Summary of the Group Project

Source here: <https://fabacademy.org/2024/labs/puebla/week3/>

In the laboratories of Fablab Puebla, the task of technological advancements and project development is crucial for the technological development of society. So much so that the laboratory contains multiple machines that serve different purposes, one of them being the laser cutting, which consists of carbon dioxide technology composed of other gases in a mixture that allows certain focus lenses to produce a beam that uses energy to cut, engrave, vaporize, or melt material. Due to this application, it is necessary to calibrate the laser correctly to achieve the desired result.

Starting with this, we have the unfocused laser, which simply resides in an area and allows visualization of a beam but without proper calibration. These pass-through focus lenses, which are placed at a certain distance to generate a smaller radius and concentrate the beam's force. Following this, we have the hose, which directs the light beam towards the material we are working on. Continuing along this path, we reach the stage where we have a concentrated beam that will be used. To direct its energy and start the cuts or engravings, it is necessary to calibrate the depth to which we will bring our beam towards the material to use the correct power and speed for the cut.

In the case of my work, I will talk about the CFL-MA1390T machine. This machine allows a working area of 1.3 by 0.9 meters, with a cutting speed from 0 to 36,000 mm per minute and an engraving speed from 0 to 64,000 mm per minute, with a power of 100 watts, allowing a cutting depth of up to 25 mm with a kerf factor of 0.1 mm.

These machines are capable of engraving paper, cardboard, certain fabrics, synthetic fibers, natural and synthetic leather, rubber or latex, wood, thin planks, plastic, and our preferred material, which is MDF, among others.

Of course, one must take certain precautions when engraving or cutting materials, such as not cutting materials that are not suitable for use in the machine, as this can lead to excessive energy consumption, the emission of toxic gases, machine misalignment, and possible damage to facilities or users.

Since we are talking about cuts and engravings, we must talk about the components that allow these actions, such as speed and power. These are data that must be entered into the cutting system and into the machine to perform the necessary actions. It must be considered that the higher the speed, the lower the application of power for an engraving or cut, and that higher power can result in a better cut, but caution must be taken because if too much power is used, the material can burn and produce an undesired finish or begin to melt. So, there must be a clear balance between speed and power to perform the necessary cuts or engravings and meet the requirements we want. In the case of cutting, it is necessary to prioritize the use of power over the use of speed, not to overload the machine with pure power but to favor the necessary power for the laser at its displacement speed. In the case of engravings, speed is usually more important, as less power is needed to simply mark the material. In the case of the machine I have been using, it has been found that a clear cut can be made from a range of 60% to 100% power and a speed of 10 to 70 millimeters per second. The quality of these cuts varies, but it is advisable to stay within those figures. For engravings, it is simply a matter of staying below that range in terms of power and increasing the speed slightly.

Well, if you are a very observant reader, I mentioned a word called "kerf" a few paragraphs ago, but what is kerf? This word refers to the amount of material wasted when making cuts. Due to having a tool that needs to be calibrated, one needs to know the difference between distances when making their designs to determine how much material can be spent and preserve the difference. This is done by giving certain tolerances when drawing our pieces so that when they are input into the laser cutting machine, there is a disposable waste that does not affect the operation and quality of our piece.

In the case of the cut that I have been making for the pieces in the course, it has been found that for a cut of a depth of 3 mm, there is a waste of 0.123 mm. This may seem like a relevant statistic, but when making precision instruments or mechanisms that require a certain minimum tolerance, this could result in a catastrophic failure and a possible accident, so appropriate considerations must be taken to ensure that this does not happen.

Ending with this article, we will have a part that is directly linked to the design of my parametric construction kit. In this case, we are talking about joints, which refers to the method by which we will join two or more pieces and form another shape or another piece. There are different ways to determine which joint we can use, including Snap Fit Joints (one part snaps into the other, fixing it in place), Finger Joints (shape that resembles two hands interlocking fingers), Wedge Joints (two pieces fixed in place by a third wedge-shaped link), Pinned Joints (two pieces that slide inwards of each other through a gap in the middle and a pin inserted in that union), Press Fit Joint (one part that fits tightly into the other due to its design), and Flexure Joint (thin cuts that allow two pieces to slide and bend into each other).

In my case, I used Flexure Joints, which allowed me to design a system of a curve and a central piece that allows for more joints, creating different shapes like a sphere, a tripod with a circular head, a circle, and the number 8. It is interesting what one can do with different pieces or with just two, and all the shapes that can be created; clearly, creativity is the factor that allows us to develop our projects.

Well, in my case, this is all I have to say about the article that can be found in the link referenced at the beginning; there are very interesting points that I addressed and others that may have been left unmentioned. So, I suggest you read the full article in case I missed something. But for today, I say goodbye and wish you a good day.