

# Varroa Oxalic Acid Vaporiser

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## Design Considerations

After some experiments with different prototypes I decided to use an aluminium block and a diesel glow plug as the basis for the vaporiser. The thickness of the material means that the entrance block will need to be removed to get the unit inside the hive.

I wanted to run everything from a 12v battery and decided that rather than using a heavy car battery I would get a small 12v motorcycle battery. As the glow plug draws 5A I opted for a version that is rated at 7A. A quick test connecting the 2 together had the plug glowing red hot in less than 20seconds.



From my research it looks like the Oxalic acid should be fully vaporised within 2-3 minutes. Rather than having to disconnect the power by unclipping the battery connectors I decided to have a switch built into the handle. This makes the wiring assembly a bit tricky but should be a more elegant solution.

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## Parts List

Part	Quantity	Description	Comments
1	1	Aluminium block	42mm x 36mm x 12mm
2	1	Aluminium hollow rod	300mm x 10mm diameter
3	1	Wooden handle	200mm x 40mm square
4	1	Rocker switch with LED	Rated for 12v
5	1	Glow plug	M10 fine thread
6	1	2 core cable	1.5m length
7		Assorted clips	Crocodile & spade clips
8		Heat shrink tubing	
9	1	12v motorcycle battery	Rated at 7Ah
10	1	12 v battery charger	Standard trickle charger

## Fabrication

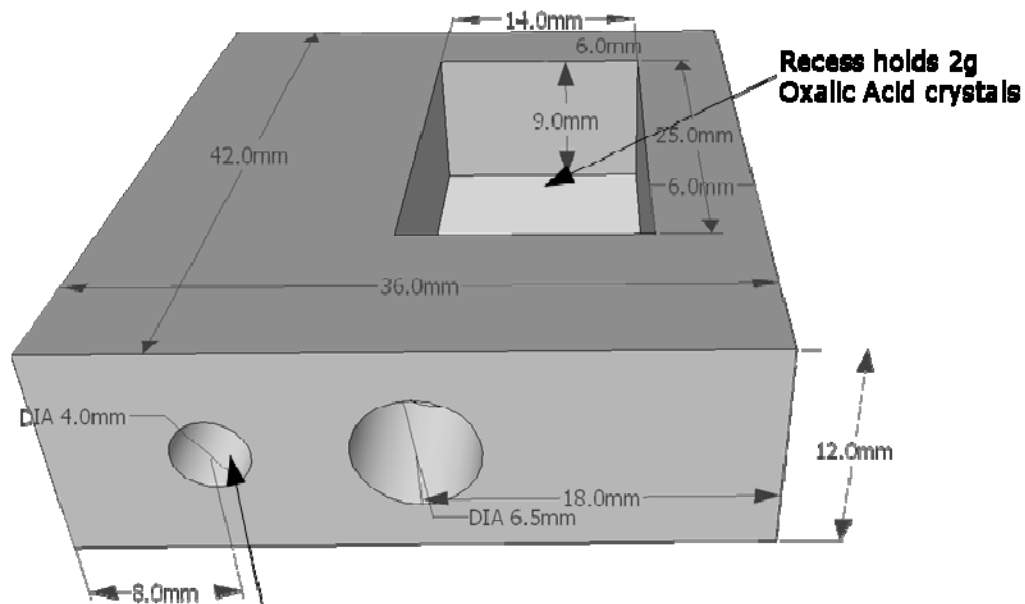
1. Aluminium block –
  - I calculated to hold 2gms of Oxalic Acid dihydrate crystals would require a recess 25mm x 14mm x 9mm deep. In order to accommodate the glow plug I offset the recess (see photo). I had a friend CNC the block for me as one of the prototypes I tried to make indicated I didn't have the correct tools for the job.
  - Drill and tap 2 holes for the metal rod and glow plug. One issue I faced is that the glow plug was M10 fine thread and my taps are for standard threads. However, I managed to buy one for £2.
2. Aluminium hollow rod - screws into the heating block and the handle and so needs threads cut into both ends. The wiring runs through the rod (that's why I chose a hollow one) and a small hole is drilled into the end that screws into the block to connect to the glow plug terminals.
3. Wooden handle turned and shaped on the lathe – Has a hole drilled all the way through for the wiring. A mortise slot is routed into the top to hold the rocker switch. Tapped the end to take the hollow rod.
4. Wiring – very easy to do with spade clips. The only fiddly bit is getting the wiring for the rocker switch in place as there isn't much space. Heat shrink tubing protects all the connections.
5. Used epoxy to secure the aluminium rod and rocker switch in place.

## Testing

Connecting everything up was a doddle and my initial test was with water which boiled dry in just over a minute. The recommended treatment dosage is 2g of Oxalic Acid per hive and this was vaporised in just over 2 minutes. I have mesh floors so I will conduct some tests to see if the treatment can be successfully applied from beneath the hive floor. I think that I may find the vapour condenses on the mesh rather than going up through the hive.

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**Aluminium Block - Weight  
45g  
holes tapped to 10mm for tube and  
glow plug**



**Hole for glow plug drilled to depth of 38mm at 4mm, then drilled out to 6.5mm to a depth of 25mm and tapped for M10**

