

Selective Laser Sintering Process Preparation and Control

Intro

DMC software can be used to control laser based additive manufacturing processes, like selective laser sintering (SLS), selective laser melting (SLM) or stereolithography (SLA).

In this particular case, customer was developing a new SLS system. During the prototyping stage marking software was used for machining control. However, the process was not fast enough, the system often crashed and new developments were needed for system specific software functionality.

The previous software was replaced with DMC to have a complete solution for SLS process preparation and control.

The Challenge

Customer had a prototype SLS system assembled for process testing and demonstration purposes.

- **STL file preparation. 3D printing/additive manufacturing uses files in the STL format to import models to be printed. After the import models are sliced, hatching parameters are computed for the volume and object is printed layer by layer. Some of the objects to be printed have a lot of small features and STL file for them might have millions of triangles and hundreds of megabytes of information. Handling of this information and to converting it to motion data that can be used by positioning stages and/or scanners is a big challenge as conversion uses a lot computational resource. Marking software and similar solutions created for simpler processes tend to crash or take hours for calculations to finish when working with large and complex models.**
- **Long term stability and reliability of processing. Customer was designing a cost-effective solution for SLS. To keep the costs at bay, budget galvo and stage controllers were used. To ensure long term stability, safety measures had to be taken in the software to keep process running for >20 hours at a time. Each crash means aborted processing and wasted production time.**



- **Integration of custom hardware.** Unique hardware was designed by the customer to add safety measures, temperature control and other machine functions. The hardware had to be accessible and controllable via the DMC software.
- **Recipe testing.** A prototype machine was used for R&D of sintering recipes for different materials and different printing resolutions. Creating and performing testing routines on existing tools was taking a lot of time. Speeding up the process would allow to achieve better printing quality and reduce machine time to market.

Solution

Several Q&A sessions with customer took place to determine which features are needed. The specifications for OEM version of the DMC software were prepared. These are some of the features and advantages of the DMC software which helped the customer with their additive manufacturing challenge:

- **DMC has state of the art geometry handling algorithms.** This provides our customers with fastest in the market STL slicing, hatching and preparation for printing. Taking full use of 64-bit system, preparation (slicing and hatching) of 5 million triangle STL file is done within 30 seconds. Efficient computing resources handling makes DMC reliable and stable when working with large and complex models.
- **Flexible architecture of DMC allowed to implement new stage and galvo scanner controllers quickly and easily.** During testing phase special safety measures were implemented to prevent system from crashing during long term fabrications.
- **Support for custom control electronics was developed to implement temperature control and interlock safety features.** With these features, operator now can set a specific temperature to be reached before fabrication and add cooling parameters. Temperature is constantly monitored and displayed to the operator. If temperature goes out of a set range, process is paused to correct it. Fabrication does not start until doors are closed and locked to prevent accidents.
- **DMC has a flexible recipe creation tool to create highly automated and easy to customize recipes.** Using this a special recipe was created to print an array of parts, each with a different set of parameters. Each part also has a number printed on it for identification purposes. This allowed the user to print 40 parts with unique parameter sets and find the best parameters quickly. Which parameters are tested (scanning speed, laser power, volume filling density, layer thickness, etc.) and ranges for testing can be easily selected in the recipe.
- **A special user interface was created for an operator to streamline the working process.**



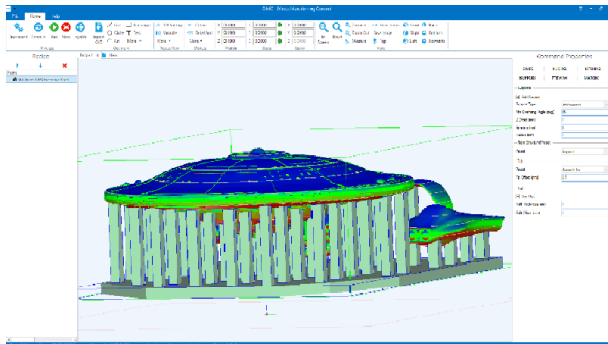


Figure 1: STL model for printing prepared with DMC



Figure 2 A sample printed via process controller by the DMC software

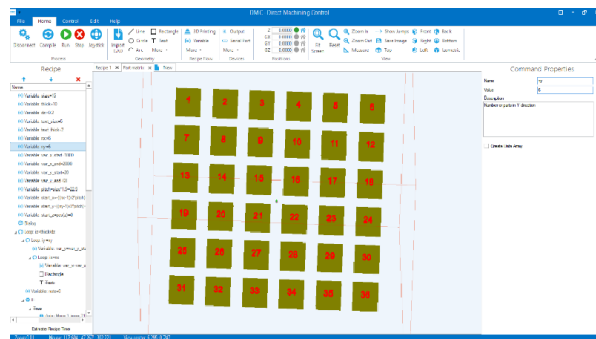


Figure 3: Recipe for printing parts with different parameters

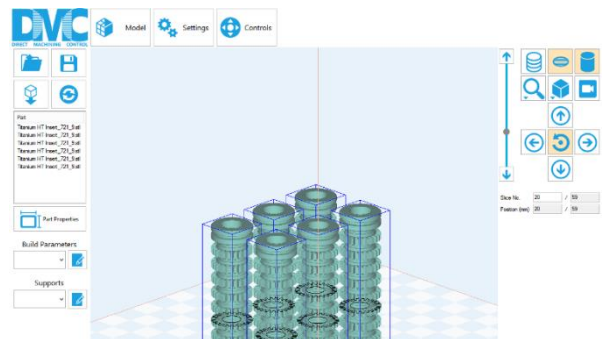


Figure 4: Operator interface for 3D printing

Results

DMC simplified the 3D printing process, as all preparation and control of the machining process is done via a single software interface. There is no need for code generation and upload.

Time of process preparation was reduced due to DMC efficiency in 3D model handling and preparation.

Time to market for the machine was greatly reduced as well, since DMC needed just minor adaptations to control the machining and they were implemented within 15 days. A combination of online and onsite testing helped to make the testing process cost-efficient, yet assured a reliable operation of customers SLS Machine.



Your quick path from idea to implementation.

About Direct Machining Control

DMC is a control software for laser machines. It's an all-in-one solution where the user creates or imports CAD objects, sets process parameters and clicks Run. DMC takes care of all the hardware control according to the recipe.

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Applications

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LASER ADDITIVE MANUFACTURING	PCB LASER PROCESSING	LASER ENGRAVING	LASER DRILLING
DMC software is a great tool to prepare and control laser additive manufacturing / 3D printing processes like Selective Laser Sintering SLS, stereolithography and others.	Gerber and NC Drill files can be imported to DMC laser machining software and prepared for machining. The whole process for both sides of PCB is controlled at single window.	Laser engraving processes can be easily prepared and controlled with DMC laser machining software. Import DXF, STL files or design picture with inbuilt tools.	DMC laser machining software allows easy preparation and control of laser drilling processes. Use NC Drill, DXF files or add holes yourself.

DMC is hardware-independent and looks the same for any combination of the hardware. Visit directmachining.com and fill the form to receive a link to the **FREE TRIAL version of DMC.**

