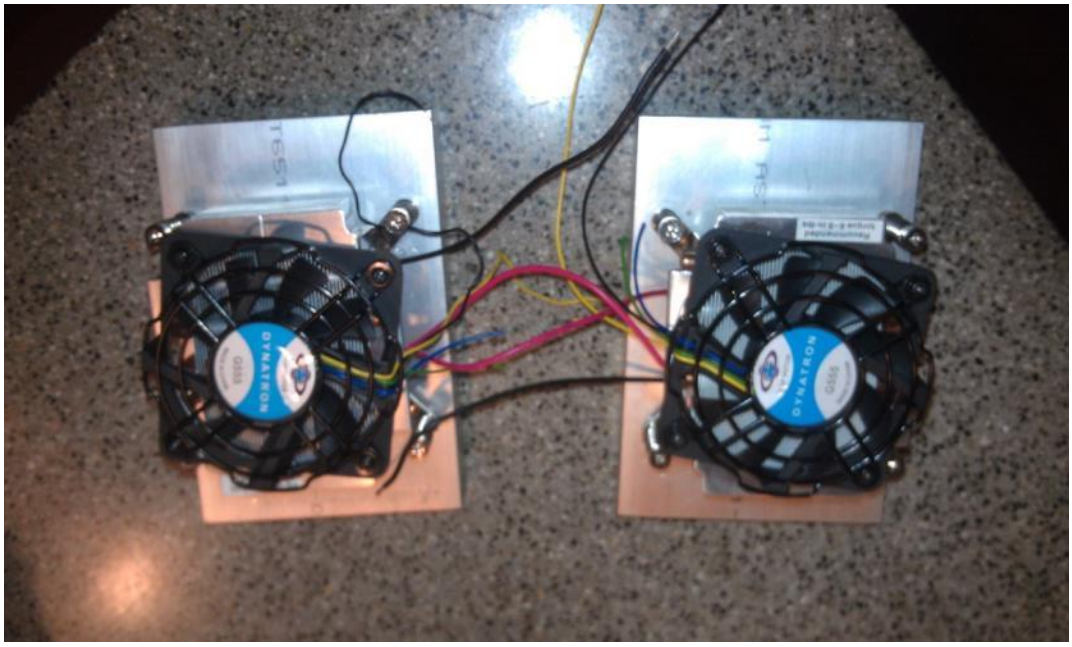
“cold” on the cold side to ensure I put the “cold” side of the thermo-cooler on the aluminum cold plate.


Apply grease to the cold side to ensure a solid contact.



Screw it down (or attach) it to the aluminum blocks and you are done with building the cold plates. *(Be sure the chip is firmly compressed between the fan and the aluminum block).*

*NOTE: You can improve performance by applying the silicone paste between the aluminum block and the fermenter for even better heat transfer.*



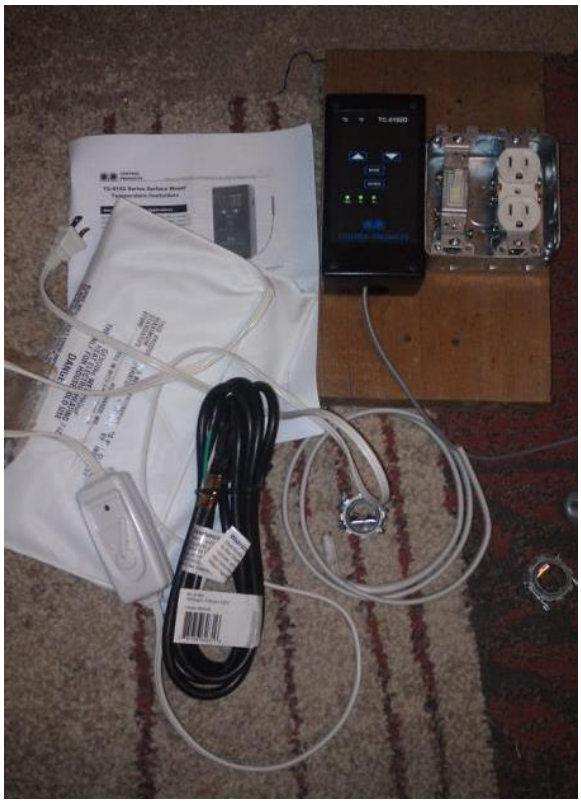

The red wire coming off the thermo-cooler takes 12 volt and the black is ground. The yellow wire coming off the heatsink fan is 12 volt and the black is ground. The blue and green wires from the fan are not needed so I cut them back. I tested my setup to ensure they worked by using the computer power supply. I achieved a 20 degree drop in 10 minutes on the cold plate side!

*STK: Some customers have reported that by removing the fan from the aluminum heat sink and re-installing it upside down, the reverse air flow (so it is pulling air away from the heat sink, instead of blowing air into it) noticeably improved the cooling. We agree!*

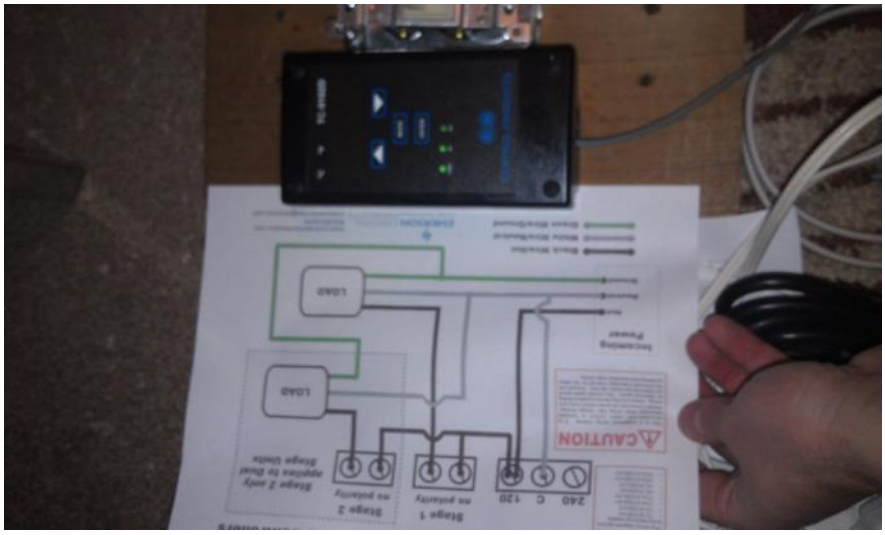
**Setting up the controller:**

I used a block of cedar for my mounting plate (2"x10"x12"), but you could use anything. I wanted something that I could attach to the legs of my fermenter and that could also hold the switch and 2-stage controller. I drilled holes in it so I could attach it to the fermenter with zip ties.

Next I attached the 2-stage controller and 2-gang box to the mounting plate. You can also see the heating pad I am going to use to warm up the conical.



Make sure to download the wiring diagram from the manufacturer's website or you won't know how to wire it up. The following picture is a printout of the wiring diagram.




The next step is to wire up the controller using the 14-2 wire. I actually stripped out the individual wires. The big grey wire is the temperature wire that comes with the controller. I just followed the instructions and it was straight forward.

Now you need to wire up the outlet and switch box. I put a switch on it so I can turn the fermenter on and off. The 2 stage controller has built in memory so you don't need to worry about programming your set points every time.

The bigger black chord on the right is the AC plug. I happened to have an old computer AC plug and stripped it out and hooked it up to the switch. Wiring a switch and outlet is really easy. You can see examples on YouTube. I ran the top outlet to stage1 and the bottom outlet to stage2. You can make each outlet independent by removing a small bridge on the sides of the outlet. Also note that I used the plastic knock-out protectors to ensure the wiring was safe.

Note: I always wire my outlets upside down with the ground facing up.

I then wrapped all the loose wires in electrical tape for a cleaner finish and the control box was completed. After I tested it out, I put silicon on all the openings of the 2-gang box to seal it up.

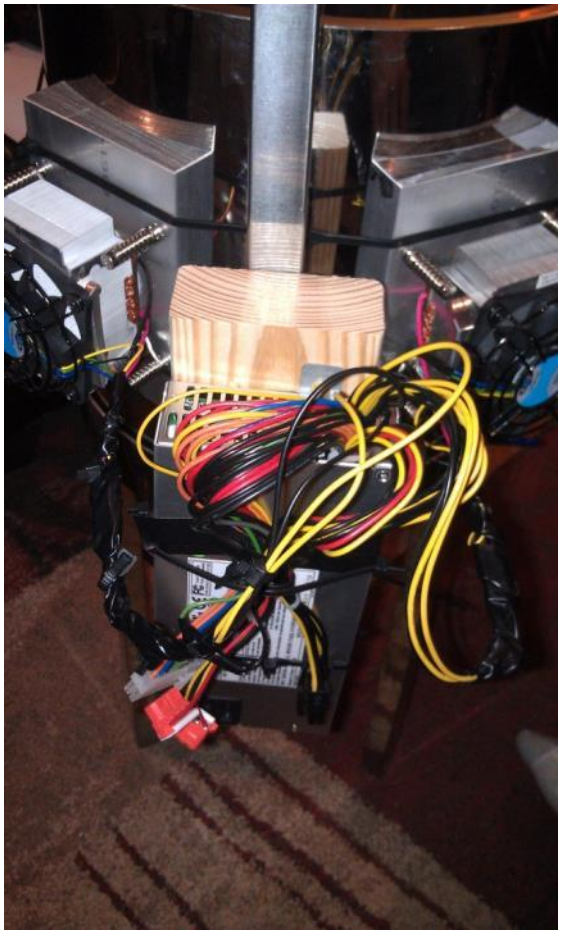
Since I have this on a block of wood and the temperature wand wire is pretty long I will eventually mount this away from my conical on the wall in my brew room.

**Completing the build:**

I attached the control block to one side of the conical' s legs using zip ties.

I then attached the cold plates to the other side of the conical using zip ties. I used zip ties because they were cheap and I could easily cut them and re-attach them. This is important if you want to clean the outside of your conical.

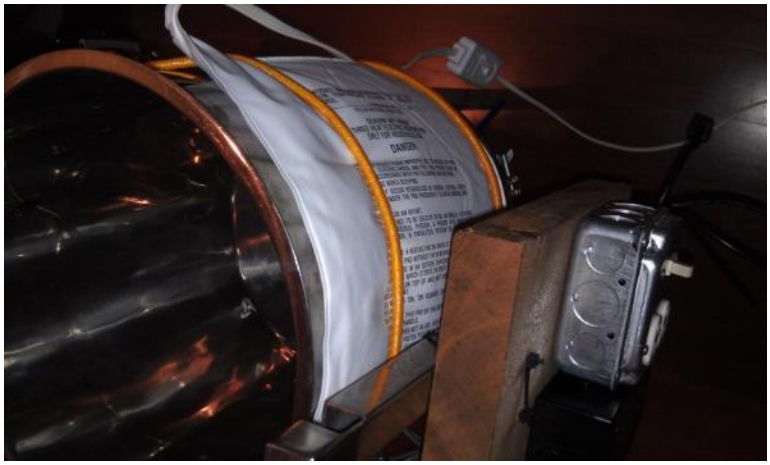
I then had to attach the old computer power supply to this side of the conical frame. I just used a 2"x4"x12" block of wood. The power supplies generally do not turn on when you plug them in. You need to find the "PSU on" wire and ground it out. This is "generally" green wire and you just short it to a black ground wire. You will hear the PSU fans kick on if you get the correct wire. You also need to find four 12 volt outputs and four grounds from the power supply to attach to the newly built cold plates. They will all be "generally" yellow (12v) and black (ground) respectively.



We are mostly complete with the build and just need to attach the heating pad and insulation.

Notice the fermenter I have from Stout Kettles (http://conical-fermenter.com/) has the temperature option. This is where you insert the thermostat from your controller (grey wire).

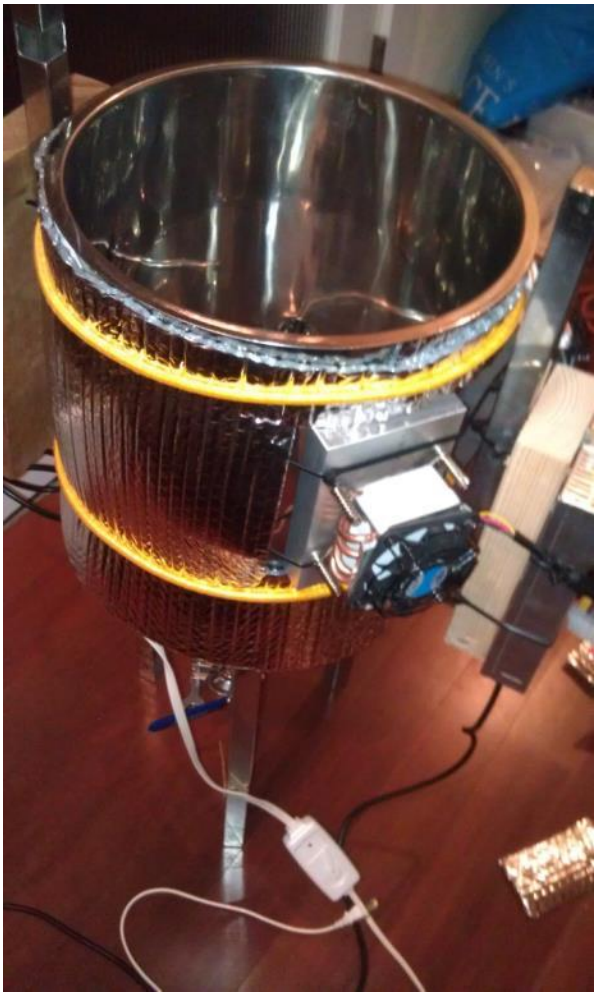
I then attached my heating pad to the opposite side of the conical fermenter. Initially I put the bungees to hold on the heating pad. I then modified this to attach it underneath insulation with the same set of adjustable bungees.



The next step is to cut the insulation to fit.

*STK: We put insulation on top of the aluminum block (except where the chip goes) so that the air from the fan does not inadvertently warm it up.*

I then used the bungees to attach the insulation and heating pad (under insulation) to the conical.



The project is now complete.  After testing it out, it works perfectly!  Below are pictures of the finished product.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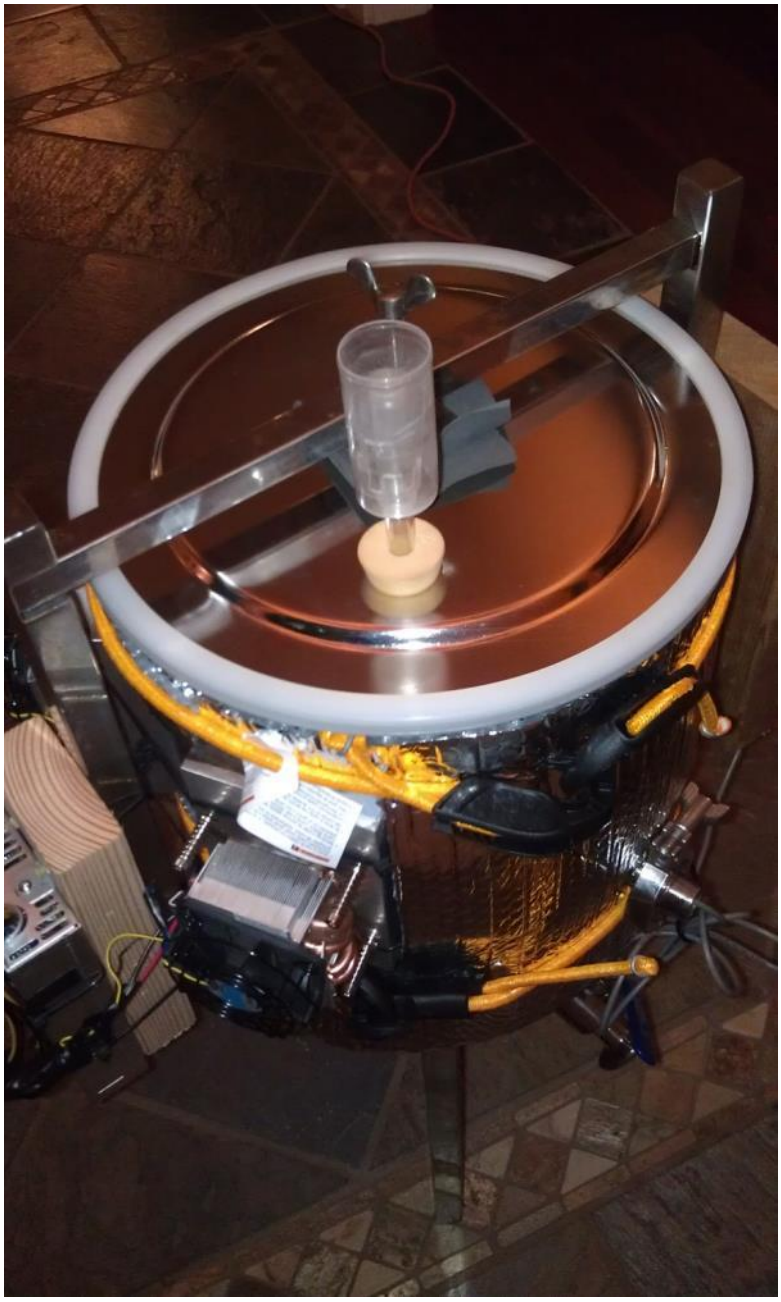

In all I spent less than $200 to build my temperature controller.  I hope these instructions help other home brewers out there.

Thanks,

Rob Swanson