Les Marmitons NEW JERSEY

Build Your own Sous Vide Machine
By Paul Eggermann
Vice President and Secretary New Jersey Chapter
November 21, 2010
Amended June 5, 2012

I first became interested in sous vide cooking during our October 2010 Event when Chef Dan Richer from Arturo's Trattoria introduced us to the method. I did a lot of on-line research and found plenty of info for the Do-it-yourselfer, like me. Without much ado, I found that the basic parts of a sous vide machine included the following:

PID Controller capable of 0.1 degrees C control.
P100 thermocouple
Solid State Relay
Fountain water circulator
Heater of appropriate wattage.
Miscellaneous AC outlets, switch, Ground Fault Switch, plastic enclosure and power cord.

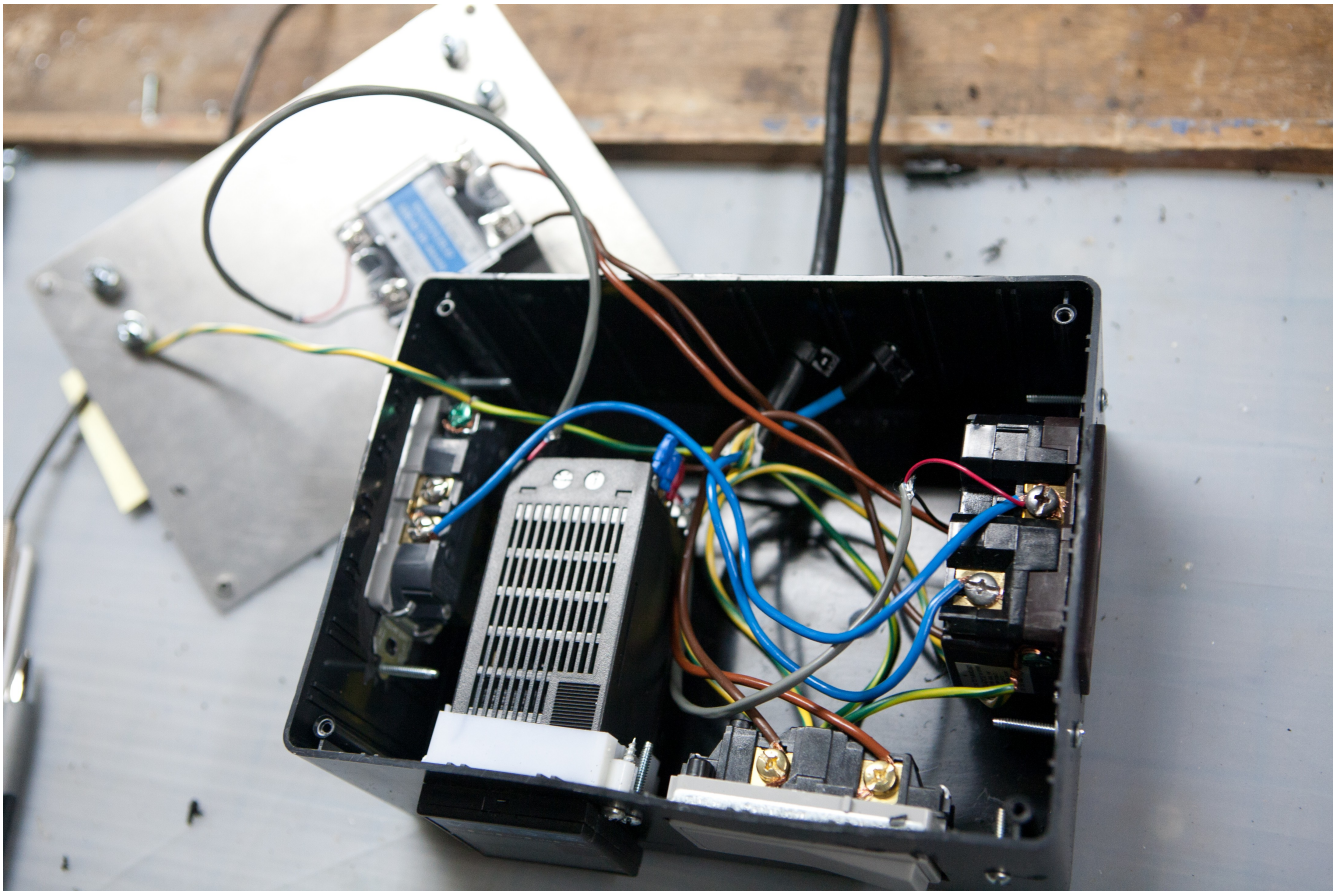
I purchased a PID with thermocouple and solid State Relay for $52 plus $23 shipping on ebay from http://cgi.ebay.com/Sous-Vide-Crock-Pot-Incubator-Temperature-Controller-/110611343094?pt=LH_DefaultDomain_0&hash=item19c0f326f6#ht_2040wt_1139 This auction will probably have ended but you can look up items by this vendor. He will not stop selling these. I also found this controller on Amazon with free shipping after I bought this one.

I purchased a 100 Watt bucket heater from Amazon for $40.01

I purchased a fountain circulator from Avalon Supply on Amazon for $14.47

The rest included a GFS outlet that I had in my shop (probably cost about $25), another plain Jane outlet for $1.99 and DPST switch $2.17 from Home Depot and a plastic box from Radio Shack for $6.99. The cooler is optional since you can move the heater and thermocouple to any container and heat the water with precision. Total cost =$165.63.

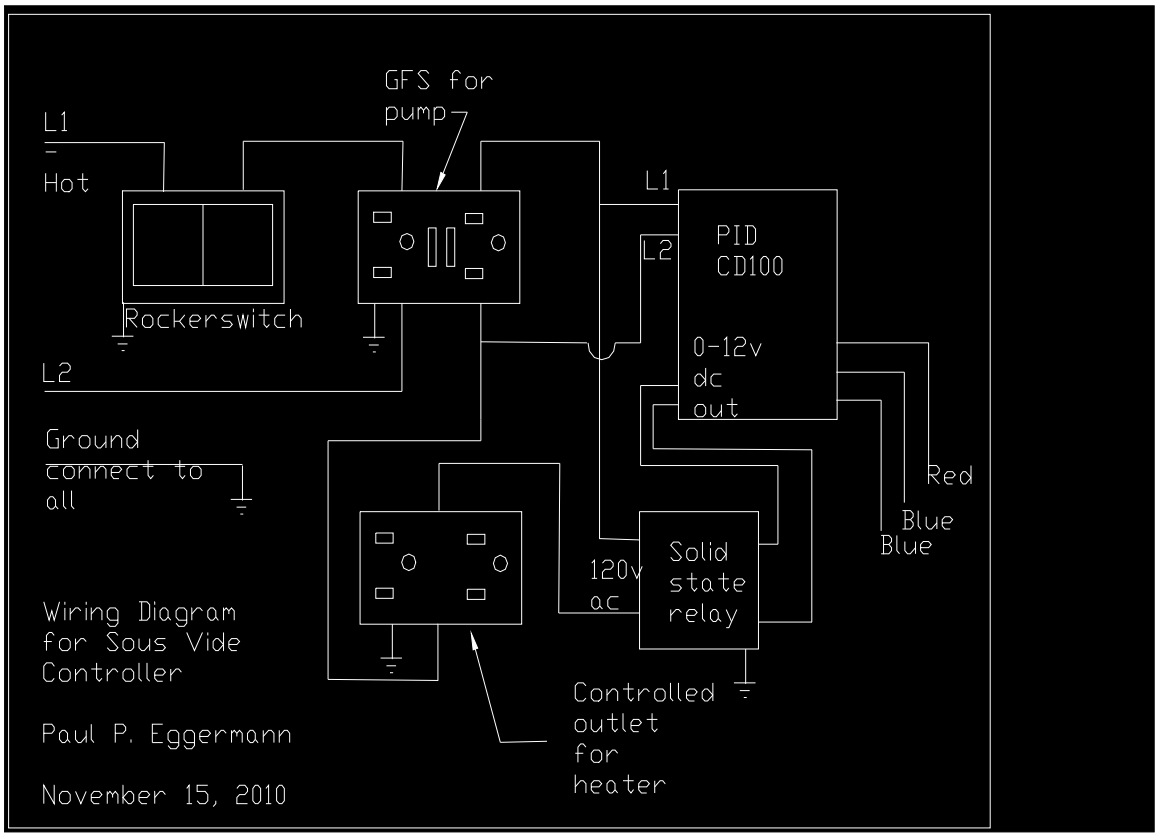
Here are all the parts of the controller. The 16AWG power cord was taken from a dead appliance. It is good to have a multimeter handy to check your wiring before you connect the power and heater and pump.



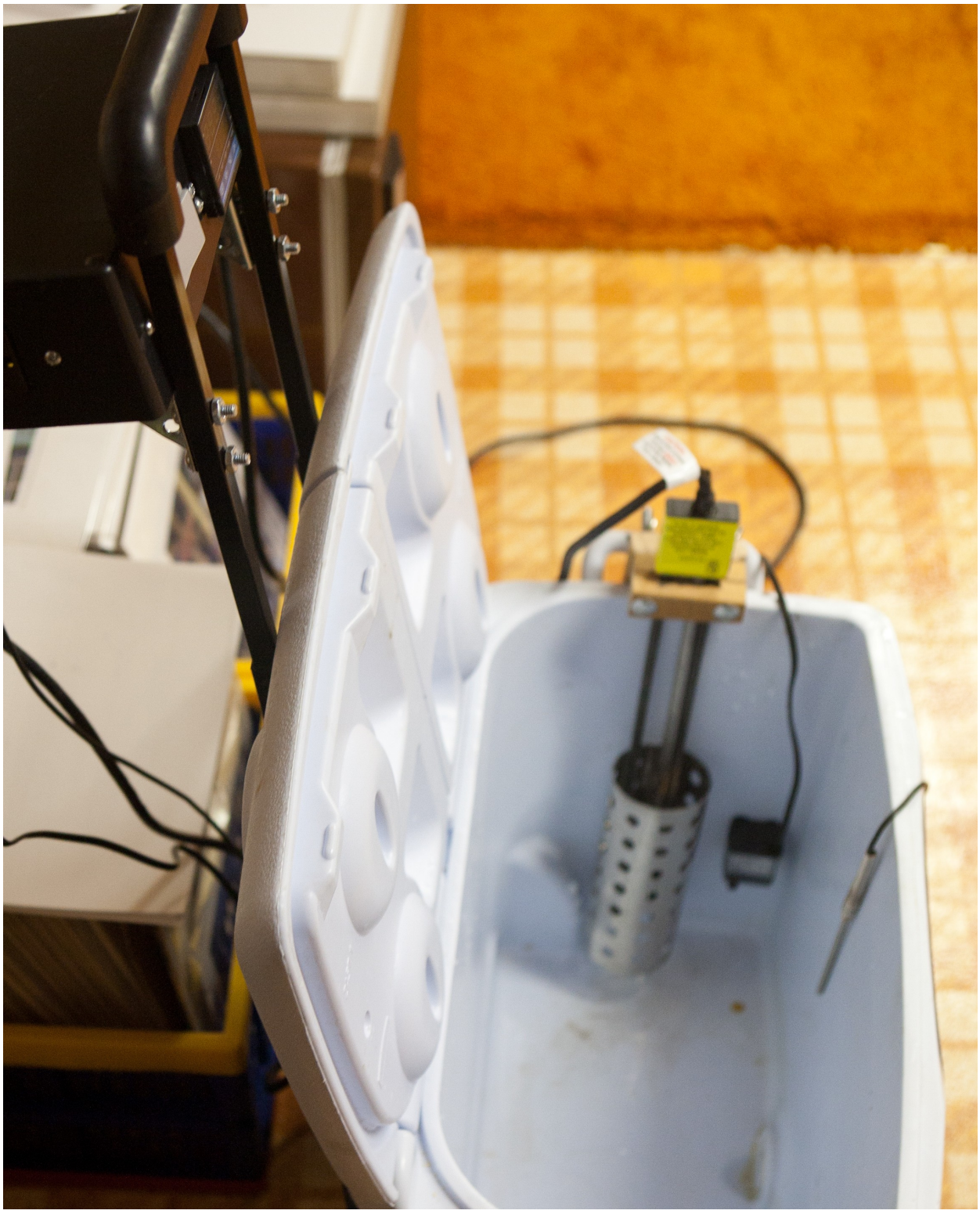
This is a shot of the inside of the control box. The PID Controller is facing the bottom of the picture, The on/off switch is next to it, the Solid State Relay is behind the box mounted on a metal cover that is the bottom of the box.
The relay has a heat sink and I put that side against the metal cover to dissipate any heat from this source. The cover is also grounded as are all the receptacles. There are two receptacles on this box. The one on the right is a Ground Fault Switch that is primary in the wiring. All power is distributed through this switch. The pump plugs into the GFS outlet. It is not controlled by the PID.

The outlet closest to the PID on the left is the controlled outlet and the heater is plugged into this one. The PID reads the temperature from the thermocouple and sends a low voltage signal to the solid state relay which passes 120v to the controlled outlet. As the temperature of the water bath approaches the set point temperature the PID pulses the signal to the relay to slow down the heater to prevent overshooting the set point temperature. This setup allows you to use different size heater(s) for different containers. The bucket heater requires at least 6” of water and will heat a 5 gallon bucket from room temperature to 130F in about 10 minutes.

Here is a simple wiring diagram for this setup:

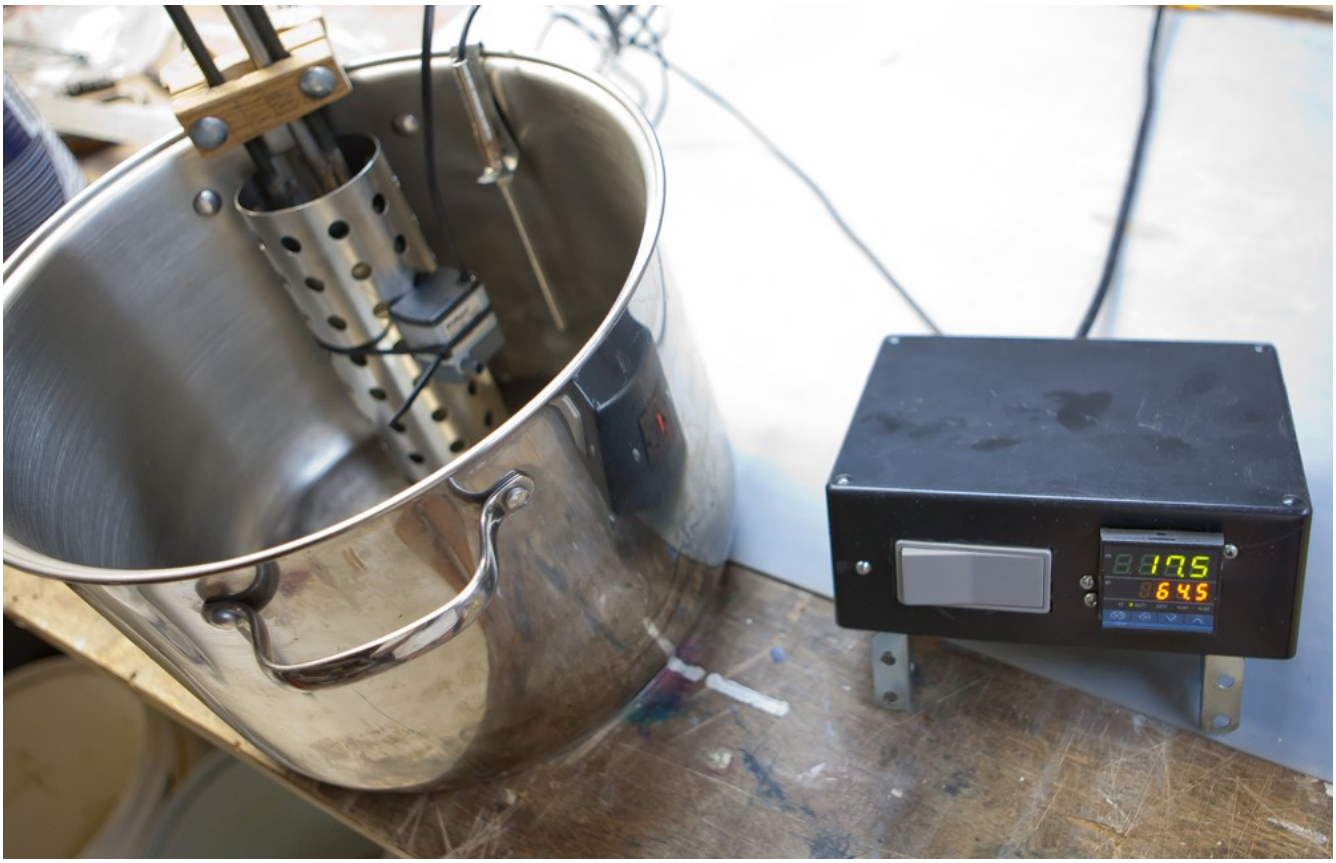


This picture shows the front of the box with the on/off switch and the PID. The box is mounted on the handle of the cooler that serves as the water reservoir in this installation. The box can be removed from the handle and placed on the counter up to 6 feet from the heater. The thermocouple lead is also 6' long so that is the maximum distance for this setup. Longer leads can be ordered if you wanted to have the box further away from the water bath.



This shot shows the heater, thermocouple and pump all installed in the cooler. The wooden blocks that are holding the heater in place are a loose fit to allow the heater to be installed in different sized containers. The only rule is that the heater element must always be covered with water.

Here is another version with the control box on the counter and the heater etc in a large stock pot. I attached the pump to the heater shroud using an electrical tie wrap. You could use a small heater for smaller containers.



Next you need to learn a lot about sous vide cooking. One of the best sources is http://emath.colorado.edu/~baldwind/sous-vide.html . I also purchased Thomas Keller's book Under Pressure at Amazon for under $50. This book is written for the professional chef but you will find a wealth of information.

The best place to start is with eggs. They cook best at 64.5C for 90 minutes. They can be taken out at 60 minutes or up to 120 minutes with a few variations. I prepared 100 eggs for an event we ran in November 2010 and cooked them for 90 minutes to perfection. The shot below is a bit shaky but you will get the idea. I had a dozen leftover that I took home. They reheated nicely by opening the shell and pour the egg into a small pot of simmering water. One minute does the trick and they are great on pasta or a brekfast muffin. They will last at least a week in the refrigerator.

This dish of prosciutto, shaved Parmesan, white asparagus, sous vide eggs and brown butter sauce is a knockout!

Happy cooking,

Paul Eggermann
Vice President-Secretary and webmaster
Les Marmitons NJ Chapter

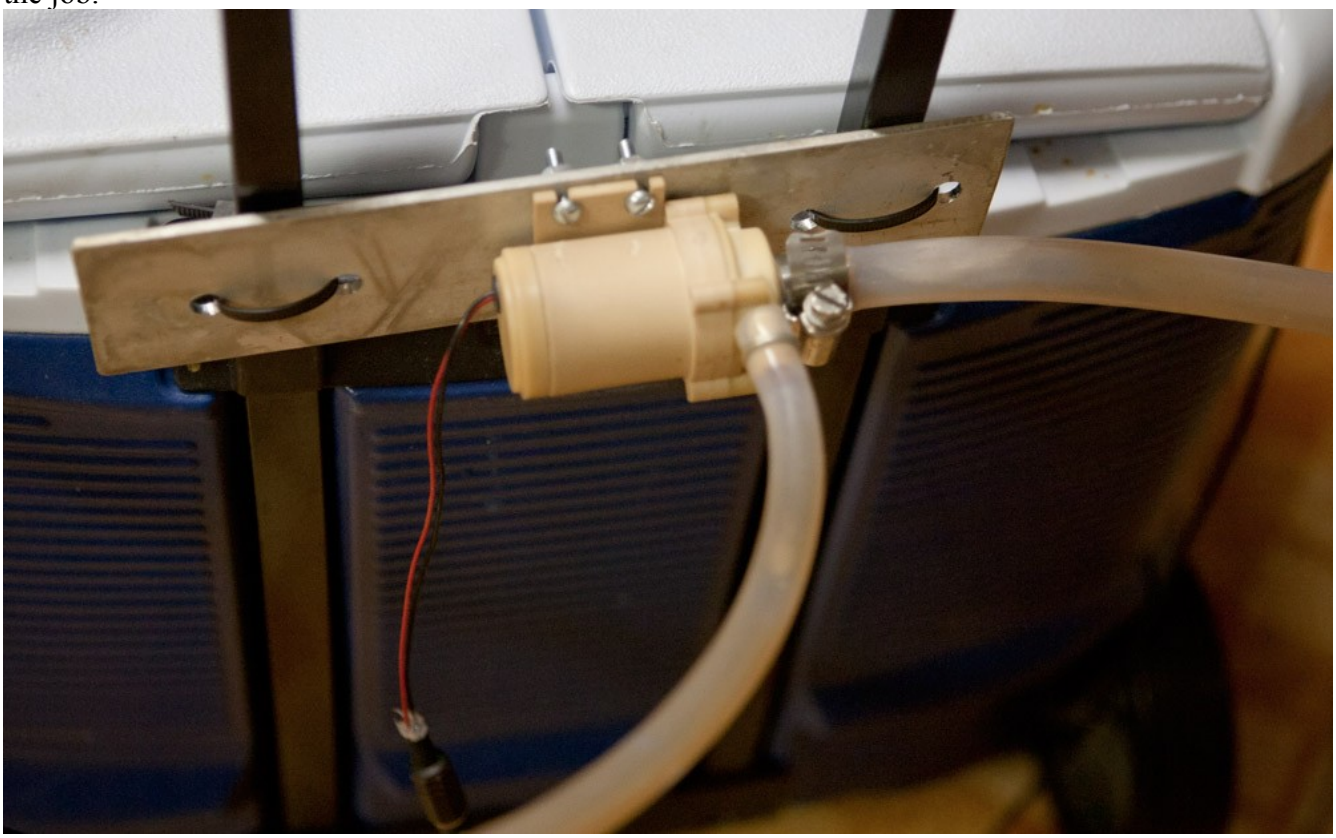
Amendment 1 June 5, 2012

PUMP SELECTION

I found that the fountain pump I purchased initially was okay at temperatures below about 60C (140F), but failed at vegetable cooking temperatures of 83C. The housings softened and collapsed around the impeller, making them unusable. I searched for high temperature pumps and could not find any submersible pumps rated for 80C+. I did find an external centrifugal pump rated at 105C (I haven't tried to pump boiling water with it!)

This pump is sold on ebay from a seller in Hong Kong http://www.ebay.com/itm/DC-12V-Electric-Centrifugal-Water-Pump-109-GPH-P-38E . I bought two since getting a replacement if the first one died could take too long. The first one has been in service over a year now with no problems.

I bought a 2 Amp 120vac/12vDC transformer at Radio Shack and some silicone tubing on ebay to hook it up. At Home Depot I bought a 1/4" faucet hookup extension ath I cut in half and put one half on each end of the silicon tubing to keep it from sliding out of the cooker. A few clamps and tie wraps finished the job.



I mounted the pump on a piece of aluminum and attach it to the cooler with tie wraps. I cut the tie wraps when I want to use it on the stock pot.

This is the front of the cooler with the supply and return lines in place in the cooler. The notches in the cover allow the covers to be closed to minimize heat loss. Another item to do will be to fill the hollow spaces in the covers with foam since they tend to collect a small amount of condensation during long cooking periods. I have not found that there is any appreciable water loss during 72 hours cooking periods and the temperature is stable at all times.

Another item I added to this system is a bunch of 1/2” diameter stainless steel rods that I use to weigh down the bags. They allow you to set the depth of the food in the water bath by proper placement in the bag. For long cooks I double bag the items and put the rods in the outer bag. For single bags I roll them up in the end of the bag and clip the ends to keep them from falling out.

Happy Sous Vide!

Paul