

BUILD-IT

Corn Sheller



This project is a low-cost device for removing corn kernels from the cob. It is made from a piece of sheet metal which is formed and then joined together. This device was developed by Marco Villagarcia, an engineer from Cusco, Peru, based on an injection molded plastic corn sheller from Malawi. It is made from a single piece of sheet metal. To make it, you will learn to use a spot-welder, a rivet gun, the OMAX water jet cutter, a bending jig and a variety of sheet metal fabrication tools.

Materials Needed

Steel Sheet Metal
Rivets
Nails

Tools/Machines Needed

Water Jet Cutter
Bending Jig
Spot-Welder
Rivet Gun
Punch
File
Ruler
Calipers

Session 1

The Hobby Shop Room

Cutting the sheet metal

Making parts from sheet metal often requires that you form three-dimensional objects from two-dimensional starting material.

Think carefully about the shape of the corn sheller and draw a template. Cut this shape out of card stock to be sure that it produces the shape that you want. Be sure to account for the extra length required to make the ridges and leave a tab that will allow you to attach the ends when you form the truncated cone.

We will use the water jet cutter to cut the sheet metal parts. If you are unfamiliar with the OMAX software and other CAD programs, run through the OMAX tutorial before class (there is a copy of the OMAX software that you can download onto your laptop or you can use one of the D-Lab laptops). Use the OMAX Layout program to generate the tool path for the parts and cut your part out before the next class.

Session 2

D-Lab Annex Room ???

During this session, in addition to forming your sheller, you will learn how to use a variety of other sheet metal fabrication equipment.

Forming the Ridges

You will use a special die to bend the ridges in the sheet metal. Either an arbor press or vice can be used to generate sufficient force to bend the metal. Mark the position of the ridges on your part and then use the die to bend the ridges.

Forming the Cone

You can form the cone by bending it over an anvil or a piece of pipe, by hand or with a hammer or you can bend the whole things by hand. Be careful not to damage the ridges as you form the cone.



Fig 1 The sheet metal sheller, made at the Fainsa workshop (right) and the original plastic sheller that is was modeled after (left).

Session 3

D-Lab Annex

Room ???

There are a variety of methods that you could use for fastening the ends of the sheller together. Chose one of the methods below for joining your sheller.

Riveting

Rivets are simple fasteners that can be used to join two pieces of sheet metal. Solid rivets have a pre-formed head on one end; once the parts are assembled, the other end is deformed so that the pieces are permanently joined. Ad hoc rivets can be made from nails or welding rods.

Blind rivets, or pop rivets, can be used when there is access to only one side of the part. The rivet extends through holes in both sheets, then a rivet gun is used to pull on the mandrel, which deforms the inside end of the rivet so that it will hold the two sheets together.

Drill or punch the holes in the sheller, making sure that they will line up when the sheller is fully formed. For solid rivets, put the head on the inside, then hammer the other end to deform it; this will also make the shaft of the rivet expand, which also helps hold the sheets together. For the blind rivets, insert the rivet into the gun and then into the hole; press the handles of the rivet gun until the mandrel pops loose.

Spot-welding

Welding is the process by which two pieces are joined through a melting and re-solidification process. Spot-welding allows rapid welding of thin materials that do not require a complete weld seam. Two copper electrodes hold the sheets together and then deliver enough current through the sheets in a concentrated area that the sheets melt together at that spot. Spot welding is not appropriate for all materials, however the sheet metal that we are using can easily be welded using the spot welder in the Pappalardo Lab.

Finishing the sheller

In order to finish your sheller, you will want to be sure that all the edges are smooth. File away any burrs or sharp corners that could cut the user.

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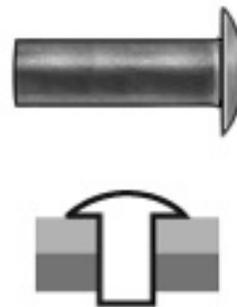


Fig 2a solid rivet

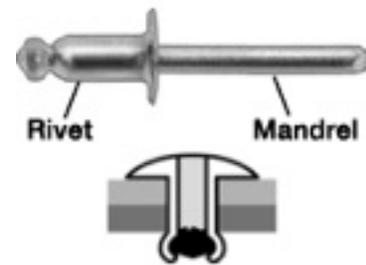


Fig 2b blind rivet



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