3D-PAINTBRUSH

MELTING AND COOLING PLASTICS

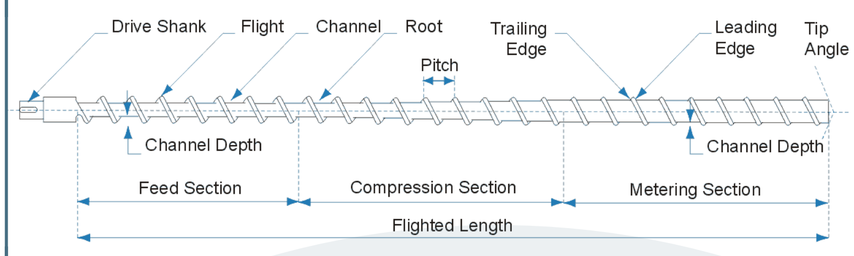
The 3D-paintbrush is a manually controlled plastic pellet extruder which translates human body movements into 3D works of art.

This graduation thesis takes the existing 3D-Paintbrush and redesigns it to improve the extrusions speed. This means the device needs to melt and cool faster. In addition the human-machine interaction has been improved by giving the 3D-paintbrush more degrees of freedom, big grips to control the movement of the 3D-Paintbrush, a clear reservoir and a pigment mixing system.

By optimizing both the melting and cooling of plastics a design of the 3D-paintbrush has been proposed. Of this design a mock-up has been made to test the dimensions of the new setup as well as the movability of the 3D-paintbrush.

Extruder Screw

Research is done into extruder screws to find the best extruder screw for this application. The extruder screw is the basis for the rest of the design. Including heater bands, outer housing and insulation.



Screw design variables

L/D ratio = 28:1

Screw profile = 5-15-8
- feed zone = 0.125m
- comp. zone = 0.375m
- met. zone = 0.200m

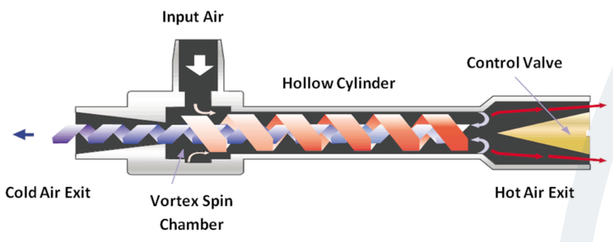
comp. ratio = 3.5:1

Channel depth = 7.5mm

Helix angle = 17.66°

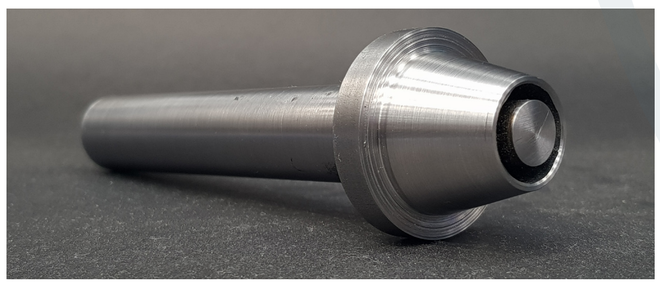
Vortex cooling

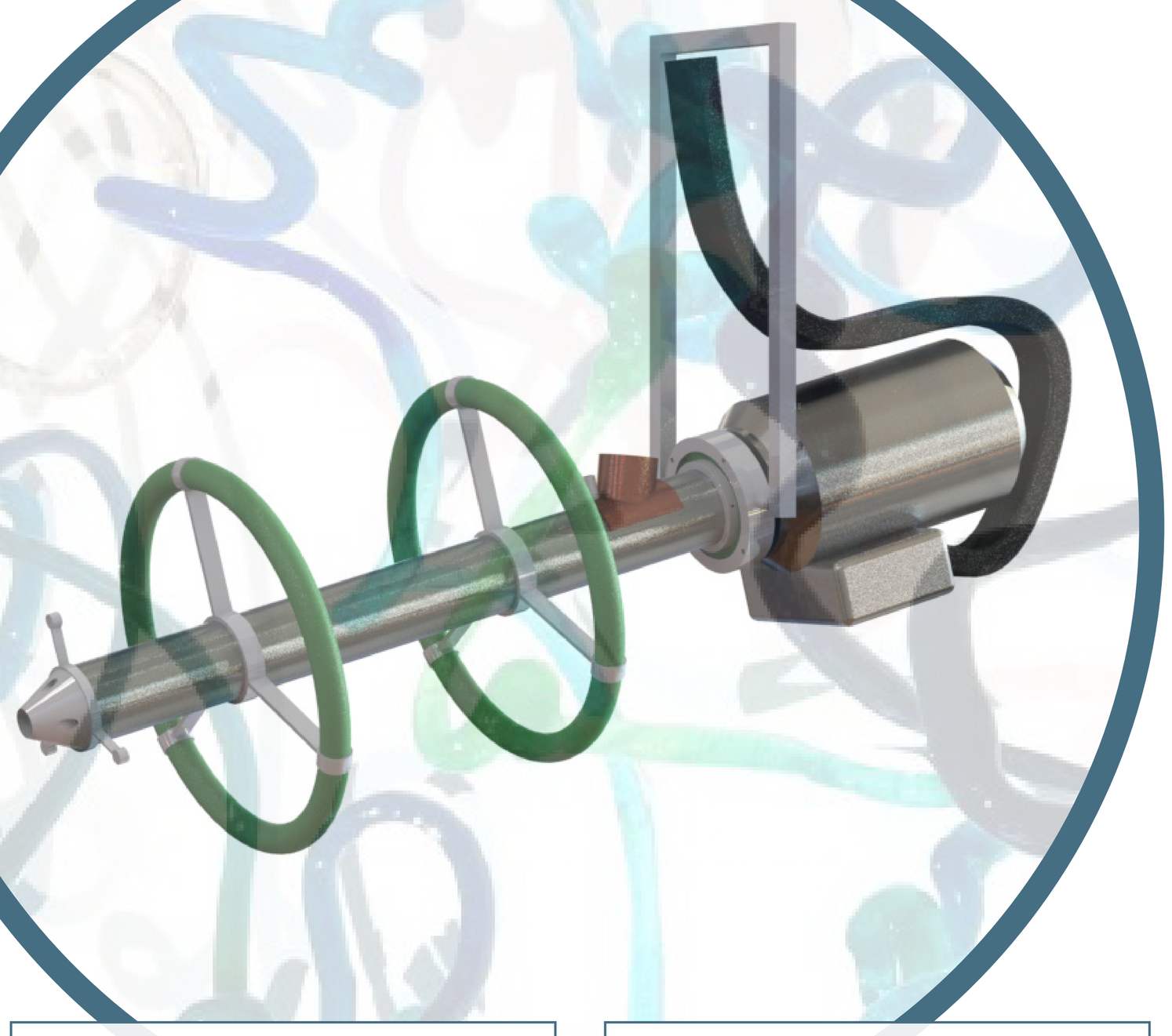
Vortex cooling is effective way of cooling, it has a low temperatures measured down to -15°C and a continues fast airflow to reduce the heat of the extruded work.



Nozzle

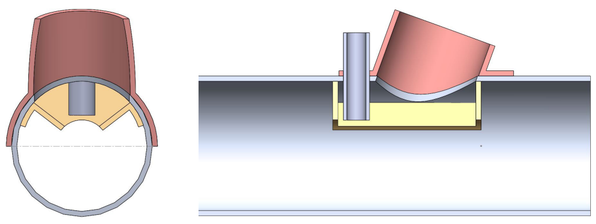
The nozzle can be changed and a nozzle with a core has been designed to make hollow extrusions and reduce the amout of plastic needed for big outer diameter extrusions.



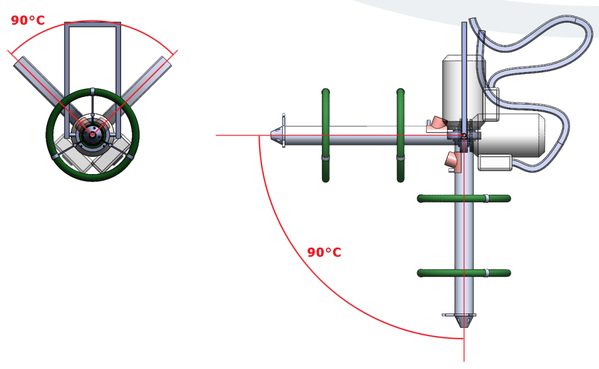


Hopper

The hopper is angled at 20° so when the 3D-paintbrush is vertical the pellets still have to fall down. It has a extra tube for pigments so that they will reach the front of the feed zone.



Movement



Mock up

A mock-up has been made to test the movement and the setup of the new 3D-paintbrush.

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3D-Paintbrush: Melting and cooling plastics
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Integrated Product Design

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