

Laser Cutting

Introduction to Laser Cutting

Prerequisite

Follow presentation “CNC Basics”
<http://xxxxxxxx.com>

1. Principles

HOW OPTICS WORK IN A LASER CUTTER



What is a focal point ?

The central role of the lens ?

What is the depth of focus ?

https://youtu.be/K_dKUsY05jY

From [Trotec official](https://www.youtube.com/channel/UC...) Youtube Channel.

VIDEO - WHAT IS “MARKING” OR “LABELING”



Laser labeling is very similar to Laser engraving, at the difference that it just change the color of the material, just like thermic paper would do.

https://youtu.be/lq_BsejihZ8

From [Trotec official](#) Youtube Channel.

CHOOSING A CUT MATERIAL



Note that you can use the “cut” function to draw or trace material.

For this you simply need to reduce the laser power so it does not cut through the entire height

https://youtu.be/SljUVCho_xU

From [Trotec official](#) Youtube Channel.

CHOOSING AN ENGRAVE MATERIAL



With lasern graving you can reproduce picture on wood or texturise material by removing upper layers of your material.

<https://youtu.be/BileXWPR00I>

From [Trotec official](#) Youtube Channel.

TWO MAIN PARAMETERS FOR THE BEST RESULTS



[DSCN4939.JPG](#)

Speed and **Power** determine how the laser is cutting through your material.

Speed: the velocity at which the laser is moving from point A to point B. The Higher is the speed, the less effective the cut

Power: Power is the percentage of the maximum power you want to use. The higher the power the deeper the cut

To better understand, imagine passing your hand over the flame of a candle

2. Designing for Laser Cutting

THE DIFFERENCE BETWEEN *VECTOR* AND *RASTER*



Vector and *Raster* are two key concepts you need to understand for digital fabrication.

https://youtu.be/p2thSkOa_Xg

From [Buddy Media](#) Youtube Channel.

USE OF VECTOR AND RASTER

Vector

- Mark following the outline of the vector shape
- Cut following the outline of the vector shape
- Engrave "burning" the inner part of the vector shape

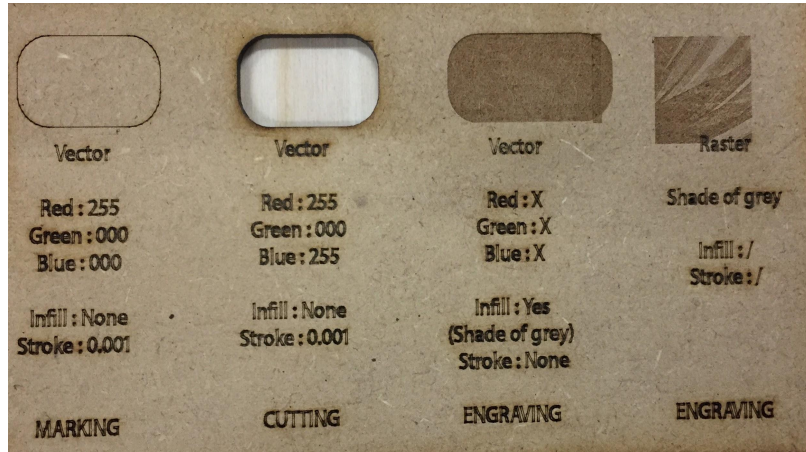


Raster

- Engrave if the raster is Shade of grey
- In a certain extent, the laser cutter is able to take in consideration the different shade of grey



USE OF VECTOR AND RASTER



Raster :

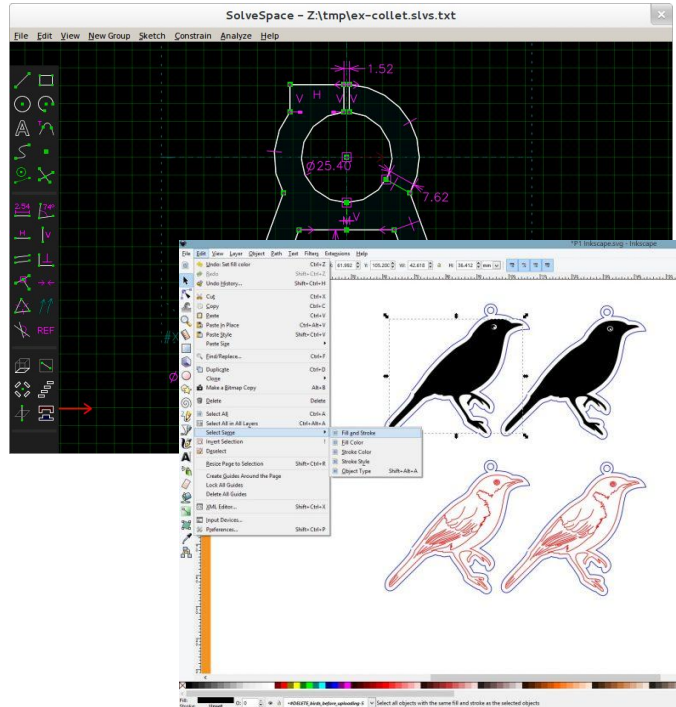
Engrave every black pixel as an inkjet printer would do.



Vector :

Draw the shape as you would cut paper with a cutter.

SOFTWARE



Depending on what you your project is you might use different software :

There is no absolute rule, you can design functional part with Illustrator or use Fusion 360 for artistic pattern!

Best for illustration : Adobe Illustrator, Corel Draw, Inkscape

Best for architecture : Rhino, Sketchup, Autocad

Best for engineering : AutoDesk Fusion 360, Rhino

You can visit the [following page](#) to have a better idea on the existing software. Chose one and learn how to use it.

VIDEO - USING ILLUSTRATOR FOR LASER CUTTING



This video explains how to use Adobe Illustrator for laser cutting and how to set up your document and colours.

NB: Colour code is not the one used in Fab Lab Limerick (see slide 19)

<https://youtu.be/FFK3VI7i6Eg>

From [Daniel Wood](#)'s Youtube Channel.

VIDEO - USING *FUSION360* (FREE EDUCATION LICENSE)



Fantastic fast tutorial to learn how to elegantly design a laser cuttable laptop stand with Fusion 360.

<https://youtu.be/7riGolu7BpA>

From [AutoDesk Fusion 360](#) Youtube Channel.

DEMO - ENGRAVING, CUTTING AND ETCHING







This example give you example of what the different options are.

<https://youtu.be/sdACSB8GH3Y>

From the [Core Electronics](#)' Youtube Channel.

3. Setting up Your file

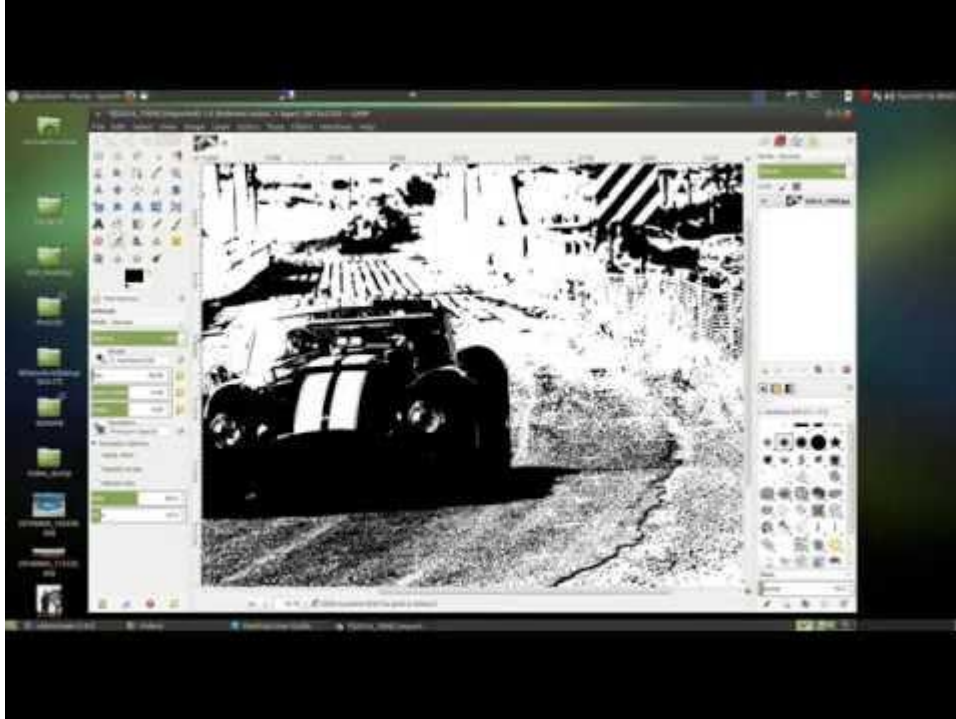
DIFFERENTIATING BETWEEN ETCHING, CUTTING AND ENGRAVING

			
Vector	Vector	Vector	Raster
Red : 255 Green : 000 Blue : 000	Red : 255 Green : 000 Blue : 255	Red : X Green : X Blue : X	Shade of grey
Infill : None Stroke : 0.01	Infill : None Stroke : 0.01	Infill : Yes (Shade of grey) Stroke : None	Infill : / Stroke : /
MARKING	CUTTING	ENGRAVING	ENGRAVING

JobControl assigns different tasks according to the color code (left).

Note: Your file has to be in RGB mode

VIDEO - ENGRAVING GOOD PICTURES IS AN ART



Sometime you have a raster file (picture) you want to engrave

YOU NEED TO PREPARE YOUR FILE THE RIGHT WAY

<https://youtu.be/CroUeK03Dyl>

From [Helmreich Enterprises](#)' Youtube Channel.

Video - Vectorise, Rasterize and vice-versa



If you have a raster image you would like to cut, you need to **vectorise** it

If you have a vector shape filled with color scale / shade of grey you want to engrave, **rasterising** it allows you to engrave it as you would an image.

If the the vector shape you want to engrave is has no nuances and is filled in black, there is *no need* to **rasterise**

See this video for more information:

<https://youtu.be/giX65ls1lgs>

From [VscorpianC](#)'s Youtube Channel.

4. Exercise:
Design & Prepare your file

Exercise

This practical exercise will allow you to :

- Experience the difference between raster and vector
 - Help you set your file for laser cutting
 - Help you create a part of the project you will realize on the training day
-
- 1) Download and install [Inkscape](#), or use the vector editing software you are already using.
 - 2) Download the following files and start working, the tutorial lay within the file : <http://fablab.saul.ie/assets/downloads/xxxxxxx.svg>.

From your design to the real thing...

FROM YOUR SOFTWARE TO JOB CONTROL



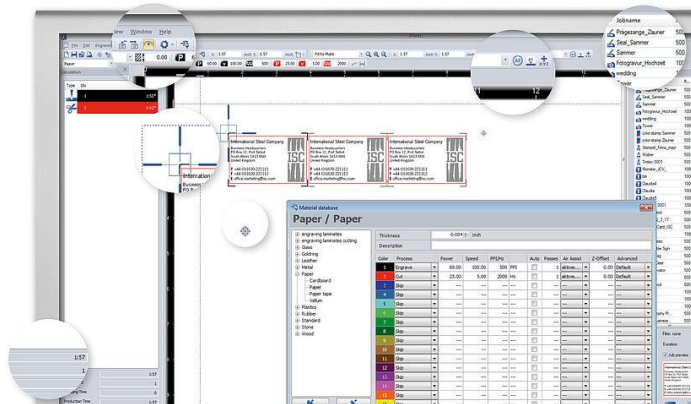
The Laser Cutter takes its orders from a software named Job Control. Software available at Fab Lab Limerick.

Job Control links the computer to the Trotec Speedy 400, and allows you to place printed files before you start your job.

- 1) Open your file with Adobe Illustrator or Inkscape
- 2) *File > Print*

Best file formats to work with for maximum compatibility :

.ai .svg .dxf



VIDEO - INTRODUCTION TO JOBCONTROL



Job Control Is a licenced software, unfortunately it can only be accessed in the Fab Lab.

Here (left) is a short introduction.

***Note:** Material profiles are all already set-up on the Fab Lab computer and differ from the materials shown in the video.*

<https://youtu.be/scwgUbANwNI>

From [Howtolaser](#) Youtube Channel.

5. Resources

VECTOR EDITING SOFTWARE

Adobe Illustrator: <https://www.adobe.com/products/illustrator>

CorelDRAW: <https://www.coreldraw.com>

Inkscape: <https://inkscape.org>

Use Inkscape in a browser with RollApp: <https://www.rollapp.com/app/inkscape>

Vectr: <https://vectr.com>

LibreOffice Draw: <https://www.libreoffice.org/discover>

VIDEO - ONLINE RESOURCES FOR LASER CUTTING



Laser Cutter Projects
ONLINE RESOURCES

<https://youtu.be/suf075V7a7U>

From [3D Universe](#) Youtube Channel.

TASK- SPECIFIC TOOLS

Dremel Laser Cutter Projects: https://www.dremel.com/en_US/explore-projects/-/projects-by/tool/27380/digilab

Obrary: <https://obrary.com/collections/designs-for-the-laser>

Thingiverse: <https://www.thingiverse.com/tag:laser-cut>

Monica's Creative Room: <https://monicasc creativeroom.se/category/cutting-files/>

Design boxes easily:

- Make-a-Box : <https://makeabox.io/> Or Maker Case : <https://fr.makercase.com/>
- Cloud-Convert : <https://cloudconvert.com/>

Optimise your space:

- Svg-nest : <https://svgnest.com>

For Paper Craft, software like Pepakura: tamasoft.co.jp/pepakura-en/, or and [AutoDesk's Slicer for Fusion360](#)

See you at the lab
for the hands-on tutorial!

If you have any other questions try <http://fablab.saul.ie/how> - for various tutorials and other information