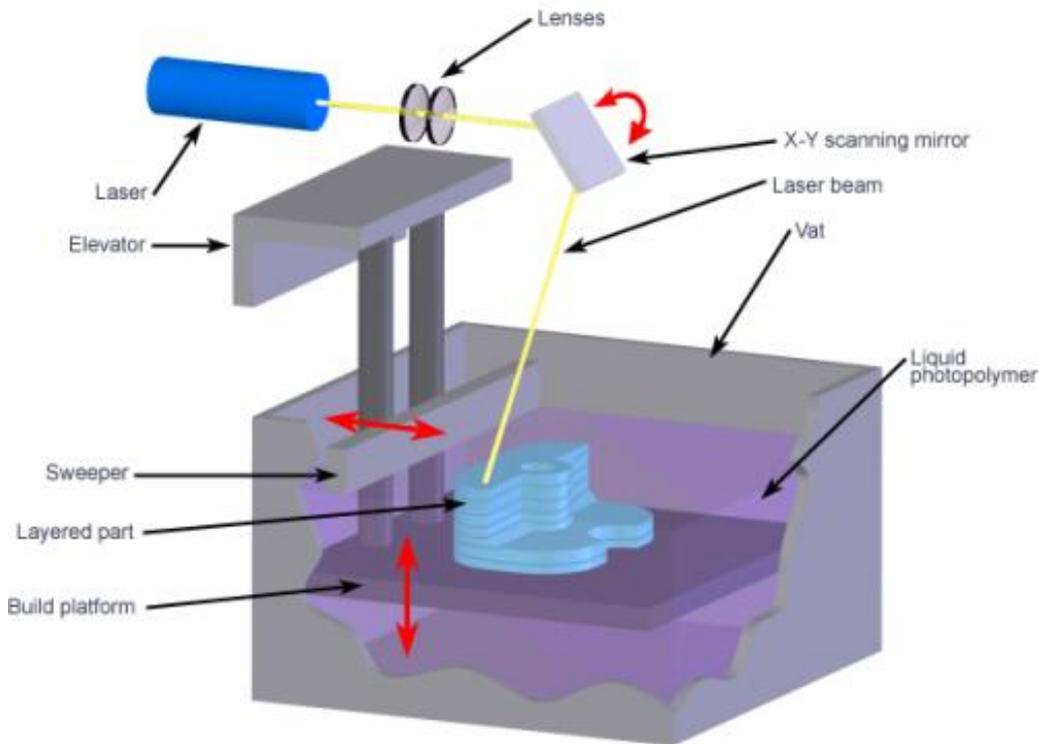


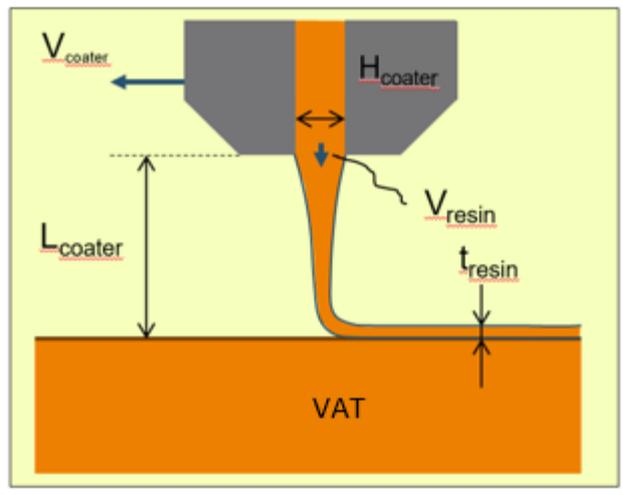
Master thesis project: Recoating for industrial VAT polymerization

Introduction



Within the AMSYSTEMS Center a new large scale, high speed and accurate stereolithographic device is developed. This VAT photo polymerization device uses a vat of liquid photopolymer resin, out of which the geometry is constructed layer by layer. An optical light engine (laser) is used to cure or harden the resin where required, whilst a platform moves the object being made downwards after each new layer is cured. Currently, layers are deposited by moving a sweeper over the resin bath. Both accuracy and throughput of this recoating process is limited since the sweeper is in contact with a high viscous resin. In this assignment a new recoating principle is developed which deposits layers in a contactless manner.

Assignment



The sketch above shows the current principle of a contactless recoater. Here, a highly viscous resin is pumped through a coater slit (H_{coater}) which subsequently forms a screen over a certain working distance (L_{coater}). As of the relative movement between coater and VAT, layers are deposited in a sort of contactless manner. For generating minimum layer thicknesses, resin velocity (V_{resin}) should be minimized while having a maximum coater velocity (V_{coater}).

Earlier experiments (stand still coater and moving substrate) showed the operating window for having a stable screen. In this assignment we would like to focus more on the deposition of highly viscous resins in combination with either a moving VAT or moving coater.

The assignment can be divided in the following phases:

1. Literature study on contactless resin deposition
2. Repeat earlier experiments to get familiar with involved physics
3. Construct a fluid-mechanical model which explains / predicts dynamic sheet behavior
4. Define, build and execute recoating experiments with a moving recoater
5. Interpretation of experimental results
6. Design recommendation
7. Graduation report and presentation at TNO

For this graduation project we are searching for a student mechanical engineering or applied physics with a specialization in fluid mechanics. Experience with setting up experiments, MATLAB and CAD software will be useful in the project. You will be properly supervised during your master thesis project and TNO will provide a suitable work placement compensation. In case this vacancy has aroused your interest, please feel free to contact us.

TNO contact person:

Ruud Olieslagers, Email: ruud.olieslagers@tno.nl, Phone number: +31(0)888665543