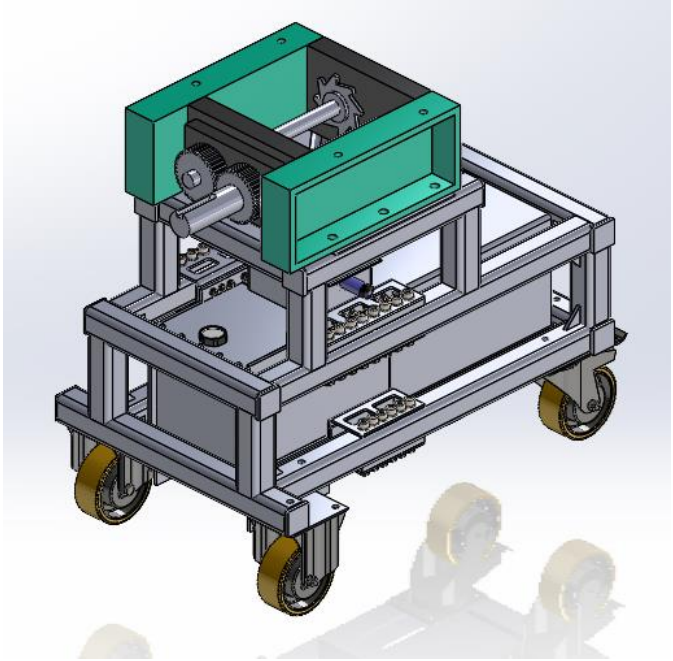
Shred-Packer documentation

By Oscar Meunier



Intended use

This is intended to give you an overview of the folders, assemblies, and parts to help you get started with the project. I recommend making a copy of the “ShredPacker” folder and working from there.

I have designed this documentation for someone who might only have a small amount of CAD experience. If you already have a good base feel free to skip the “Before you start” step.

Note: The names of some files have spelling errors but changing names of files in Solidworks is tedious.

Before you start

I began this project in the middle of my 3rd year of university. This being my first engineering work experience, I would have liked some guidance for understanding the Solidworks workflow properly which is why I have made this section.

Make sure you understand the following concepts as it will help you be efficient in your design procedure:

- Difference between a body, part, and assembly
- Top-down vs bottom-up design
- Save-Bodies feature
- Solidworks file management

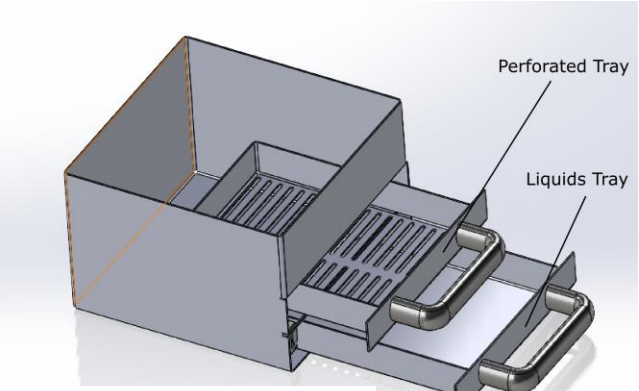
Below are some links to tutorials that will help you to understand these concepts:

- Top-Down Design
- SOLIDWORKS: In-context Design
- Advanced SOLIDWORKS Tutorial: Multi-Body Parts
- SolidWorks Training : File Management

I also recommend you read the Solidworks Documentation and watch any additional tutorials you feel that you need.

Introduction

The objective of the shred packer is to be a compact waste processing unit. It shreds waste into 15mm wide strips which fall into the compaction chamber. It then compacts them into a puck that is then dropped down by a flush sliding door. In other iterations it is dropped into a perforated tray that allows liquids to drip into the liquid tray as you can see below [INSERT PROCESS CHART]:



Trays used to seperate solid from liquid waste.

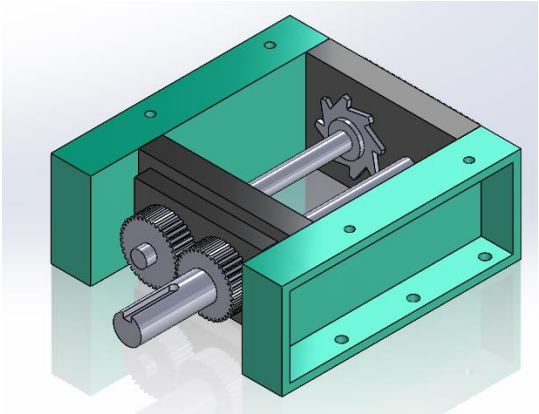
It should be able to shred any waste, including metal cans and glass bottles. It is also important that the machine be as small as possible whilst still performing the adequate function.

Components

The top-level assembly is "*\CAD\FullAssembly_Telescopic.SLDASM*" and contains all the components.

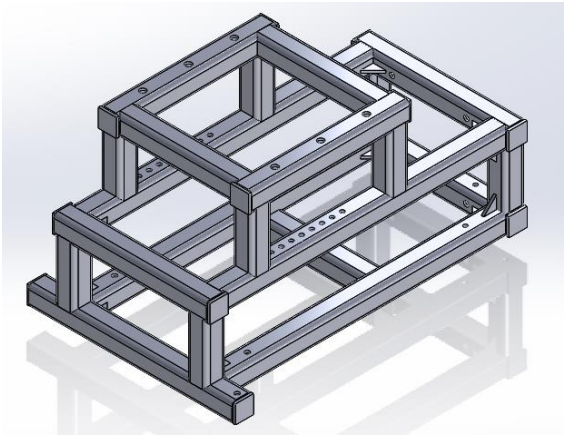
Shredder

There are a few manufacturers on Alibaba that make shredders, as far as I can tell a lot of them are based off the same design this is the YSD180 although it might also be called EB180. The contact that I was using is helen@ysdcnc.com, make sure to introduce yourself. The figure below is modeled after the spec sheet you can find in the file located in: "*\SpecSheets\YSDCNC shredder EB-180TYPE.pdf*". Helen has already **quoted $1700**, including additional housing components (see spec sheet). The figure below is just the "knife box" although **we will also be using the motor provided with it, which I have not modeled**:



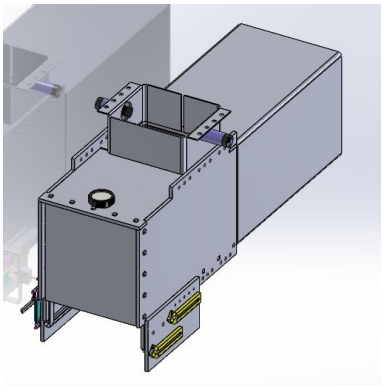
Chassis

This is used to mount all the components. The cap ends are there to prevent bacteria traps. I would recommend contacting clyde side sheet metal to get a quote as well as a manufacturing evaluation once you believe there is nothing left to be added although the choice of manufacturers is entirely up to you. In its current state it is built using a **3D sketch and the Weldments toolbar in context with the assembly, it is stored as a virtual component (saved within the assembly)**. This must withstand a strong longitudinal force of around 12 kN and hold all components in place.



Compactor

Below is the full assembly for the compactor. This can be found at: *"\CAD\SubAssemblies\Compactor_Telescopic.SLDASM"*. This assembly has a lot of components, so I have broken it down further for clarity.

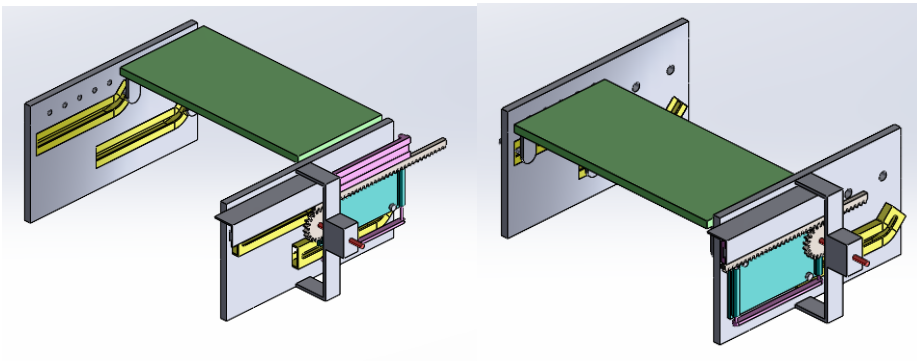


Sliding door

This model was inspired by this sliding door. This design was chosen as it needs to be flush with the compaction chamber. The subassembly can be found at *"\CAD\SubAssemblies\SlidingDoor.SLDASM"*. The parts in this assembly are exported from *"\CAD\Part_Pre-export\FlushSlidingDoor.SLDPRT"* so **to alter it, make changes to the part file, not the assembly**. You can use the global variables to easily change aspects of the part:

Global Variables	
"slot_DistanceFromOuterShell"	= 5
"SlotRadius"	= 2
"DoorMovementHeight"	= 6
"DoorHorizontalTravel"	= 70
"DoorLength"	= 70

The main ones to use are "DoorMovementHeight", "DoorHorizontalTravel" and "DoorLength".



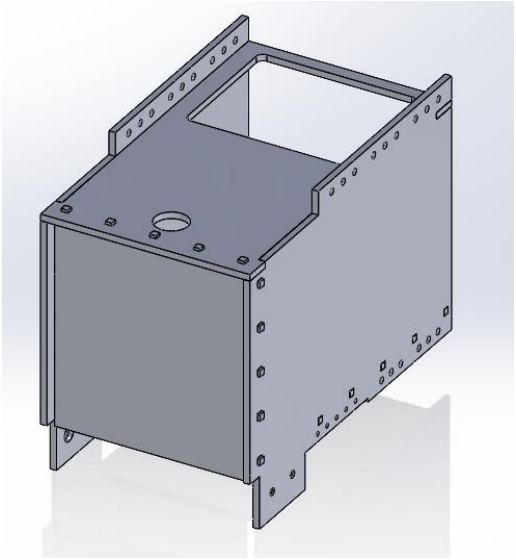
The door is operated by a rack and pinion. You will need to **choose an electric motor** to rotate the pinion. It needs to be able to break once the door is closed.

You will also need to **choose slides that meet the criteria** of this sliding door. These need to be suited to a **dirty environment and a force of at least 200N** normal to the door.

Compaction chamber

The compaction chamber is constructed using 4 plates of metal. These need to be thick to withstand the strong forces present in the compaction. For this reason, they cannot be formed by bending sheets and will be cut using some form of CNC cutting. The tabs are welded to create a robust structure. This can be found at "*\CAD\Parts\Compactor_Parts\Tabed_chamber.SLDPRT*".

This structure has not been checked by the manufacturer so you will need to **find out whether this is feasible** and consider changes/improvements to make.

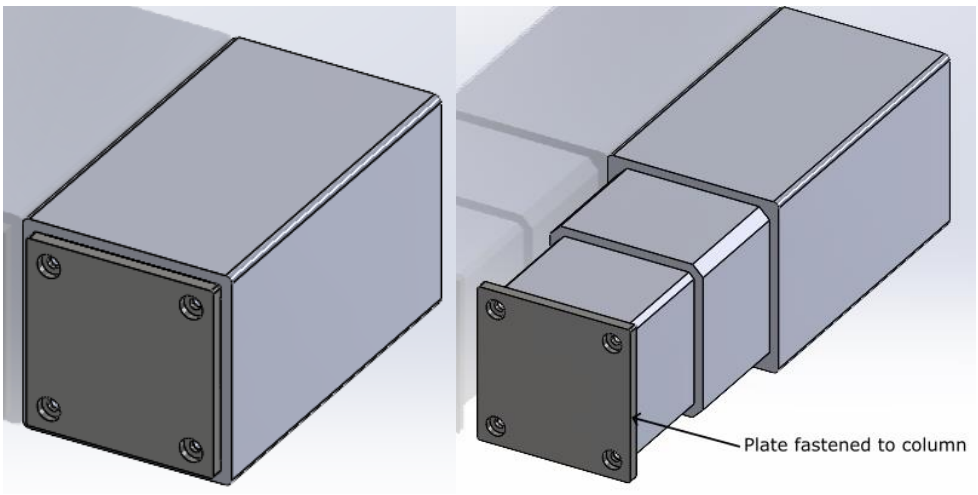


Lifting column

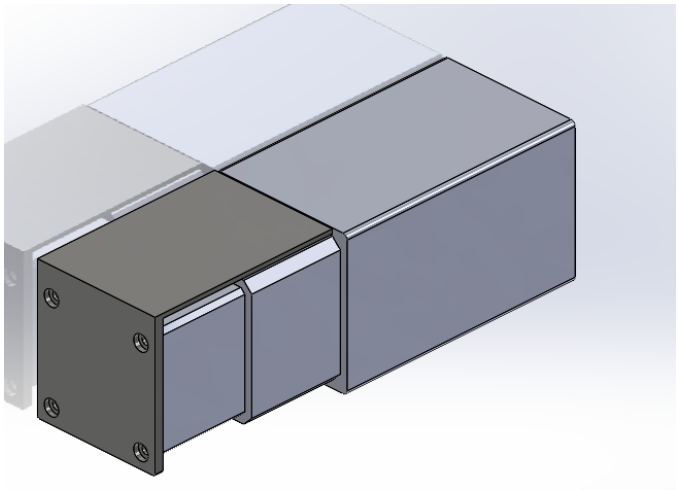
Below is an A13 electric, telescopic lifting column from here. You can see that it produces a **force of 12 kN** which is the highest I have found whilst considering the size constraints of the shred packer. An additional plate is fastened to the front to **prevent dirt from reaching the joints**. To improve upon this, you will need to find a way to prevent this further. **Piston scrapers** could be used, you will probably need to have them custom manufactured.

This assembly is exported from *"\CAD\Part_Pre-export\Telescopic comumn isotechnic.SLDPRT"* so, to **make changes, edit this file**.

Note: There is a chamber in this part file, but it is replaced by the "Tabed_chamber" in the "Compactor_telescopic" sub assembly.

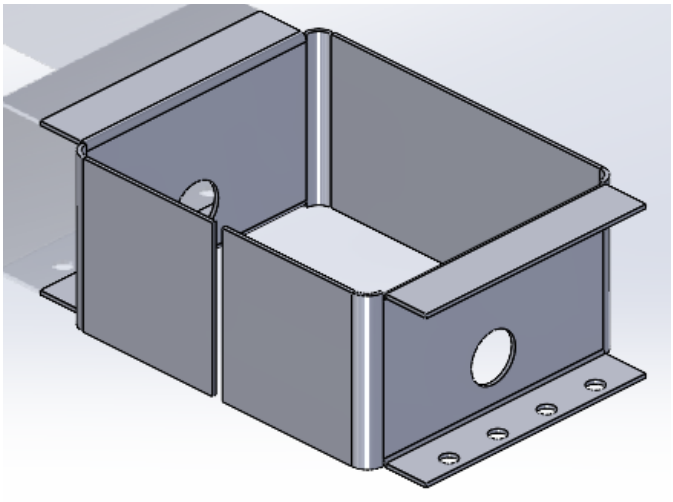


An overhang could also be added to stop debris from falling onto articulations when it is extended. Look at the figure below to help you understand. This was something I made quickly; you will need to find a way to guide and support the overhang to prevent bending.



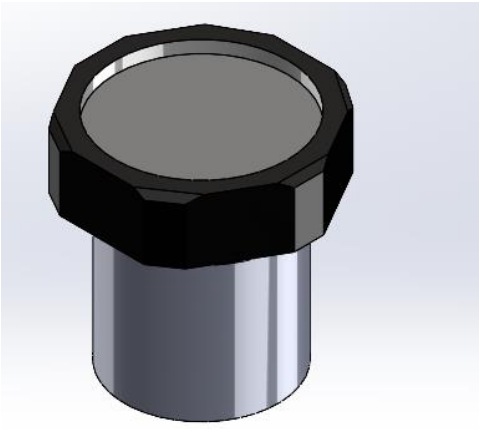
Sensor housing

This holds both sensors to detect buildup of waste before compaction. It is a straightforward sheet metal component. This is exported from the *"\CAD\Part_Pre-export\Telescopic comumn isotechnic.SLDPRT"* part file.



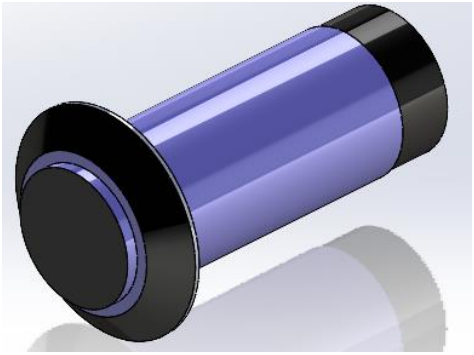
DLD12886 – Outward valve with gasket

This **allows air flow out** of the compaction camber to prevent pressure build up. You can find the technical drawing for it in "\SpecSheets\bld12886_inst_iss_02_1.pdf". I have also been told that the length can be reduced so that it is flush with the compaction-chamber wall.



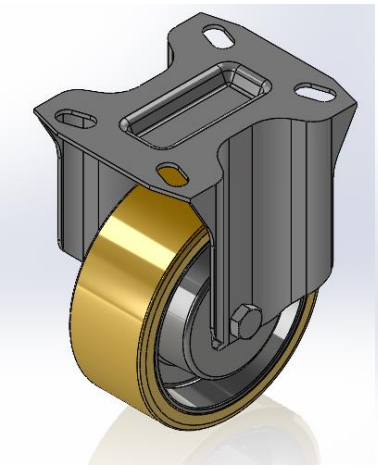
S15-PANA-5 Tubular photoelectric sensors

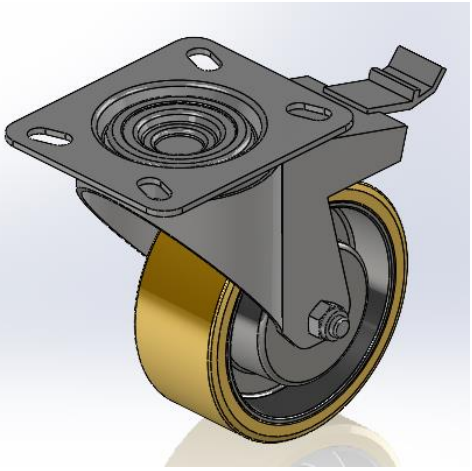
2 sensors are fixed in sensor housing and are modeled after *"\SpecSheets\S15-PA-5-M01-PK.pdf"*. They **detect buildup of waste to activate compaction.**



Castors

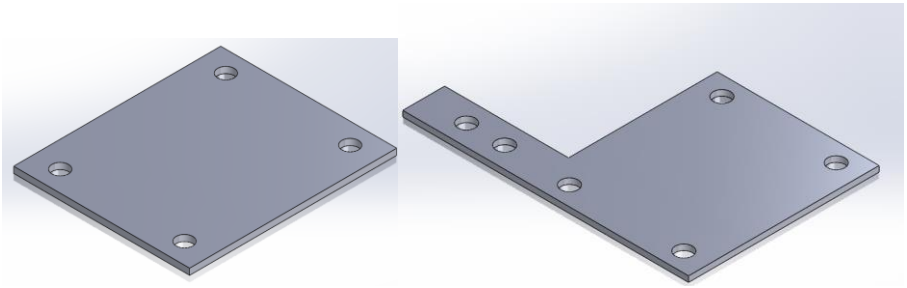
These are from here and they are the models RE.F4-100-PSL-H(left) and RE.F4-100-SSF-H(right). The **mounting for these wheels needs to be worked out** as the current configuration lacks structural integrity. These were chosen when the design was much heavier than it is today so they **may be overkill**.





Brackets – Wheels

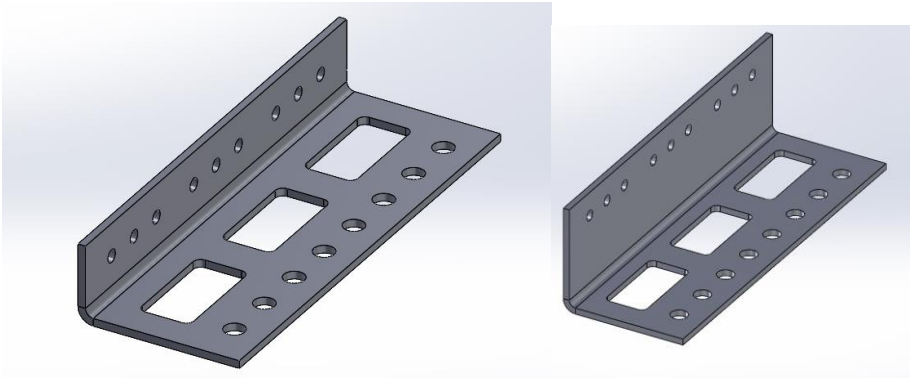
These are a new addition and are supposed to help mount the wheels. **I am not sure they are necessary**. They are also saved in the context of the assembly. It might be a **good Idea tom recreate these in their own part files** as it would reduce conflicts context. The front wheel uses the bracket on the right and back wheels use bracket right.



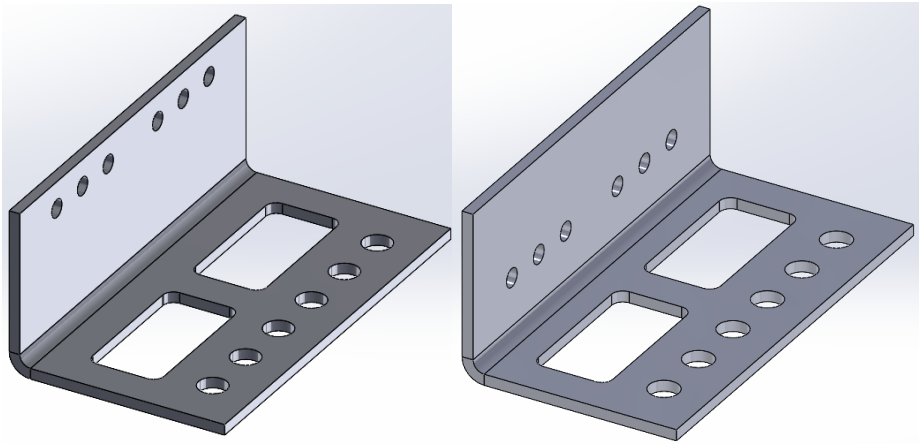
Brackets – Compaction chamber

These brackets **fasten the compaction chamber to the chassis**. They were made within the assembly so that adjustments in the compaction chamber updated the parts. The **rectangular holes enable the unit assembly** as it allows a hex key to pass through. They are made using thicker sheet metal than other components as they are load bearing.

Brackets 1 & 2

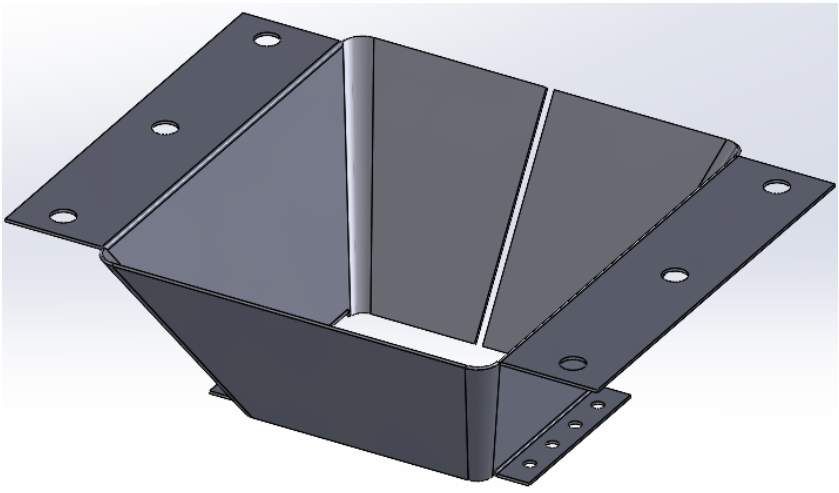


Brackets 3 & 4



Hopper

This funnels the waste into the compaction chamber. It is another simple sheet metal component. The **bend angles are too precise and need to be altered to be feasible**. This part is created within the top-level assembly. This is useful as it changes depending on the distance from the top of the compaction chamber and the bottom of the shredder.



Closing remarks

I may have gone into a lot of detail but as I am unsure of your experience level, I thought this would be better. I have worked on this project for 8 months now, and in that time have learned a lot and hope that you do as well.