# Pressure Tank Report

This report is explanation of the calculations and measuring the distance of the pressure tank gun we are building.

# Prerequisite to the report

We are making a water gun that needs to shoot at least 6 meters. Therefore, we have bought a pump that Tolga and Nikita are testing, but to explore more options, we are currently trying to build a reverse bottle rocket, where we hold the bottle part still, and shoot out water.

We have a goal of making the bottles hold 50PSI of pressure, that would have an exit velocity of 22m/s according to Radu’s calculations of the bottle. You can see the calculations here:

Et billede, der indeholder tekst, håndskrift, blæk/sværte, papir

Indhold genereret af kunstig intelligens kan være forkert.

# First and second try

Our first try we build them like you would normally a bottle rocket, where we tried to just glue the valve and the one-way valve for the pressurization. Here is the pictures and a small explanation off why it didn’t work:

Et billede, der indeholder maskine, Metalarbejde, bore/bor, Maskinværktøj

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Et billede, der indeholder værktøj, person, Maskinværktøj, jord

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This was all very great, the idea was good, but the execution was a bit off. It did hold the pressure up until 10PSI. but after that it blew out the glue from the cap. This was because the glue doesn’t stick on “fatty plastics” which this is, because it’s made from PP (polypropylene), and PET (which is the rest of the bottle) is not a fatty plastic. Meaning the glue stuck great for the one-way valve, but the release valve was not good.

Therefore, we decided to make a bottle that only was glued on the PET bottle.

This looked like this:



Et billede, der indeholder person, indendørs, blender, Laboratorieudstyr

Indhold genereret af kunstig intelligens kan være forkert.

This was a bit better at a whopping 12PSI of pressure before bursting the glue open, spewing water everywhere. This was better, but still not ideal. Therefore, we were thinking a bit outside the box. We tried to sketch up ideas of welding a steel pressure tank together. Usually, the only steel tanks that we could buy would be rather heavy (exciting the weight of max 11kgs) and have a very large capacity, which was not needed.

Therefore we looked into other types of tanks;

# Pressure tanks made from PVC pipe.

We took a lot of inspiration from different sources, but the thing we were looking at was other people successfully storing 80-120PSI of pressure in air cannons, the concept looking very similar to what we are building. The main youtube video “guide” we follow was this;

Et billede, der indeholder cylinder, indendørs, lampe, gulv

Indhold genereret af kunstig intelligens kan være forkert.

<https://www.youtube.com/watch?v=NvH9WHNxvj8>

Unfortunately, we didn’t manage to build this type of tank before we found new and better ideas. And even more unfortunately we can’t glue the end blinds to the tubes because of the university’s strict “no harming students” policies. Therefore we decided to keep exploring other options.

# 3D printed tank

Firstly we didn’t think that the 3D printed tank was going to work, generally is 3D printed things not going to be water tight (or gas tight) therefore we never thought this was going to work, that was before we saw this video:

Et billede, der indeholder tekst, skærmbillede, software, Multimediesoftware

Indhold genereret af kunstig intelligens kan være forkert.

<https://www.youtube.com/watch?v=ZB6VbkeYrkw>

this shows that there is very much a potential for this to work, some of his restrictions in his work was he couldn’t get a non leaking version of his design, therefore we looked into other things.

Et billede, der indeholder apparat/anordning, Måleinstrument, måler, jord

Indhold genereret af kunstig intelligens kan være forkert.

This video showed a similar pressure tank design that is leak free and is made from ABS plastic instead of PLA.

It is also vapor smoothed with acetone. This is not feasible on school ground but smoothing and using acetone the more “standard way” of just brushing it on with a paintbrush. This Is more possible.

We tried to firstly print a model so we could see if this worked for us, that’s where Tobias 3D printed the first model on his own printer and afterwards mounted all the hardware (one way valve and the release valve) this worked very well, even though it was very leaky. It held up to 100PSI (He didn’t dare go higher than that for now)

We then decided to try and 3d print a bigger one, with more walls (because the original one only had 2 walls on the inside, then 30%infill and then 2 walls again) so we didn’t have much confidence in its strength if we decided to move forward with more testing. Therefore we simply printed the same thing again, but this time with 12 walls in total, really making sure that it was water tight.

(12 walls is not needed for the final design we don’t think, as you saw in the youtube videos, 4 or even 6 walls is more than enough to hold a lot of pressure, but what we want to make sure in our testing is that we don’t have premature leaks or blowouts, before we have a safety valve ( a valve that will let our pressure before it builds up to be to much) also having very many walls means that we rather safely can go up in pressure if we find that the pressure we need is bigger than the 50PSI that we originally design the pressure tank for. Therefore while we can do testing, we should not have less than a safe amount of walls.)