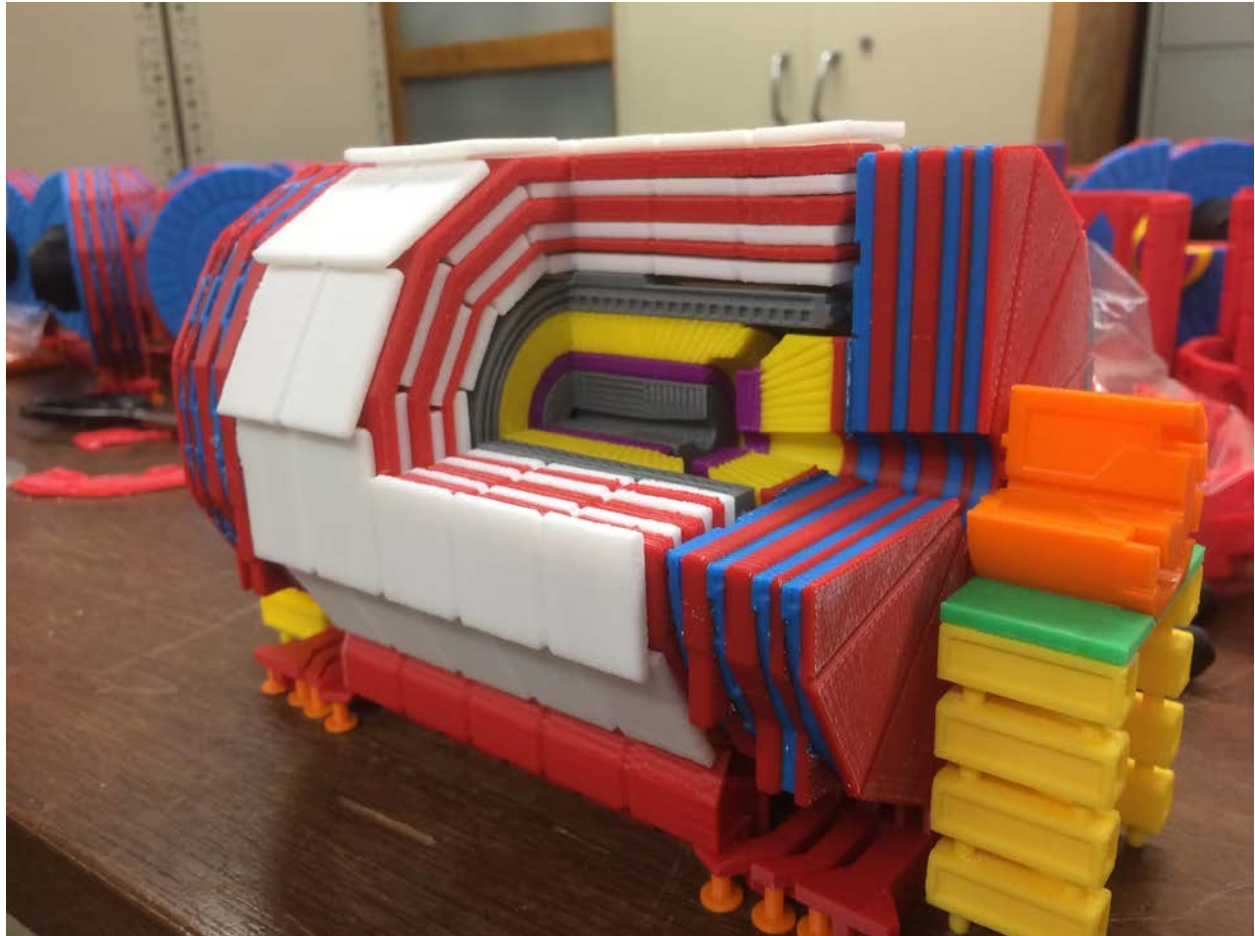# 3D Printing: The Beginner's Guide

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1: Getting to Know Your Printer

This guide will focus on the use of the Afinia H-Series H480 3D Printer *(See Figure 1.1)*. The printer features a modest build platform size of W:140 x D:140 x H:135mm that can print a wide variety of small pieces and parts. With an overall size of W:245 x D:260 x H:350mm, the printer takes up very little room and can be used on almost any rigid surface. The front of the machine as depicted in *Figure 1.2* and

Figure 1.1 Afinia H480 3D Printer

displays the Afinia logo along with a status light to indicate power and operation, and an initialization button to ready the machine to print . In the rear of the machine shown in *Figure 1*.3, a 19V power supply input and

Figure 1.2 Front of printer

PLATFORM PROBE

POWER SUPPLY

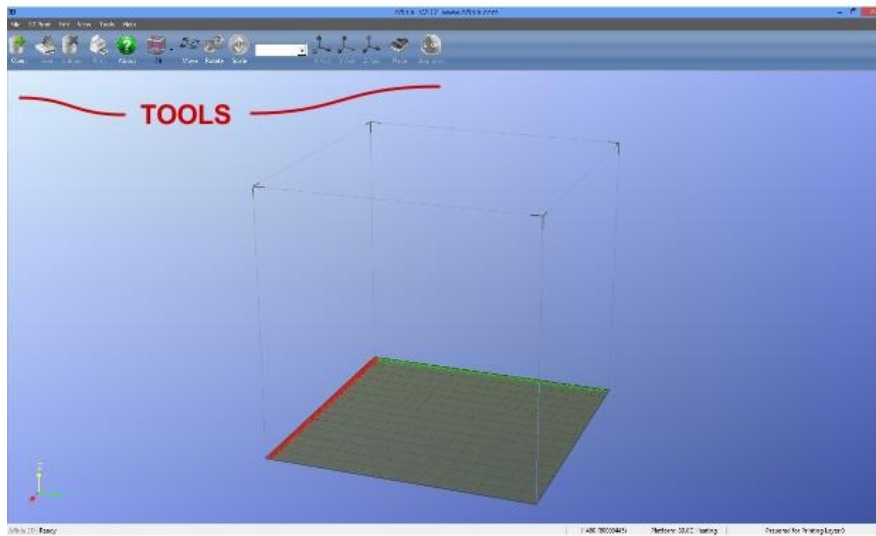POWER SWITCH

Figure 1.3 Back of printer
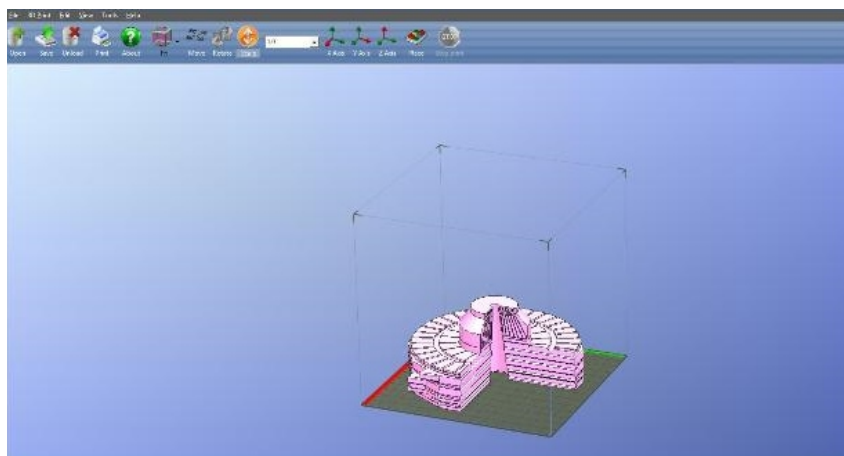

Figure 1.4 Platform probe

switch can be found to power the machine, as well as a platform probe input which is used to receive platform height information from the probe *(See Figure 1.4)* at various points on the printing surface.

2: Your First Print

Although occasionally buggy, the Afinia printing software is very straightforward and easy to use. Upon opening the software, a toolbar can be seen with many options for tasks such as loading a part, saving a project, and moving and scaling the part within the print bed *(See Figure 2.1).* To load a part into your software, click the *Open* button in the main toolbar or navigate to *File>Open…* and select your .STL or .UPP file using the dialog window. After it has been imported, use the tools in the main toolbar to rotate, scale, and move the part as needed *(See Figure*

Figure 2.1 Afinia printing software

**Figure 2.2** Imported part ready for printing
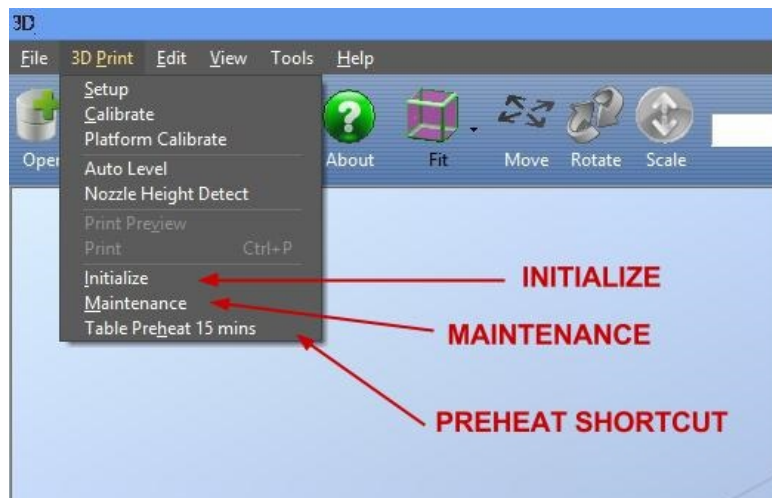
Figure 2.3 3D Print Menu

2.2). Although your part is now ready to print, we must ensure that the printer is too. To initialize your printer (if it has not already been initialized) navigate to *3D Print>Initialize (Figure 2.3).* If you do not have multiple printers connected to the computer, the printer will begin to initialize itself. If multiple printers are connected to

the same computer, the screen shown in *Figure 2.4* will appear. You must select the printer you would like to initialize and click *OK.*

Note: a non-initialized printer will display a solid red status light, while an initialized printer will display a solid green status light.
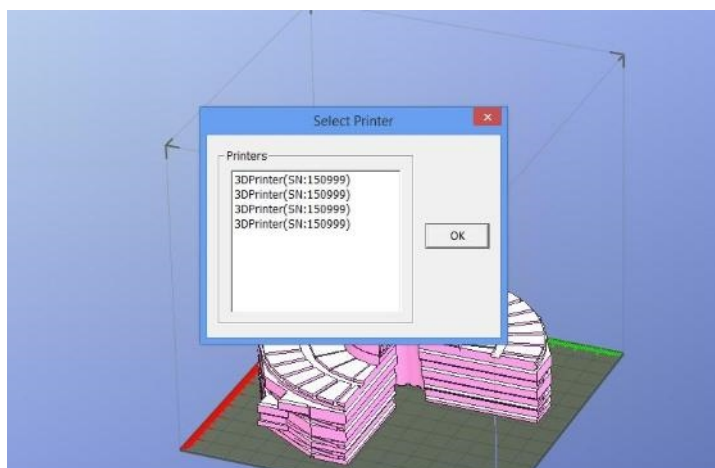
Figure 2.4 Select a printer

You will hear several beeps and the printer will move through its axes. After it has finished initializing, you must begin to heat the print bed. This can be done with the maintenance window, located in *3D Print>Maintenance,* or the *Table Preheat 15 mins** option under the *3D Print* menu tab *(See Figure 2.3).* If you have multiple printers, the screen shown in *Figure 2.4* will once again be shown. Select the correct printer and click *OK.*

Note: If multiple printers are connected to the same computer, the preheat shortcut will only preheat the printer that was last used. For greater reliability, always use the maintenance option to select the printer to heat.
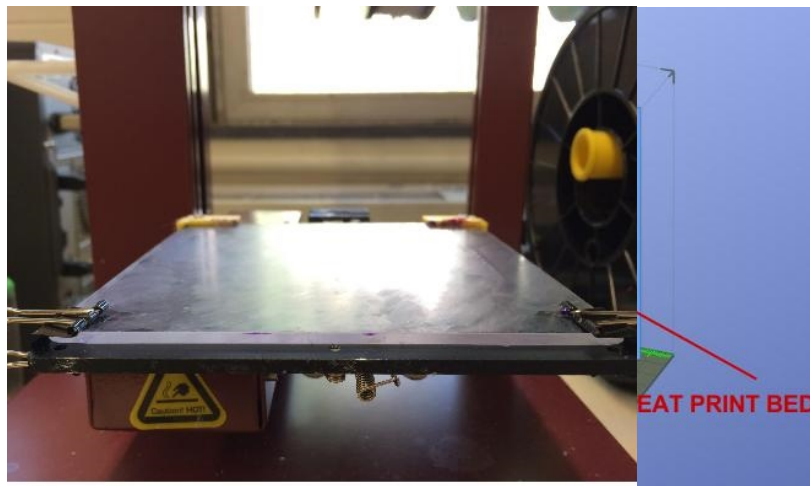

Figure 2.7 Check plate's reflection

The maintenance window in *Figure 2.5* will be shown, and from here you will be able to view the temperatures of the extrusion nozzle and print bed, move the extrusion nozzle and print bed, change the printer's print height, extrude or withdraw filament, stop or pause the current print, and lastly preheat the print bed. Click the *Table heat 1hr button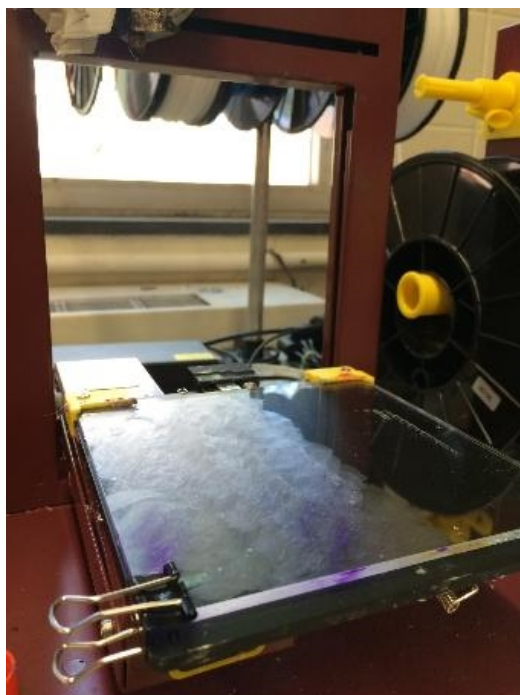*. This will begin to heat the table to 104°C and hold its heat for one hour. While the printer is heating up, begin to apply an adhesive, such as the glue from a glue stick on the printing surface. The best results have been achieved using an Elmer's Glue Stick by smearing the glue in a circular pattern on the surface of the plate *(See Figure 2.6).* Check the surface of the plate in the light to ensure that it has been coated evenly and thoroughly *(See Figure 2.7).*

Figure 2.6 Applying glue to the printing surface

Ensure that there is filament in the extrusion nozzle. If the nozzle is empty or if the
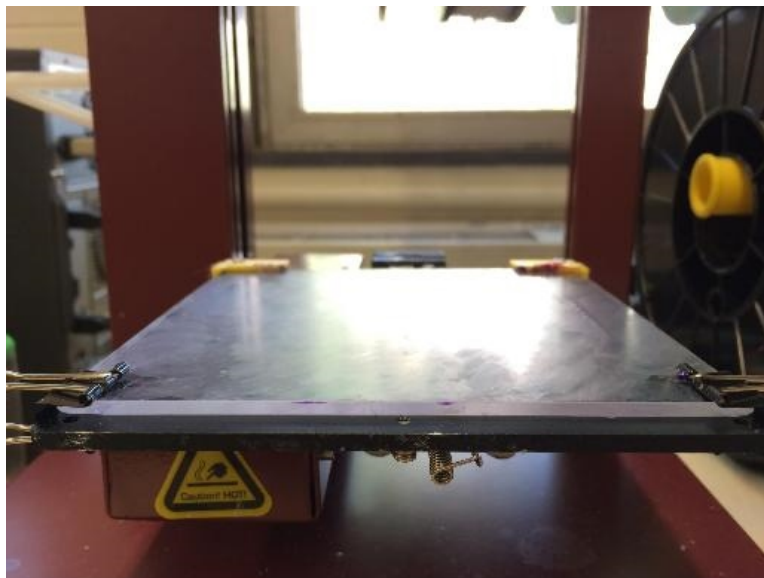
color is incorrect, use the extrude/withdraw functions in the maintenance window shown in *Figure 2.5* to change or add filament.

Once the plate has been heated to 104°C, the printer is ready to print your part. Navigate to *3D Print> Print* or select the print button from the main toolbar *(See figure 2.8)*. Once again, if multiple printers are connected to the computer, you will need to select the printer on which you wish to print.

It is here In the print menu shown in Figure 2.9 that you will be
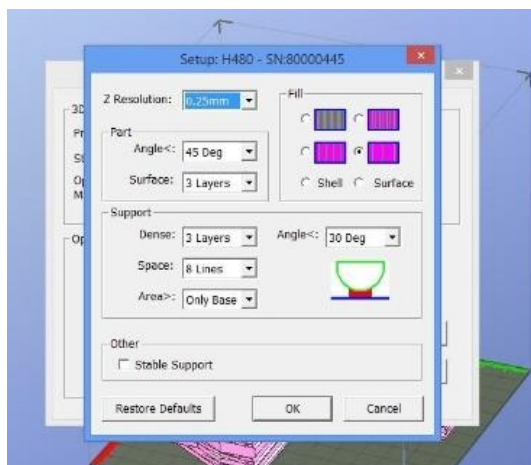

Figure 2.7 Check plate's reflection
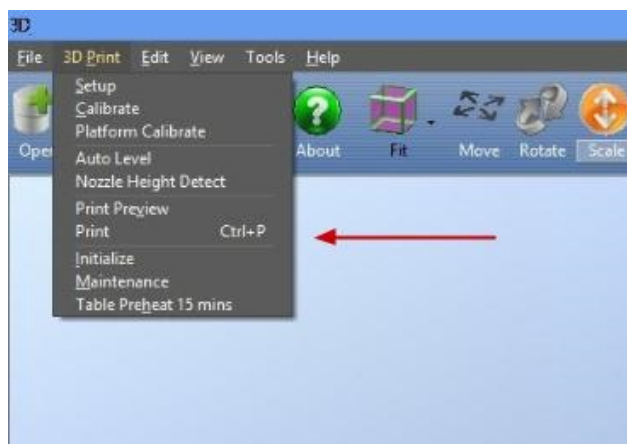
Figure 2.8 Select Print

able to set your print preferences, quality, and stop points if you wish to print in multiple colors. Select the print preferences option to finalize the settings for your print *(See Figure 2.10).* It is in this menu that you will be able to adjust how your part is printed. The default
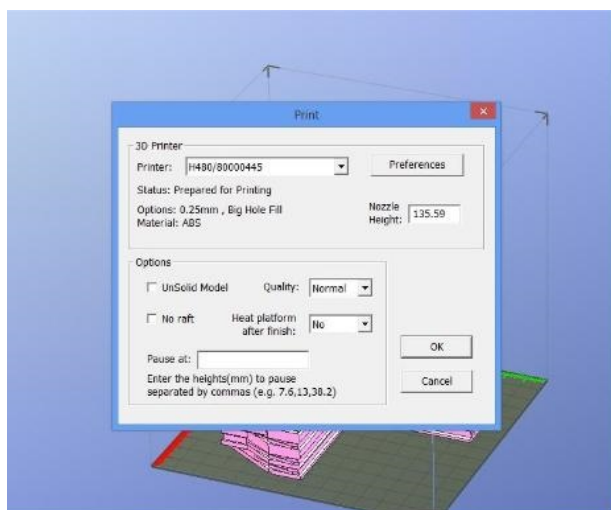

Figure 2.9 Print Menu

Figure 2.10 Print Preferences

settings are usually sufficient. If your part has faces that extend outwards into the air, supports will be built if they extend outwards at an angle greater than the angle specified in the support menu. The area setting in the support menu will affect how supports are built on areas that would otherwise be unsupported. If the unsupported area is greater than that specified in the menu, supports will be built. The fill settings will affect the material cost of the part. The different fill options are specified with a small thumbnail preview. The farther apart the lines in the thumbnail, the less material will be used in an otherwise solid piece of the part *(See Figure 2.11).*

When you are ready to print, close the print preferences window and you will once again have access to the print menu. If you have predetermined pause points for multi-colored parts, enter them now. When you are ready, select *OK* and your print will be sent to the printer.

Do not unplug or turn off your computer or printer during this process. Doing so may result in corruption of the printer's SD card or the part file.
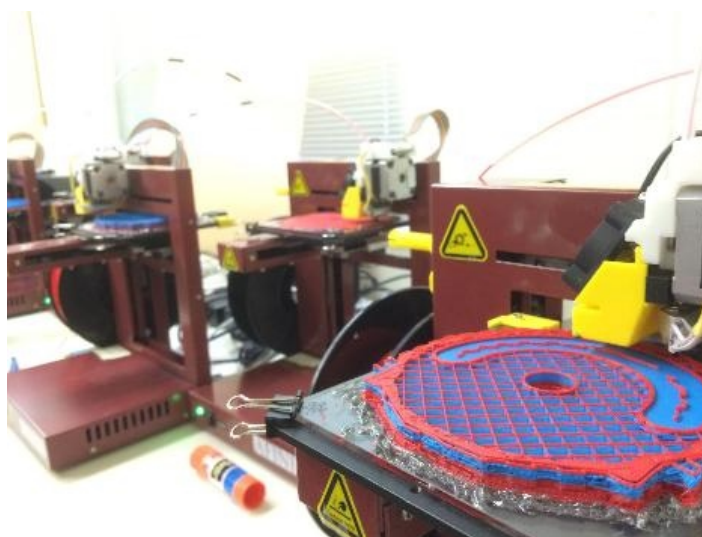
**Figure 2.11** Example of the lowest fill setting

When the printer is ready to print, the message shown in *Figure 2.12* will be shown. It will contain information about the material cost of the part, the duration of the print, and the time it will finish. The nozzle will now begin to heat to 260°C. Once it has reached this
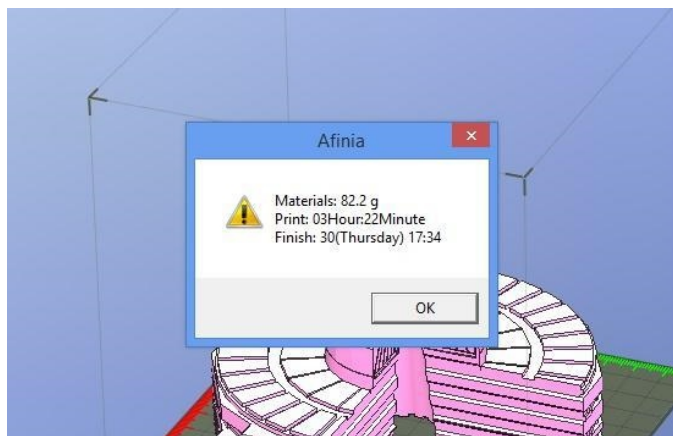
Figure 2.12 Sending print

point, the printer will give a single beep and the printer will begin to print. A small trail of filament should be present at the end of the nozzle. If this is not the case, watch the printer closely. This is often the sign of a clogged nozzle. Clear the trail before the nozzle reaches the print bed.

After the print is complete you will need to remove the platform on which the part is printed (the raft) from the print surface using a putty knife. Peel this raft and any
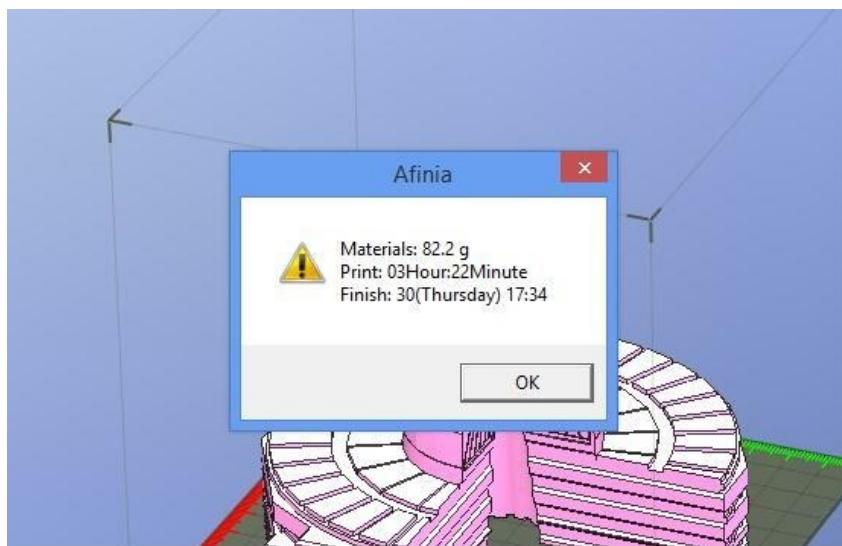
Figure 2.12 Sending print

support material away from the part. You have now successfully printed your first part.

3: Part Assembly and Care

The printed pieces are accurate to within a fraction of a millimeter, and usually fit together snugly. For pieces that are not designed to lock together, or pieces that are not intended to come apart, acetone is used as a 'glue'. Acetone dissolves the ABS plastic used by the 3D printers, but soon evaporates out. A small amount of acetone painted onto a piece will only turn the surface tacky for a few minutes. The instability caused by the acetone can make pieces slide together easier, and once the acetone has evaporated the pieces will have melted together.

An acetone slurry, made of acetone and dissolved print rafts or filament, can be used to fill cracks in a part. In the case of a repair part, this goop will fill the gap between the unfinished layer of the original part and the bottom of the repair part. The acetone in the slurry will evaporate out over time, so it should be kept covered when not in use.