

Energy efficient fermentation

The presented fermentation device can be used for yoghurt or like I use it to grow effective microorganisms. To grow bacterias like lactic acid bacterias or others we need constant temperatures ranging from 34-36 degrees.

There are a lot of ideas for fermentation devices around in the internet. None of them appealed to me. My fermentation device had to fulfil the following requirements:

- Capacity to grow 10 l of culture
- Low energy consumption
- Easy to adapt temperature
- Hygienic solution with low maintenance effort

I tried different solutions upfront – which were quite disappointing.

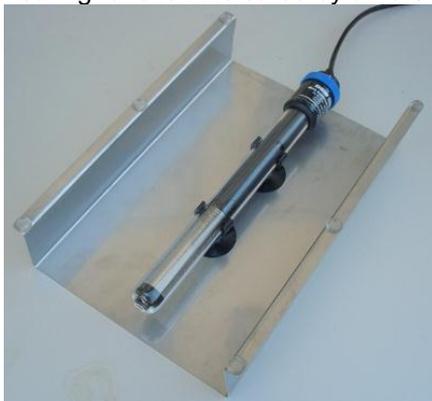
I decided then to build a thermal insulated fermentation device. As the 5l bidons with the gas drainage and the heating underneath are quite high you need a thermal box that is high. Take one that is constructed to hold 1.5 to 2 litre pet bottles.

The Camping Gaz Icetime 30 l has just the perfect measure to house two 5 l bidons. The outer measures (in cm) are: 46 h x 39 w x 27.5 d. The inner measures (in cm) are: 39 h x 35 w x 22.7 d.

The inner height measure doesn't add up the 3.5 cm that the cover exposes. The usable inner height of Icetime 30 l is therefore 42.5 cm.

I found that the fish tank heating systems from JAGER are most suitable. Jager aquarium heaters can be precisely adjusted from 18° to 34°C and readjusted if required with control accuracy is +/- 0.5°C.

The heat is controlled to a constant temperature with the heating function indicated by an on/off control lamp.



These heaters can be fully immersed, and are protected against running dry with an auto switch off.

The special glass jacket enlarges the heating surface and ensures optimum even heat transfer and therefore a smaller heater will heat a large surface of water compared to other heaters.



This special laboratory glass is also free from any pollutants and is a lot less likely to shatter or crack if there is a low water situation.

For my appliance a 50W heater is sufficient. Due to the good isolation even 25W would be more than sufficient.

In the picture on the right you see the whole setup. The heater and the inox metal construction on the floor. Then a 5l bidon with its gas drainage. In your own setup please check that there is sufficient space for the gas drainage to breathe. With this setup we have roughly 5 cm for the inox metal construction (Lochblech), 25 cm for the bidon, 8-10 cm for the gas drainage that adds up to 38 cm. So we end up with 4.5 cm breathing space for the gas drainage when we subtract 38 cm from the available height of 42.5 cm. Be aware that two of these bidons have place in the box. Right on top fits the cover of the thermal box.

The bidons with the nutrient solution for our germs have to stand to at least one third in the water. Due to this setup there is a natural temperature gradient that moves the nutrient.

You shouldn't use calciferous water in the thermal box as this would calcify the whole setup which makes it quite messy to clean.

The inox sheet that hosts the heater is easy to get with a panel-beater. A thickness of 1 mm is sufficient. You just have to take care the heating has sufficient space and that the overall height still matches and you can close the cover. The cover is a must as it closes the fermenter preventing humidity and heat to escape the system. If the cable for the heater isn't too thick you still can close the cover. If not you will have to drill a hole. With this setup it works without harming the thermo box.

Here is my recipe for growing EMA ([Effective Microorganisms](#)):

- 3% EM-1
- 3% Sugar-cane molasses
- 94% Wasser (9400 ml = 9.4 Liter)
- 0.01 - 0.05% Salt (approx. 1 - 5 g)

First dissolve the sugar-cane molasses in warm water, fill the bidon and add the EM 1 and the salt. Close it with applying the gas drainage. Put the two bidons in the thermal box and fill it with water. The bidons have to be at least one third of their height in the water. Close the cover and plug in the cable for the heater. Wait one week and harvest your bacteria.

Have fun with the construction – and happy bacteria breeding.

In case of questions just contact me at gisler@gginfo.com.

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