Using a Cutter Plotter

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In the January/February 2017 NTRAK Newsletter, Hans R. Egli wrote about NTRAK Swiss Division's activities. One of several workshops we hold is about using a cutter plotter in our hobby. I would like to share experience with you.

A cutter plotter is similar to a small inkjet plotter, but instead of ink cartridges it holds a small sharp knife. The blade is able to cut material such as cardboard up to a thickness of 0.5 mm (0.02"). By moving the knife holder (x-axis) and moving the cardboard back and forth (y-axis) the plotter is able to cut any desired shape.

Cutter Plotter

I use the Portrait model plotter from Silhouette, the simplest basic model, which cost about $200 USD. It works fine for me. There are some more advanced models which allow a wider material feed and cutting thicker materials available from this manufacturer and others such as Brother. For me, in N scale, the capability of the portrait is sufficient and the cutter is also pretty small and can be easily stowed away.

Before buying a model I would recommend to search the internet for reviews which compare the different models, or just take the simplest as I did and get started and see if that type of tool is something you like and go later for a more advanced machine if there is a need.

The cutter plotter comes with its own software tool which offers common features known from drawing and painting tools. It offers some nice additional features, for example merging single objects together to create a single shape.

I found this cutter to be a great and affordable option to create my own structures. I will explain the process based on the Chicago's 16th street tower *(See illustration below)*.


Google Street View, or the Internet in general, is a fantastic source to find information about the structure you want to build. First, I make a small sketch to get the dimensions of the model. Some selective compression is often required to fit into your space, or to maintain a visual aesthetic compared to your other structures on the layout.

Using a Cutter Plotter

The walls of this tower are built up in three layers. The first inner layer is the window frame layer. The second middle layer is the body of the wall, while the third outer layer is the wooden facade.

I normally use several pages in the tool to design and build a structure. I have a construction page, where I create the single objects (e.g. window layer of one wall). When necessary, I also do geometrical construction (good old Pythagoras is often used) which is sometimes required to get what I want. Then I move the completed parts to the page where I collect the all the other parts of my structure, see the illustration at left, showing the tool view.

The colors of the parts have no meaning but just improve the visibility on the page. Light green-yellow represents the four inner window frames (1. layer) for the four walls. I usually start the construction with that layer. Core walls are light green.
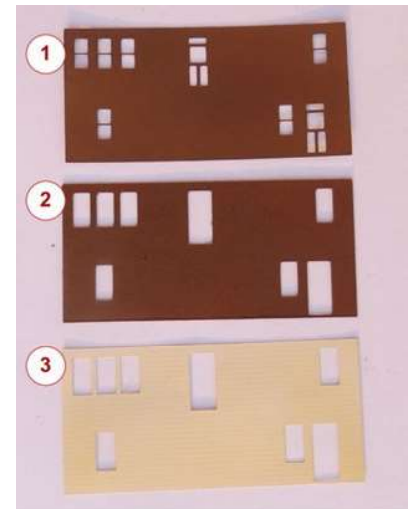
16th St. Station Wall Layers
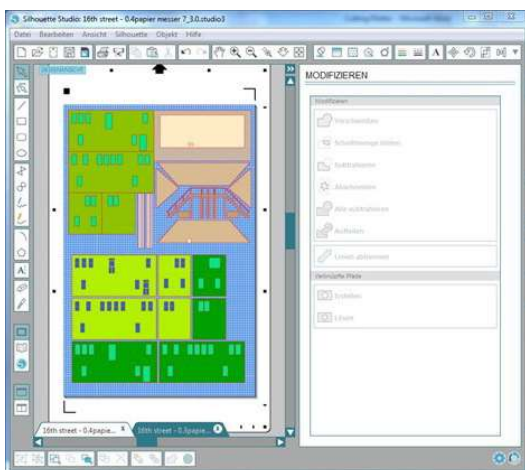
Tool View

I take the window frame parts as a base to get started with the core walls. The window openings are, for example, stretched out in each direction for an additional 0.5 mm (0.02"). The dark green is the layer which represents the wooden facade. Here again I take the core walls as a base and stretch the windows or door openings in each direction as required. To simulate the single wooden planks, I add horizontal cutting lines (you can't see them on the illustration below, due to the resolution).

The page, as you see in the illustration, is not used to start the cutting process. The core walls, the chimney, the roof and the staircase parts are made of a thicker cardboard, 0.4mm (0.015"), while the window frame layer and the wooden facade layer are of a thinner cardboard, 0.3mm (0.01"). Some parts need two treatments, such as first cutting and then secondly engraving the wooden planks or corrugated iron of the roof.

To cut out the parts I copy all objects which should have the same cardboard thickness to a new page. I then rearrange the objects to fit optimally on the sheet. (Note: I would recommend at least 0.1" spacing between the parts).
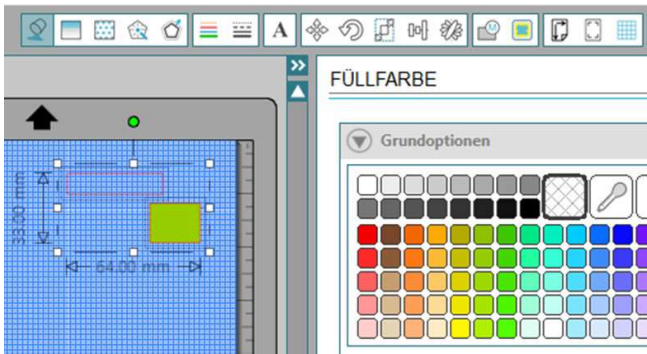
The **first cutting step** is to cut all outlines and inlines (no engraving of planks). For that, delete all the engraving lines, if possible, in one step, by selecting them all and pressing delete. Don't
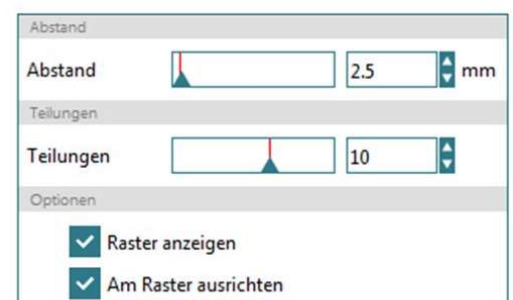
Setting the Cutting Grid

Using a Cutter Plotter

Color Settings

save the file yet. Adjust the blade deepness and start the cutting. When the cutting is completed, don't remove the cutting pad from the machine. With the command "Undo" you can now restore all the engraving lines. Delete all other outlines and inlines you just cut. Now start the cutting process again with a blade deepness of just one unit, which is ideal for engraving.

I **spray paint** the parts, especially the walls, before assembling. If you plan to illuminate your structure from inside, I recommend painting at least one of the three layers a very dark color to prevent the light from shining through the walls.

For **gluing the cardboard**, I use regular white glue. Once I have glued together all three layers of all four walls I sand the connecting edges to a 45° angle. Before gluing I check if all for walls fit flush together.

For windows I use **over-head projector transparency film** which I cut to pieces a bit larger than the window size. I glue them with Araldit, a 2 component glue, on the inside wall.

The **stairs** are probably the most challenging part. With tweezers I glue each step to one of the two stair frames. Then I adjust the steps once more to stand as much as possible vertically on the stair frame and parallel to each other. Finally, I glue the second stair frame on top as a cover, again readjusting as best as possible. No worry if it is not that exact as in reality; it's in N-Scale and not easily noticeable by observers.

I hope I have **encouraged** you to get started building your own structures. Maybe you dreamed of a special structure which is not available as a kit. Now is the time to design and build it yourself! All you need is a bit of time to familiarize yourself and feel comfortable with a cutter plotter.

I recently completed parts of **Chicago's "L", the Quincy station and elevated track** including a junction. The cutter plotter came in very handy for the station houses and the metal structure supporting the elevated track.

Cutter Plotter Best Practices

1. **Fine single objects** such as window frames or railings have a tendency to tear while cutting with the machine or when later removing from the cutting pad. I found this limit to be at 0.5 to 0.75 mm (0.02" to 0.03"). Ideally you should choose a grid small enough to reach these dimensions as a multiple of your grid size. I chose 0.25mm (0.01")

2. Objects in the graphic tool are hard to see with just a fine red outline. You can fill out the area with a color. It also helps to
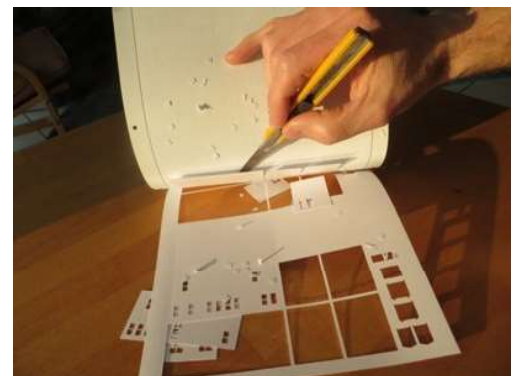
Removing Objects from Cutting Pad

Cutter Plotter Best Practices

distinguish different objects, e.g. window outlines, from wall outlines.

3. Make sure that objects or lines that you don't want to have cut are hidden beneath a colored area. If you don't see it, it doesn't mean it won't be cut!

4. New cutting pads might stick to your material too much, causing objects to tear when removing them. With a linen towel you can dab on the pad to add fibers to reduce adhesion.

5. Remove the cardboard and your cut objects from the cutting pad: lightly bend the pad and separate the cardboard from the cutting pad with a hobby knife. The objects and leftovers will fall on the table without sticking to the pad.

6. The cardboard might not be completely cut at some spots: This might be due to an uneven cutting pad surface, resulting from deep cuts from previous use, leftover paper (dirt) or glue bubbles. You can remove the latter two by dabbing masking tape on the cutting pad.

7. Unfortunately, the software does not provide a function to abort a current cutting process, which would be a handy feature in some situations. As a work around I unfasten the blade holder, remove it, and let the cutter continue its dummy cutting until the end.

Cleaning the Cutting Pad

8. Painting is often easier before you assemble the whole structure. I recommend you paint parts or groups before you glue them to other parts with different colors.

9. YouTube has many helpful tutorials.

There are many further options which I haven't explored yet, such as:

1. The software allows you to use colors. Using your color printer, you first print it on your desired material, for example cardboard, and then cut it out with the cutter plotter.

2. Instead of using a knife blade, imprint tools are also offered.

Another Good Use for a Cutter Plotter

3. You can also cut other materials such as adhesive films to create your own stickers or masking templates.

4. With your camera you can catch logos to import, edit and finally cut.