REPORT: Composite materials cutting by Laser-MicroJet®

For Anonymous

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TASK

The Laser-MicroJet® technology has been tested for cutting of composite materials. The main goal was to determine the feasibility of the process in order to give an overview of the technology.

SAMPLE DESCRIPTION AND PREPARATION

1 tube was available for the tests and was fixed with a clamp.

SAMPLE 1	Material	PBO/EPOXY+ Carbone(T800)/Epoxy
	Thickness	~1000 *µm*
	Quantity	1 *pcs*

Release of application report			
Project Leader		Responsible Application Group	
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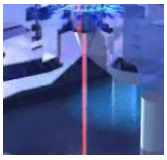
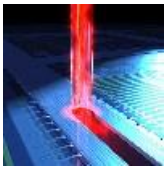
Visum:	SDE	Visum:	BC

PROCESS: INSTRUMENT & TEST PARAMETERS

For these experiments, the LCS300 equipped with a frequency-doubled Q-switched Nd-YAG laser has been used as the machine configuration in our lab.

It is a manually-loaded machine allowing to cut, drill, groove, scribe, trench, mark, or grind a wide range of materials.

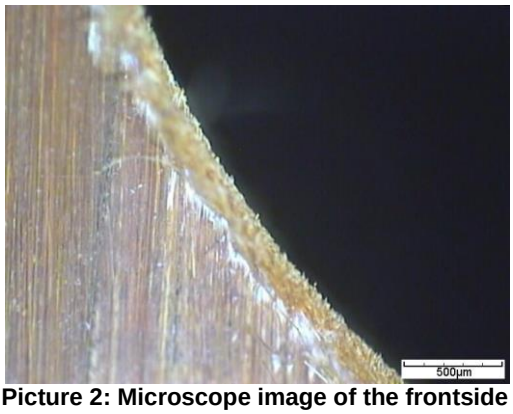
In the table below, the machine configuration is summarized:

	**SYSTEM**	Machine type	LCS300
		Helium flow (MFC)	0.9 *L/min*
		Working distance	10 *mm*
		Laser fiber	150 *µm*
		Collimator	200 *mm*
		Transmission	~58 *%*
	**MICROJET® PARAMETER**	Nozzle diameter	80 *µm*
		MicroJet® diameter	~64 *µm*
		Water pressure	350 *bar*
		Assist gas	He
	**LASER PARAMETER**	Laser type	L101G
		Wavelength	532 *nm*
		Pulse frequency	18 *kHz*
		Power (in jet)	24 (14) *W*
		Pulse width	~180 *ns*
	**CUTTING PARAMETER**	Cutting speed	20 *mm/s*
		Number of passes	10
		Process time	~20 *s*/hole
		Fixation	Clamp

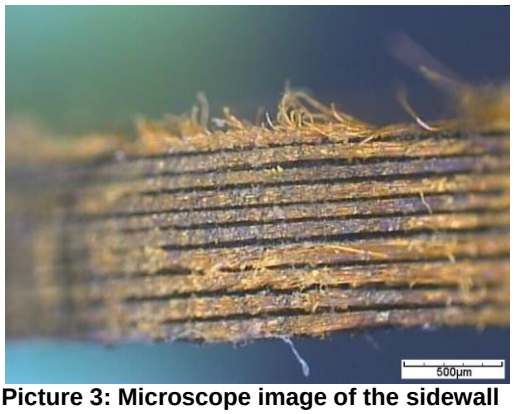
RESULTS

The following microscope pictures give an overview on the quality obtained with the Laser-Microjet® technology.

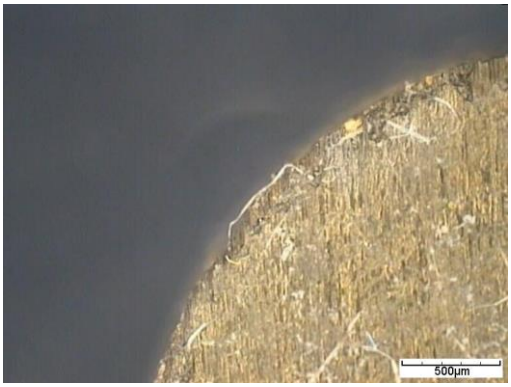
Picture 1: digital camera image of the sample



Picture 2: Microscope image of the frontside



Picture 3: Microscope image of the sidewall



Picture 4: Microscope image of the backside

CONCLUSION

The cutting of composite materials was investigated on SYNOVA LCS300. This machine is based on the MicroJet® technology and combines the advantages of the high energy pulsed laser with a hair-thin water jet. While the laser is used for material ablation, the water jet is used for guiding the laser light, cooling the edges and allowing an excellent accuracy, advantages that are essential for cutting composites with high quality.

These tests show:

- The feasibility of the process
- The cutting quality is good with limited delamination on the frontside

These first results appear promising and depending on your requirements, we could try in a further step to minimize the delamination and the heat damage, or to increase the cutting speed.

We thank you for your interest in our technology and we hope our results meet your requirements. We will contact you soon to obtain a feedback about the analysis of these results and to discuss with you the further steps.