# The Tiny Oat Collider version 1

**Stage:**
25/11/2021 V1 - Ready to Build

**License:**

.

**Description:**
Complete instructions for making a small oat dehuller - nicknamed the “tiny oat collider”. The dehuller is a vertical shaft impact dehuller.

**Build Guide:**
The development of this open source design was funded by the Gaia Foundation seed sovereignty project. A presentation outlining the design development and prototype development is available here:-
https://www.seedsovereignty.info/events/seed-gathering-2021/
https://player.vimeo.com/video/641850070?h=e2e2ed9d1f

**Documentation:**
A full set of CAD drawings is appended as follows:-

| Dwg No | Dwg Name |
|---|---|
| DH_V1_001_r1 | General Assembly |
| DH_V1_002_r1 | Impeller |
| DH_V1_003_r1 | Shaft |
| DH_V1_004_r1 | Impeller Cone |
| DH_V1_005_r1 | Impact Ring |
| DH_V1_006_r0 | Enclosure |

**Sourcing Components**
The full bill of quantities is located on the general assembly drawing. Suggestions on where to procure the parts (in the United Kingdom) is available in the below table:-

| | |
|---|---|
| Drive Motor | https://www.mmengservices.co.uk |
| Speed control - Wide V-belt, control pulley, spring pulley and control device | https://www.berges.de/en/berges/ |
| Hardware - fixing disc, set screws, circlips, bearing unit, nut, key etc | https://uk.rs-online.com/web/ |
| Machined components - impact ring, shaft, impeller, impeller cone | Search for “precision machining” service in your local area https://www.yell.com |
| Enclosure | Search for “CNC wood routing” service in your local area https://www.yell.com |

**Electrical disclaimer**

In addition to the disclaimer of warranties and limitation of Liability inherent in the creative commons Attribution 4.0 International licence, note this open source design requires electrical components connected in a safe and appropriate manner. As such it is recommended to use an electrician who is a member of a registered competent person’s scheme and therefore experienced and qualified to connect the components in a safe manner and ensure compliance with the relevant electrical safety regulations where the equipment is located.

**Operating Advice:**

The following points should provide a good starting point for your own dehulling adventures:-

1. Clean and grade your seed (by winnowing/screening) into clean seed of consistent grain size & weight.
2. Check the moisture content of the grain - condition to 16%.
3. Calculate the thousand kernel weight (tkw) of your grain, to establish input rate.
4. The rpm of the impeller will dictate the infeed rate. Based on a 40g tkw the following input rate to ensure each grain strikes the impact ring:-
    a. 610rpm - 310g/min
    b. 1500rpm - 750g/min
    c. 3105pm - 1500g/min

5. Pass the grain through the dehuller. Turn the speed up if the impact is not dehulling the grain; turn the speed down if the impact is damaging the grain. Try to find the point just below grain breakage.

6. Winnow and screen the grain between passes, and if possible screen off hulled grains to prevent damage.
7. Typically it requires 2-4 passes to achieve high dehulling rates. Typically the speed can be reduced on the latter passes, as the hull becomes looser.

**Suggested Adaptations:**

This open source design licenced under the creative commons licence allows others to adapt, remix, transform and build upon the design. Some suggested adaptations are outlined below:-

Variations for Impeller Speed Control

- Fixed diameter pulleys - the design could be adapted for a single fixed speed by replacing the variable speed pulleys with fixed diameter pulleys.
- Stepped pulleys - the design could be adapted for several fixed speeds by replacing the variable speed pulleys with stepped diameter pulleys.
- Three phase motor & VFD - the design could be adapted for three phase motor & variable frequency drive (VFD), by replacing the variable speed pulleys with fixed diameter pulleys, and by replacing the single phase motor with a three phase motor & VFD.

Variations for Power Source

- The power source could be changed to human powered (either hand cranked or pedal/treadle powered, with the addition of a suitable gear train & linkage.
- The power source could be changed to tractor power take off (PTO), with the addition of a suitable linkage or drive pulley. It would likely require the enclosure to be constructed as a fabricated steel weldment.

Variations for computer aided manufacture (CAM)

- The impeller could be changed from a machined & mechanically fastened sub-assembly to a 3D printed polymer single part. This would require 3D modelling the impeller & selecting an appropriate 3D printing medium.
- The timber enclosure (designed for CNC routing from a single standard sheet of plywood) could be improved for simpler assembly/disassembly through the introduction of more complex joints.