
Here I attempt to make a capacitor out of kitchen foil and cling film, inspired by the work of H P Friedrichs (AC7ZL) and his book Voice of the Crystal" . Eventually, I hope to build a whole CW transmitter with matching regenerative receiver, using entirely homemade components, including homemade valves. See AC7ZL's latest book
Instruments of Amplification
for more.

H P Friedrichs' components are beautifully made works of art, built in period style. His capacitors are shown in the picture (right). This capacitor is made from a strip of copper sheet with insulator made from overhead projector plastic film. He measured the capacitance to be about 0.03uF.

For my first capacitor I decided to use ordinary kitchen foil and sandwich cling film, purchased at the local supermarket. The capacitance might in fact end up signficantly higher than H P Friedrichs' due to the thinner materials used, particularly cling film which is very thin. This is important, since if I am to build an all-homebrew-component rig, I will need a power supply which will need to contain larger capacitances to obtain adequate smoothing. But I don't have time to make such a beautiful work of art as H P Friedrichs' version!

I tried 3 different methods for making a capacitor, and only my 3rd actually worked. For the entertainment value, here are details of all 3 attempts including those that didn't work.

## Take 1: the wooden jig method

This is where I dreamt of a really neat way of winding a huge capacitor. I cut two 4-inch sections off a 20m long aluminium kitchen foil roll using a hacksaw. Similarly I cut two 5-inch sections off a roll of cling film (below left). This allows for half an inch of insulation overlap at each end. Next I built a jig using pieces of pine, with 9mm diameter pine dowel as pivots. The dowels were glued into 9mm holes in one of the side pieces using wood glue. The other side remained unglued so that the foil and plastic rolls could be inserted into the jig (below centre). 4 small "washers" were made by making holes in small squares of pine cut for the purpose. These would keep the narrower foil rolls in the middle of the insulation rolls. The right picture shows the rolls in the jig before the side piece was slid on. The idea was that a 5'th dowel would freely turn in holes at the opposite end of the jig and be used as a former to wind the capacitor onto.

{gallery}capacitor/jig{/gallery}

The result was doomed to failure. Anyone who has ever tried to wrap sandwiches in cling film will know that it very easily wraps up on itself and sticks to itself rather than the sandwiches. Similarly anyone who has ever tried to wrap food in foil will know what it tears very easily at the slightest provocation. The jagged edges caused by the sawing off of the short sections of rolls multiplied these problems by several orders of magnitude. In addition, winding the capacitor required too much force on the cling film to get all the rolls to unwind simultaneously, causing it to stretch and become misaligned.

## Take 2: the kitchen worktop method

Having abandonned the jig (gallery) capacitor/kitchen{/gallery} stretch out about 2m of the rolls at a ti

## Take 3: Third time lucky!

Here's the lowest tech way. The four pictures below show the stages in the successful manufacture of a smaller capacitor than originally intended. The raw materials consist of: two sheets of cling film, about 1m long and from a 400mm wide roll (NOT the one I cut earlier!); and two sheets of aluminium kitchen foil, about 84cm long and from a 300mm wide roll (also NOT the one I cut earlier!).

{gallery}capacitor/final{/gallery}

First, I laid out the sheets of cling film and aluminium foil (in the correct order of course: film, foil,

film, foil). Next, I inserted the electrodes: two short pieces of flex wire, with about 5cm stripped off showing the bare copper strands. I folded the overlapping edges of the cling film over the edges of the foil, to keep everything together for the winding up phase. I folded the length of the layered capacitor 3 times, resulting in a strip 8 times narrower than the original unfolded strip (i.e. 37.5mm). This I could then roll up into the capacitor seen at the right, with two leads neatly pointing out.

## Capacitor Characteristics

The first thing to check for is short circuits. With the multimeter I was able to check that there is no short circuit between the capacitor electrodes. But is there any capacitance? Connecting the capacitor accross a 12V supply, then disconnecting it and measuring the voltage across it with my multimeter I am able to see the voltage rapidly decrease over several seconds as the capacitor discharges through the internal input resistance of the meter.

The next stage will be to measure the actual capacitance, but my multimeter does not have a capacitance measuring facility so I will have to find another method, probably consisting of an oscillator with the capacitor as one of the frequency determining components. Check back soon to see if I have managed to measure the capacitance yet!

## Capacitor by Jeff Jourard

Jeff Jourard built a similar capacitor to mine. He writes: "*I tried your kitchen laboratory method of making a capacitor. I used about 16" of length of the two materials, not very much at all. I rolled my small sandwich lengthwise, both edges toward the center, then folded the result in half. Then I rolled it up by hand. The whole project took about ten minutes. My capacitor meter says 0.055uF! It worked. Your gigantic one must have been about 5uF.*
"

## Suggestion from by James Logan

Thanks to Jimi, who writes: "*I just want to make a suggestion at reading your page on making a capacitor. I think if you try this it may work well. Use a simple copper pipe cutting tool to cut the materials while they are rolled up on the cardboard tubes. This will give a really clean cut and shoud do the job for you* ". I haven't yet tried this method but it sounds like it may work well!

## Another from Sergio Masci

Sergio first complained of the difficulties of making a capacitor using click film, because the rough edges of where the aluminium foil is cut easily seem to tear the very thin click film under pressure, resulting in a short circuit between the plates. However, later Sergio wrote again, describing a really neat and elegant solution:

"*I had thought about using a much tougher, thicker plastic around the edges of the aluminium foil but this would also result in a buldge at the edges making the distance between the plates difficult to maintain (just like wrapping the foil back on itself twice at the edges). What I really wanted to do was build a jig that would hold many plates together and allow me to grind down the edges without distorting any of the plates or leaving sharp edges. I thought about this for a while then came up with an alternative way of removing the edges without mechanical action - use chemical action instead.*

*A really quick and dirty experiment showed that this works VERY well, leaving clean edges. Not perfectly straight, but that can easily be perfected, not that I think its necessary really.*

*What I did was clamp about 20 sheets of Al foil between two sheets of policarbonate plastic (each sheet was 5mm think - I had some in my junk box) with a small set of G-clamps. I dipped the end to be cut into a WEAK solution of salt water. connected this to the +ve terminal of a small 3v PSU and added a copper wire as the -ve terminal (dipped into the solition). After about an hour all the exposed Al (from the plastic clamp to the solution) had gone. I removed the plastic clamp and washed the Al plates. Result was perfect edges :-)"*

## Frank Collier writes...

*"I was reading some of the techniques you and other had used for making caps from aluminum foil. The problem seemed to arise from the dielectric. I use clear contact ( shelf lining) paper for the dielectric. It has a sticky surface on one side already, which makes it easy to adhere the foil. I make 2 paper/foil sets, then put them back to back with taped down wire protruding from opposite sides.Then I tightly roll it up using a wooden dowel. It is physically large since I do not fold it, but it has great capacitance for use as a Lyden Jar. I use these for storing charges from electrostatic machines. I make these about 5 feet long before rolling. Get great sparks when used with electrostatic generator"*