Mr Edinburgh Foody writes on Sous Vide

We have been impressed for some while by the quality of food cooked sous vide by various chefs, including those on The Great British Menu. Sous vide is the term used for vacuum sealing food in a bag, and then cooking it in a relatively low (but very accurately controlled) temperature water bath. The purpose of the vacuum being to ensure a good contact between the water and the food inside the bag, without any air insulating the food from the water.

While there have been cheffy sous vide cookers on the market for a while, they have been prohibitively expensive for the home cook. The most highly recommended commercially available sous vide cooker for the home cook, which was initially only available in North America, and now in the UK is the Sous Vide Supreme which retails for £429, or the Sous vide Supreme Demi at £299.

It was with great delight I found Seattle Food Geek who had found a way of doing a bit of DIY to make a lower cost sous vide cooker. His claim is to make a DIY Sous Vide heating immersion circulator for about $75. So I set about sourcing all the components to have a go myself.

Do give yourself plenty of time to round up the essentials and please read the disclaimers before you start on this project.

Our sous vide cooker and coolbox

Ingredients

All prices exclude postage and packing.

- Control unit/display (eg a PID temperature controller with an SSR (solid state relay) output like the JLD612/TET612. APM Engineering Mall have an eBay shop selling this alone for about £26 or bundled with the solid state relay for about £33). Note that this controller comes with a free temperature probe (K type) which in theory is not as accurate as the PT100, but which could be used instead. In this case connect to terminals 9 and 10 only.

- Solid state relay (£8.49 from Virtualvillage.co.uk or £6.99 from their eBay shop)

- Temperature probe PT100+ (£5.49 from Virtualvillage.co.uk, or £4.50 from their eBay shop)

- Heater – I used a 1000W coffee cup heater from Ebay which I am not recommending as the quality was poor. This one for about £13 may do the job. Depending on the amount of water your container holds a smaller one would probably suffice.

- Circulating pump (£9.90 for an Eheim Compact pump 300 part 13227.0 from Zooplus.co.uk). It is not rated for water bath temperatures, but I have used it for a while without a problem. It is not essential (and I don't think there is one in the Sous Vide Supreme), but ensures a consistent temperature throughout the bath.

- Switch (Something like a simple rocker switch from Maplin at £0.89) -I used an old switch I had available.

- Plastic/wood/metal (or a plastic box) for mounting equipment into

- Wire, connector blocks, and heat shrink sleeving

- Screws/nuts

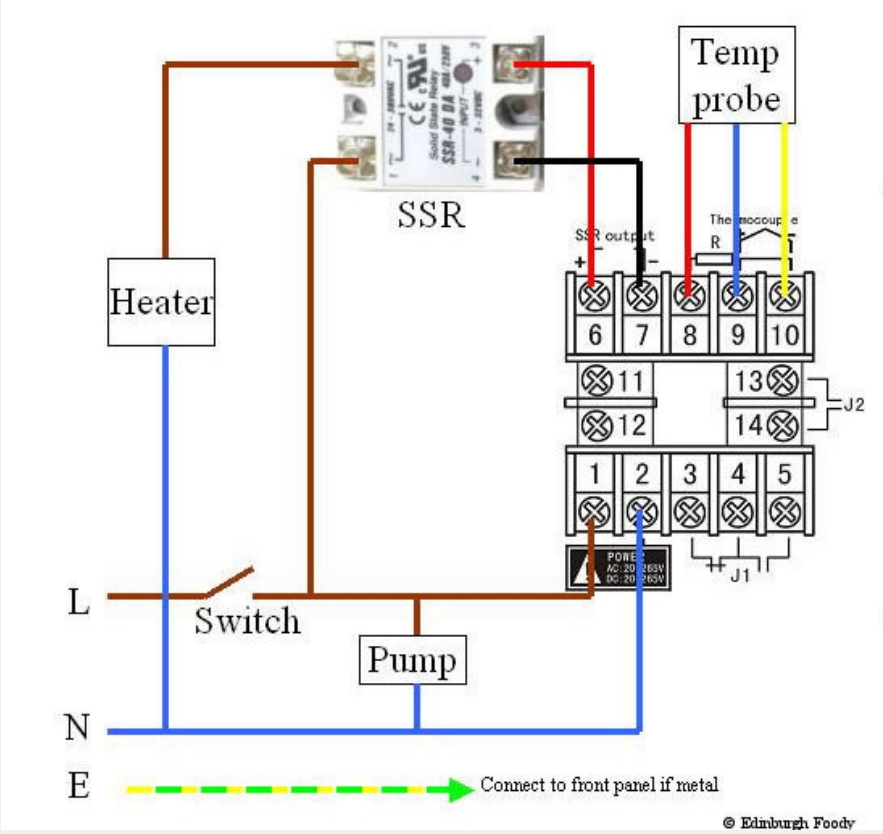
- Bucket/tub/insulated box for putting the water in. (I used an old cool box so that as much heat as possible could be retained. It holds about 11L or 2½ gallons).

- Silicone sealant

- Vacuum sealer – not part of the sous vide, but you will need one to seal the bags of food for cooking. We bought a reasonably priced sealer and bags from Andrew James.

Utensils

Wire cutters
Soldering iron and solder (not essential – terminal blocks could have been used instead)
Screwdriver
Saw (for cutting container / mounting materials)
Hair dryer (for shrinking the sleeving)



Edinburgh Foody Sous Vide Wiring Diagram

Method

1. Decide what container to use for the water bath. This will determine the minimum size of the support for the equipment box.

2. Cut the wood / metal / plastic for the equipment box to size.
   I used a sheet of thin plastic (sold for greenhouse windows) as the main support base covering the whole of the top of the old cool box that I was using as the water bath. I cut this piece of plastic in two, and held the two bits together with small hinges so that I could access the water bath, but also keep it covered most of the time to keep the heat and steam in. (I made the mistake of making this base out of wood to start with, but it got very damp with all the steam).

3. Next cut or drill holes in the base to fit the heater, temperature probe, and the circulating pump cable.

4. Form the sides and top of the equipment box
   I used 4 pieces of plywood about 6" (15 cm) square to form the sides and top of the equipment box. I used a piece of stainless steel about 6" wide by 11" long to form the front of the box, but also to mount the circulating pump on. (This could be made from plastic instead).
   I cut the square hole in the stainless steel front to mount the temperature controller in, and drilled holes to mount the SSR (a good reason to use stainless, as the SSR should ideally have a heat sink, but as it is not handling much power, it may not need to be mounted on metal).
   I drilled holes in one of the side panels to mount the mains switch on and allow the incoming mains cable to pass through.

5. Screw the sides and front of the box to the plastic base, and mounted all the components.

6. Wire everything up as per the diagram.
   I soldered solder tags onto the bare wires that were going to the temperature controller, and the SSR, and covered them with the heat shrink sleeving, although none of that is really essential – the bare wires can make a good connection under the screw terminals.

Setting up/calibrating/commissioning

DO NOT turn the unit on until the heater is immersed in water otherwise the heater will quickly burn out.

The instruction manual for the control unit can be downloaded from the JLD612 manual.

So, having filled the bath with water and ensuring that the heater and the tip of the temperature probe are under water, turn the unit on. The top line of the display is showing the actual temperature, and the bottom line is showing the temperature required.

The first thing to do is to set the control unit to recognise the correct temperature probe. On the control unit, press 'set' and enter '0089', then press 'set' again. [Use the > button to move along the digits, and ∧ or ∨ to increase or decrease]. Press ∧ until 'Inty' shows in the display, and press 'set'. Press ∧ again until Pt10.0 shows in the display, and press 'set' again. 'Outy' should be set to 0002.

Next you may want to calibrate your temperature probe. Do this by putting the probe in ice water and boiling water. (Not forgetting that if your heater is connected it must remain immersed. I temporarily disconnected the heater to do this.)

Once the temperature reading stabilises at each of the 2 temperatures, record the values. Go back into set up mode on the control unit, and scroll until ' PSb' shows in the display, and press'set'. Adjust the value to give an equal and opposite offset at the 2 extremes. Note that the 1st digit can be set to minus. [For example my probe read 99.8 and 0.6 initially. I then made 'PSb' –002 (= -0.2), and checked that I then got readings of 99.6 and 0.4].

The next thing is to autotune the parameters in the control unit. This measures the characteristics of the water bath to give optimum control. This is affected by the size, shape, volume and insulation properties of the water bath, and also the response of the heater and temperature probe, and the target temperature. I found that the whole bath needs to stabilise a bit before starting this.

Set the target temperature by pressing the ∧ or ∨ buttons to about 5° C lower than you normally expect to use it at. Once it has stabilised at that temperature, change the target temperature to what you would normally use, and then press and hold the > button until the 'AT ' indicator blinks.

The unit will automatically do 2 heating and cooling cycles and then store the optimum parameters. You do not need to do anything to save the values. (For reference my values at 60° C are P = 0.7, I = 411, D = 102, but this is unique to my set up).

In use, I have found that the connection of the wires of the temperature probe to their spade terminals has not been particularly good, causing the unit to read either high or erratically. I have taken these apart, and soldered them on to ensure a good contact.

By now you should be ready to go!

Results

We've mostly experimented with cooking fish: mackerel, plaice, barramundi, gurnard, john dory fillet, etc. Most of these have been done for about 50 minutes at 60° C it always comes out very moist and flavoursome.

We have also done beef cheek, mutton valentine chops, duck and chicken with more varied results. More to follow on this!

Disclaimers

The steps we have described above are a guide and provided for information only. You are entirely responsible for your own, and others, safety. Please do not attempt to construct this unless you are satisfied that you are sufficiently competent. Water and electricity can be a lethal mix.

Food should be sufficiently cooked so as to destroy harmful bacteria, etc. Please ensure that you have selected appropriate temperature and time settings. See references below for further explanation.

Prices and availability were valid on 22 March 2011.

References

Sous Vide for the Home Cook – the book by Douglas Baldwin. This is the "bible" on sous vide. However, it is an American publication and the cuts of meat are not familiar!

The technical stuff from Douglas Baldwin's book.

EGullet forum on sous vide. Includes plenty of links to other sources.

Sous-Vide and Low-Temp Primer Part I from the French Culinary Institute. Lots of useful information: temperature charts and pictures of things you would not expect.

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