Hybrid - Getting Started

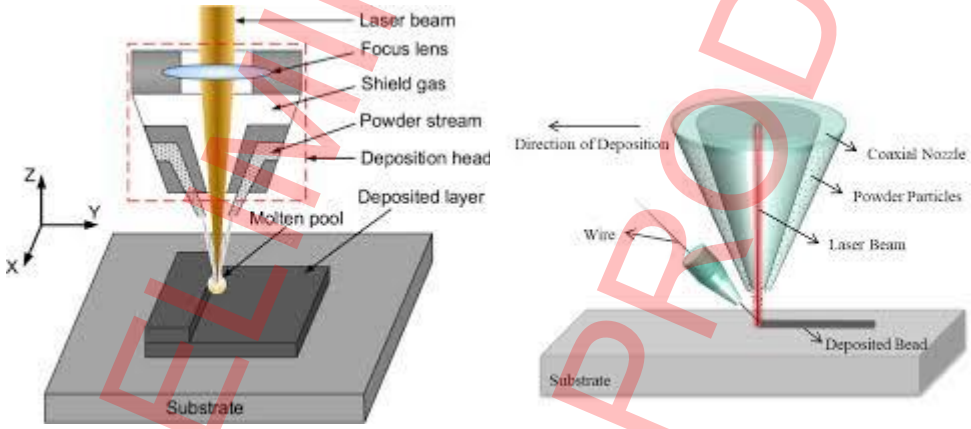
This is an overview of GibbsCAM Hybrid machining functionality. Hybrid machining is a relatively new term in machining which refers to using a combination of Additive machining (which adds material to an existing part), and Subtractive machining (Mill and Lathe). GibbsCAM Additive module works seamlessly with the existing GibbsCAM products making programming very easy and efficient.

Laser metal Deposition

GibbsCAM Additive machining specifically refers to technology which uses a laser to deposit metal powder or wire onto a part (Laser metal deposition). Additive machining is most useful for larger parts such as turbine blades and other high value parts. Different metal powders can be used to create alloys and material gradients. This is particularly suited to strengthening, repairing and adding features to existing metal parts.

The laser head assembly on an Additive machine consists of a laser beam and a stream of powder directed using shielding gas, or a wire feed.

Powder deposition/Wire deposition



In both methods, the laser melts the metal along with some of the base material, forming a melt pool- thus combining the new metal with the existing base material. This gives a very strong bond between the two materials. Multiple layers can then be built up and later finished using Lathe or Milling processes.

We are also in the process of adding another method of metal deposition to the additive software - wire arc cladding (welding style).

GibbsCAM Additive will be very familiar to existing users. The finished toolpath however results in material not being removed, but added to.

Technology file

The Technology File is a very important constituent of this process. It is required in order to handle the underlying data. This is what defines the amount and composition of material that is deposited. The technology data is compiled as a result of extensive testing and experimentation by the user. The better the data, the better the end result will be.

What you need to get started with Additive:

You will need a custom MDD that supports Additive Machining.

You must specify the location of your Technology data file.

You must create a Technology data file.

Custom MDD

Use Machine Manager to edit an existing MDD

Additive Tab and Add dialog

Machine Manager has a new Additive tab. Open this tab and click the Add button to add a laser head to the machine. Choose the required laser head type from the dropdown menu. This menu consists of all the currently supported heads.

Generic Laser (Powder)

Generic Laser (Wire)

Ambit (High Rate) (Powder)

Ambit (Fine) (Powder)

Lasertec

Optomec IPG

Okuma Trumpf Laser EX (Powder)

Fronius Mazak Variaxis

You will need to specify the Maximum Laser Power - this will be up to 2000.

Indicate the number of powder hoppers available (between 1 and 12).

Check the box if you wish to use weave patterns on all toolpath associated with this head.

Now specify the APack type which will be either a Recipe code or Job number. This is a number that calls up a set of data to output to the post.

Note the following:

Mazaks Integrex machine uses the Ambit head which can be added to a toolchanger. This is fully integrated into their controller - all the programming is done within the G Code

The Haas retrofit laser also uses the Ambit, but you cannot load any of the laser parameters via the controller, they have to be input manually.

The Fronius head has no power adjustment, only a wire diameter which should be between 0.8 – 1.2, with 1.2 being the most common. It typically uses the Job Number parameter, which sends a code to a separate controller which then defines all the power settings for the cladding. In the technology data the Fonius head has a distance parameter – how high is the head above the material, normally around 15mm. NB “laser power” definition is not needed.

Settings

Click the Additive tab in Settings. This is where you specify the location of your Technology files. It is recommended not to use the default so that the data is preserved when a new version of GibbsCAM is installed.

Tools

Additive tools you have included in the MDD will appear. Some areas are greyed out as they are set in the technology data file, but you can have several Technology Data files associated with each head. Each tool that has been set up in the MDD (for instance with different laser power, weave patterns or more powder hoppers) will appear here.

Processes

The top values where the tool head display is shown are clearance values as normal. The bottom left value is the height of the material at the start of the process. The right hand value is how high you want the **minimum** height to be. The Minimum Width value defines the width of the contour and, depending on the overlap (defined in the Advanced Settings dialog), may require several more passes to complete. The software then uses the Technology data to work out how many layers are required to achieve this and displays it. Many values on the process dialog are greyed out as they are populated from data in the Technology file.

Technology data button

We now need to click the Technology data button. This defines how we use the data in the Technology file.

Overview tab

There are three methods of defining the data for multiple layers.

The first method is the most commonly used – Use the same parameters for each cladding layer.

The option to use different parameters for each cladding layer has not yet been implemented – it will allow different material to be set up for each layer.

The Gradient option is implemented – choose the two materials and how to graduate them. The software then works out how many layers of each material is put down.

Layer Parameters

This tab shows the data from the technology file and gives an overview of what you will get.

Layer Edit

This is only partially implemented. You can make manual adjustments per layer to take into account the size of the part, or clamps where you might need to put a little extra power in. Also you might be using a powder with a slightly different grain size, which might give you slightly different results. This is designed for minor adjustments only for this particular process.

Advanced Settings

The track width and height that will be laid down is calculated from the data in the Technology file, no values can be input. The Advanced settings allows slight adjustments of track overlap/extension and corner handling.

Adjustment Regions allows boundaries to be defined within which laser power can be adjusted. This is used for regions where you know that too much or too little metal would be deposited due to temperature drains or build ups with nearby fixtures or heating.

To use a weave pattern:

Open machine manager to add a head that supports weave patterns.

You need technology data that supports weave patterns (edit an existing and check the box that says Use weave patterns).

Materials – add base and clad materials and specify a technology file for your cladding tool.

Click on Additive weave data and Add a pattern, defining the track width and pitch, giving it a meaningful name. You have control over the pitch pattern or extending the length.

Create a tool with your new head and then use this to create your Process.

Future things to watch out for:

The Technology Data dialog will be changing and tab items will be combined.