Advanced Neural Science for Engineers
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Lecture 32
Lab 09 3D Printing for Neural Devices

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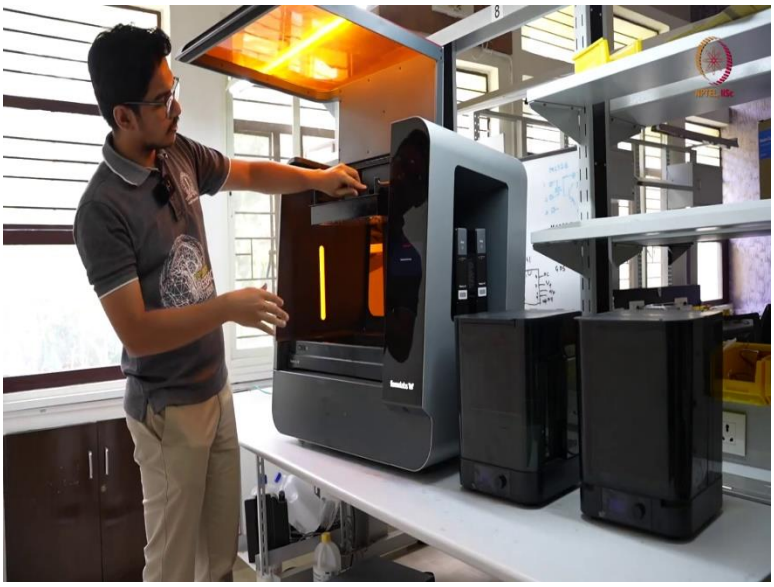

Hi. So we have here the Formlabs 3BL 3D printer. So as I discussed, so the parts that we have designed can be printed in this unit. So now, we will see what is inside the printer. So you can see a bed here. So this is what I showed in the software as well. So you can see the 3D printer

bed here. So this is where the printing actually happens. So, as you have seen in the software, this is where we have placed the part that we are planning to print. So this is the entire print bed. This print bed will actually go down and dip in the tank that we have here.

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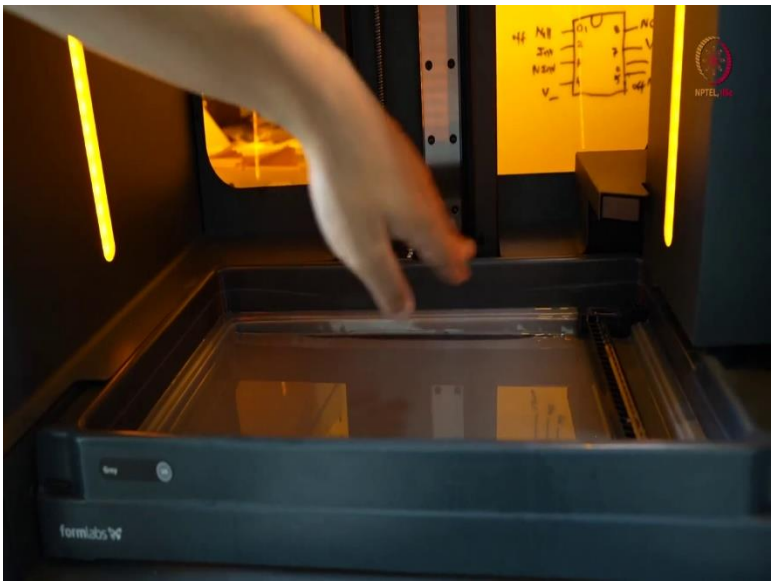

So this is the resin tank, where the resin is there. So this resin tank already has a Formlabs gray resin in it. And this resin tank is applied by resin from these cartridges that are available here. There are two gray cartridges here, which has the liquid in it. And the resin flows from these cartridges to the tank through two ports available here. Now, we will have a look at the resin tank here. So what we have here is the resin tank. You can see the gray resin that is been filled here. And we have a film cleaner that can move longitudinally to clean the surface of the liquid, as well as once the bed comes down, it will clean the surface of the bed as well. Now, we will see how to upload a print.

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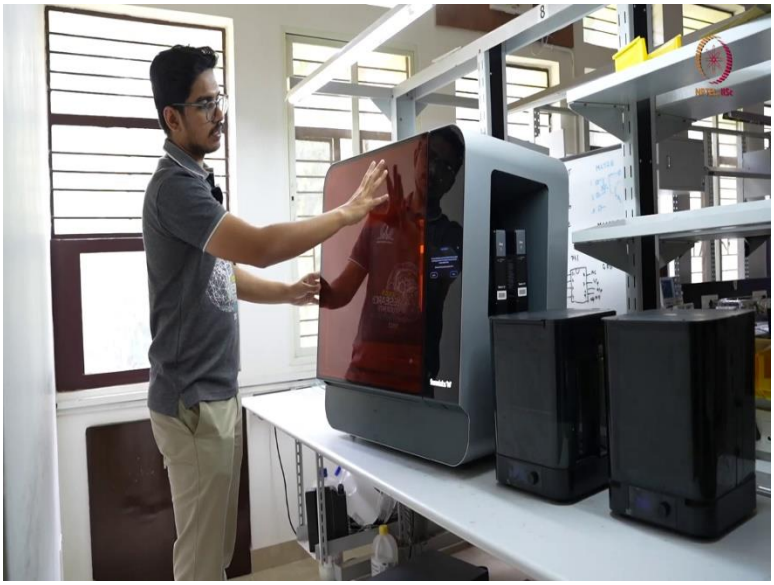
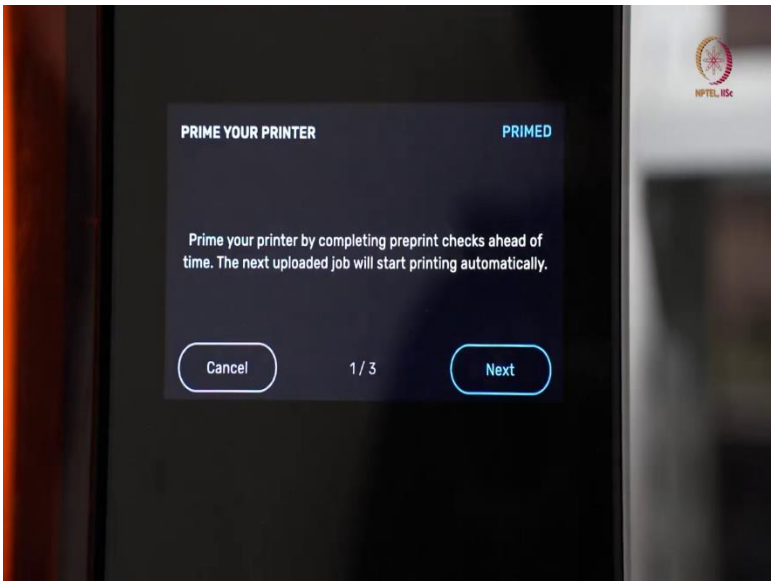
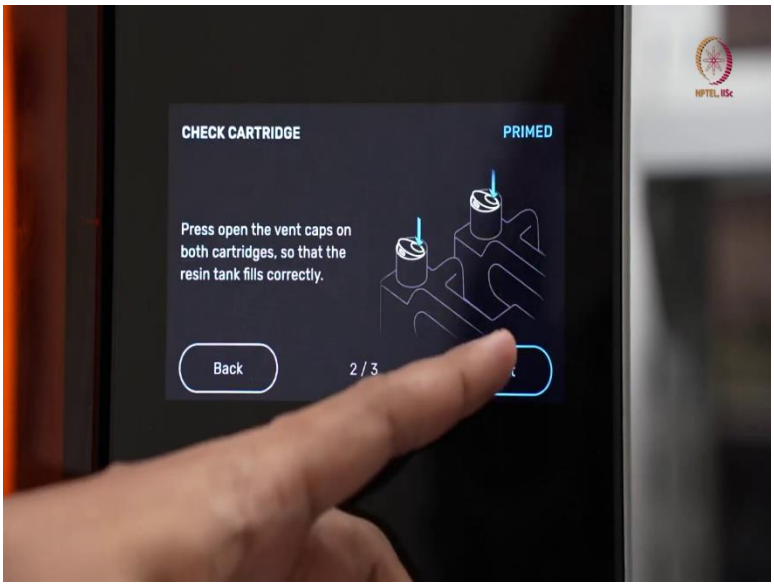
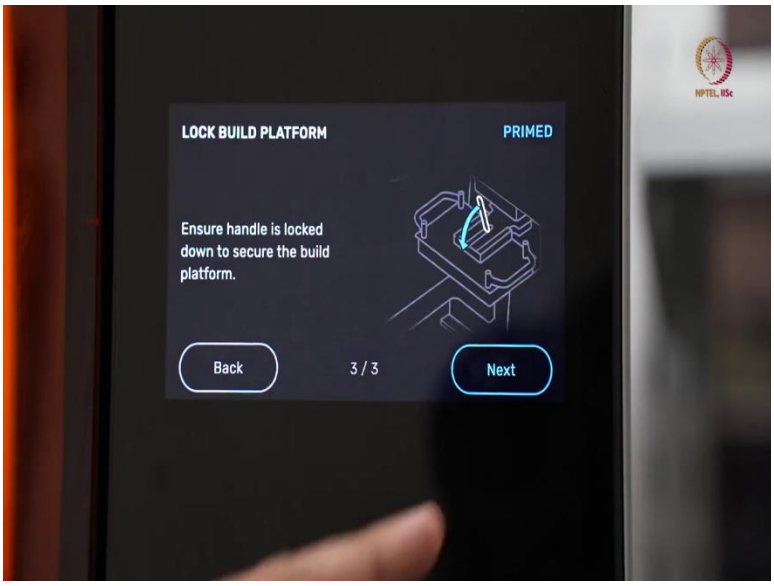
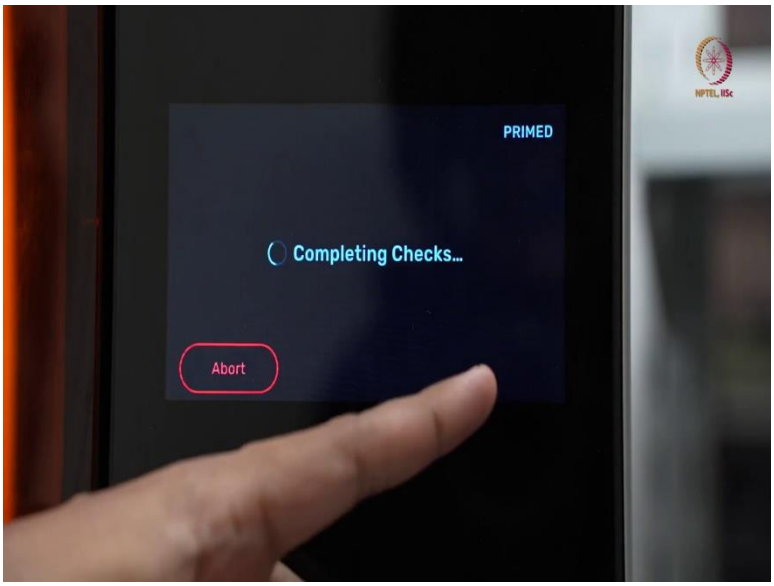
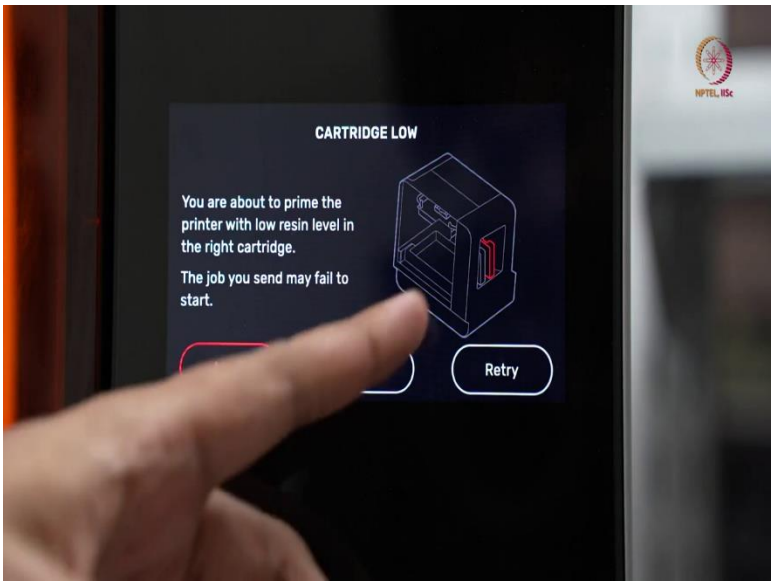


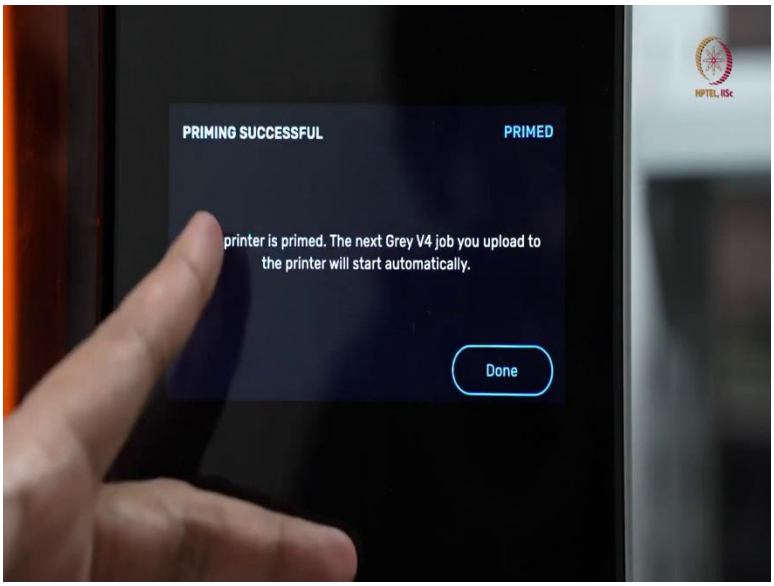

PRIME YOUR PRINTER
PRIMED
Prime your printer by completing preprint checks ahead of time. The next uploaded job will start printing automatically.
Cancel
1 / 3
Next

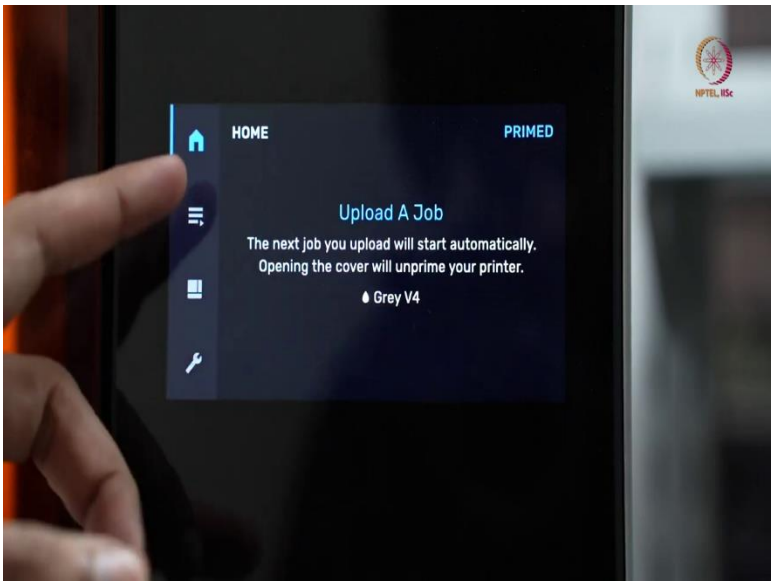

CHECK CARTRIDGE
PRIMED
Press open the vent caps on both cartridges, so that the resin tank fills correctly.
Back
2 / 3

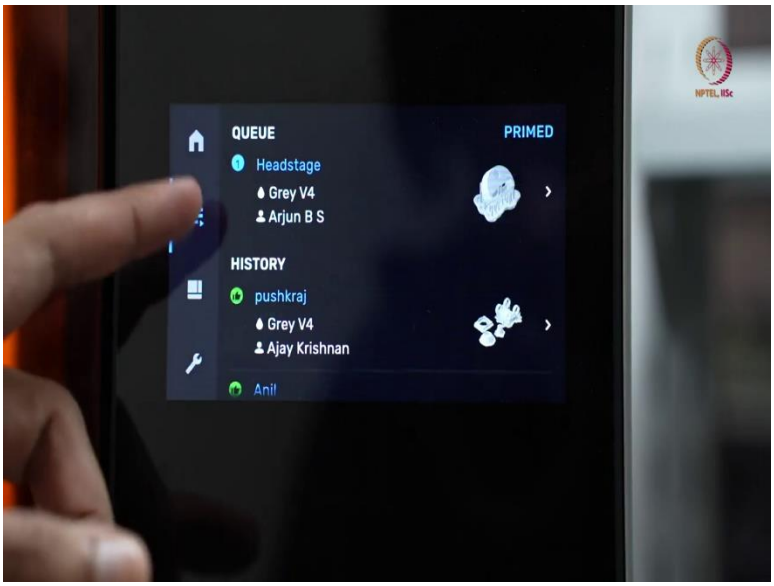

LOCK BUILD PLATFORM
PRIMED
Ensure handle is locked down to secure the build platform.
Back
3 / 3
Next

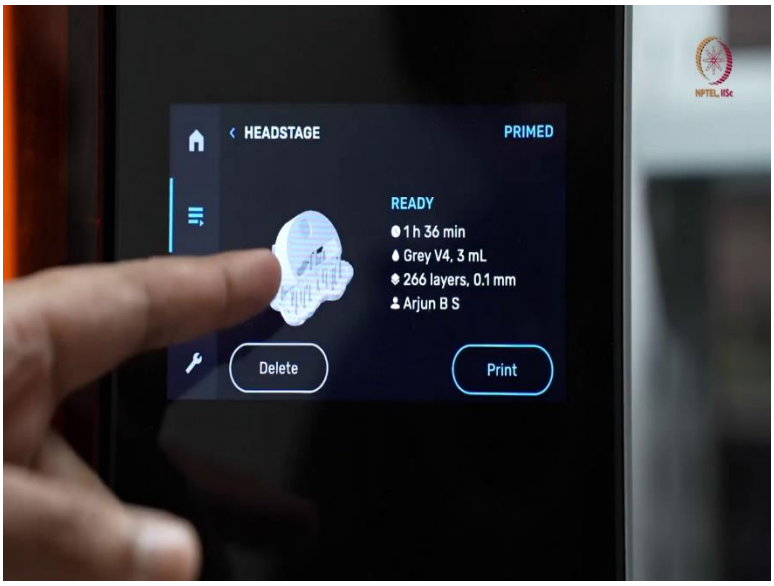

PRIMED
Completing Checks...
Abort

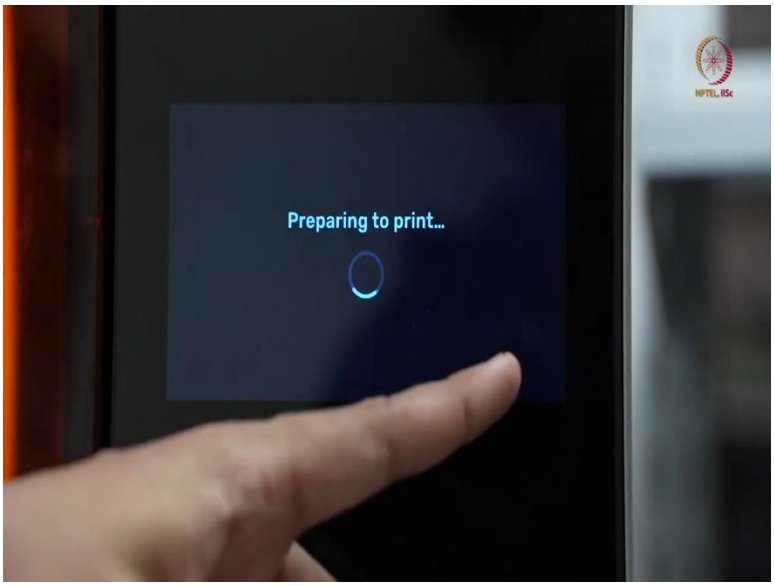

CARTRIDGE LOW
You are about to prime the printer with low resin level in the right cartridge.
The job you send may fail to start.
Retry

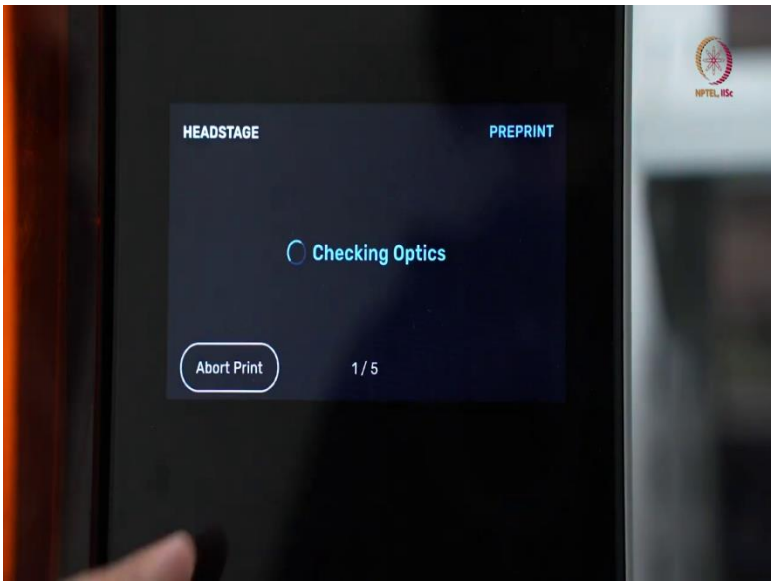

PRIMING SUCCESSFUL
PRIMED
printer is primed. The next Grey V4 job you upload to the printer will start automatically.
Done

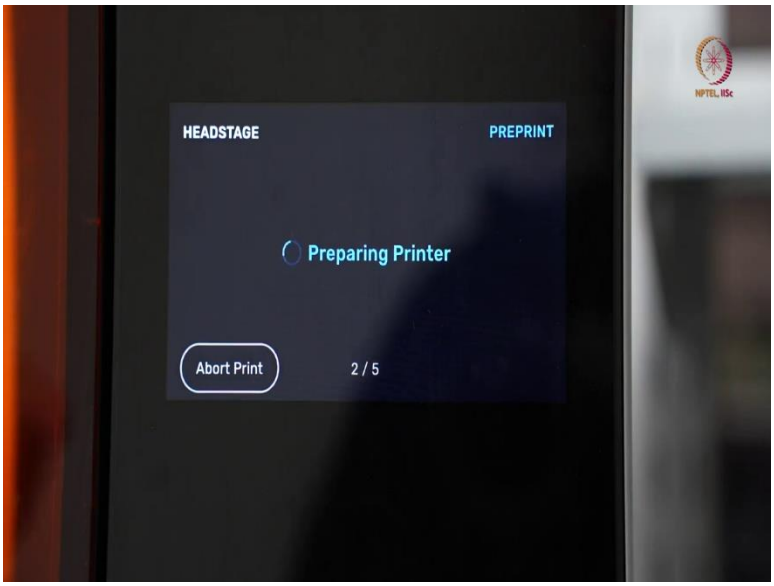

HOME
PRIMED
Upload A Job
The next job you upload will start automatically.
Opening the cover will unprime your printer.
Grey V4


QUEUE
PRIMED
Headstage
Grey V4
Arjun B S
HISTORY
pushkraj
Grey V4
Ajay Krishnan
Anil


HEADSTAGE
PRIMED
READY
1 h 36 min
Grey V4, 3 mL
266 layers, 0.1 mm
Arjun B S
Delete
Print


Preparing to print...


HEADSTAGE
PREPRINT
Checking Optics
Abort Print
1 / 5


HEADSTAGE
PREPRINT
Preparing Printer
Abort Print
2 / 5


HEADSTAGE
PRINTING
1 h 31 min
Layer 1 / 266
Arjun B S

So, once the printer bed and the resin tank is loaded, we can close the door. If you notice, you can see the window is actually tinted with a UV protection film. This is because the resin as I said is photosensitive. So if UV light force on it, the resin will get cured. So the only, the UV that is available within the system will now shine on the resin tank. Now, we will see how the printing is done. So once you load the bed, the resin tank, then we can enclose the door. We can prime the printer. This is a set of pre-checks that has to be followed so that the print happens successfully.

So now, the printer will analyze if everything is fine. So now, one of the cartridges has low resin, but it is okay. We will be able to do it anyway. So once the prime is successful, we can go for the printing. So the part that we uploaded from our laptop can be seen here, the Headstage part that we were planning. Now, you can see how much time, it showed, again, around one and half hours. Here also, you can see here and the material everything. We can press Print. Now, the printer is now checking its optics and other stage alignments, before it starts printing.

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Now, you can see the bed coming down to touch the tank. So now, you can see the printing has started. So this is the progress bar. After 1.5 hours, we will be able to see the print. So the print is now complete. We will take and see the part. So I am taking out the bed now, so that we can take the part out. So we can put the bed like this here. So if you look here, you can see the part.

Now, we can remove the part with it chisel. Now, we have taken out the part. So this is the part. So now, we have the part. So the next step is to wash the part so that the residual resin will be washed away in IPA solution. So this is the washing base. So you can place the part, set the time and press start. So now, the washing process will happen for 40 minutes, after which all the residual resin will be removed.

So now, the washing process is complete, so all the residual resin has gone. So now, the next step is to cure it and around 60 degrees Celsius for around 40 minutes. So this will harden any uncured resin that is there in the part. So we will just now keep it to the curing chamber. So here there is a combination of temperature and UV lighting that will cure the sample.

So now, the curing is also complete so we can take the sample out so it is cured and strong now. So we will be able to remove the supporting structures and with a minor amount of touch-ups, this part will be ready to be used as a packaging for implant. Now, you may see the part. So, now that we have the part we will be using it for the implantation in rat. So, we will be seeing how the fabrication of a sensor is done, how it is integrated to the electronics, and then moving ahead package with the part that we have printed. And, we will be implanting it. Thank you.