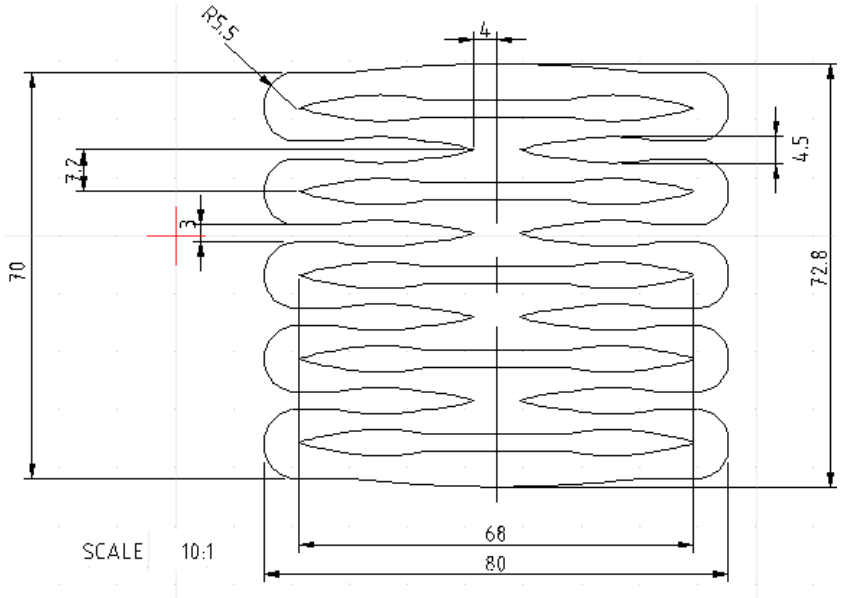
REPORT: Stainless Steel cutting by laser MicroJet®

for Anonymous

by Florent Bruckert, Rémi Laure, Synova SA

OBJECTIVE

The Laser-MicroJet® technology has been tested for cutting a special shape in a 220 µm stainless steel plate. The aim was to check the resulting quality and time of process.

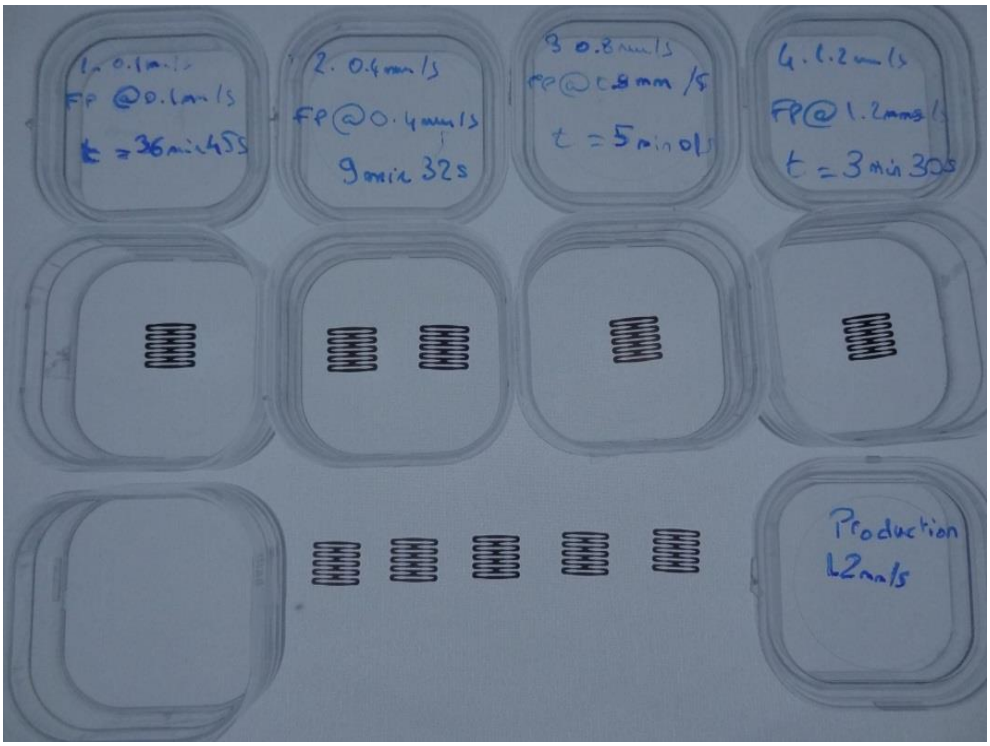


PICTURE 1: Special shape to cut (dimensions in mm)

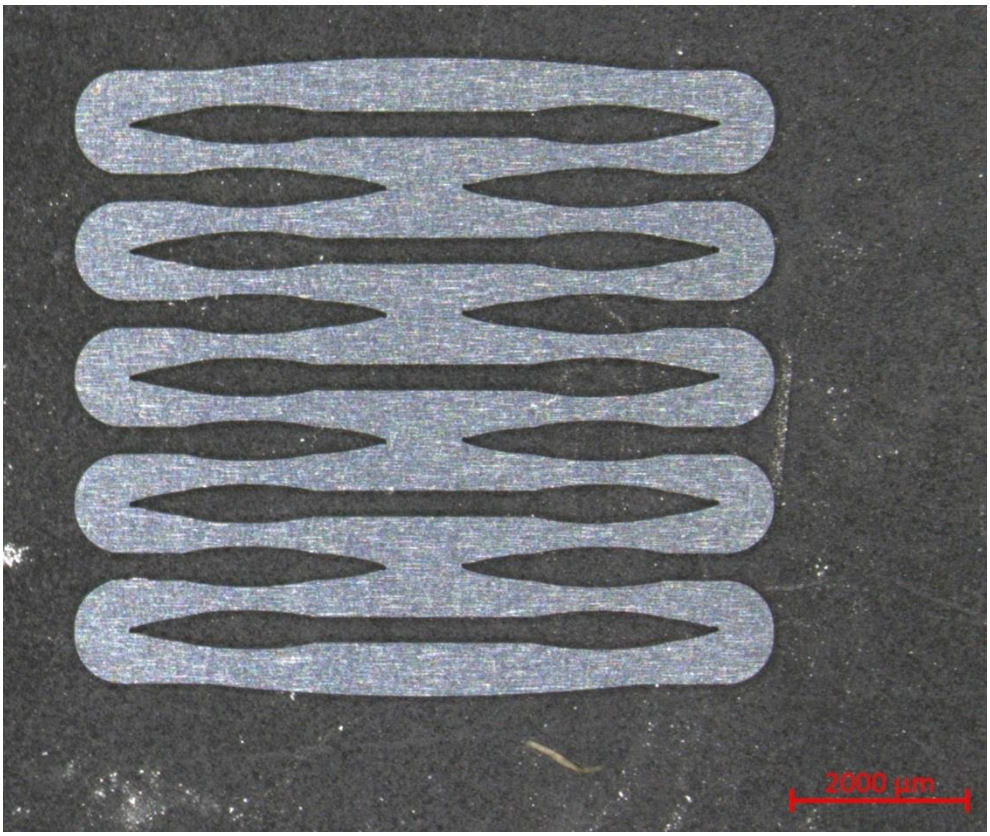
SAMPLES DESCRIPTION

SAMPLE	Material	Stainless steel	
	Thickness	220	µm
	Quantity	9	pieces

Release of application report			
Project Leader		Responsible Application Group	
Name:	Florent Bruckert	Name:	Benjamin Carron
Date:	16.12.2015	Date:	18.12.2015
Visum:	FBR	Visum:	BC



PICTURE 2: Macroscopic view of the production: 4 pieces with 4 different speeds for development and a production of 5 pieces at 1.2 mm/s

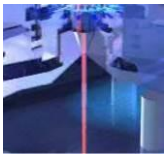
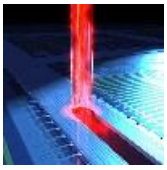


PICTURE 3: Macroscopic view of one shape after processing

PROCESS: INSTRUMENT & TEST PARAMETERS

To carry out this test we use a single-pass strategy which consists in cutting the piece by "scanning" the contour only one time. Furthermore, a finishing pass, a pass with a lateral offset, was performed to improve the quality of the edge after cutting (on inner contour only).

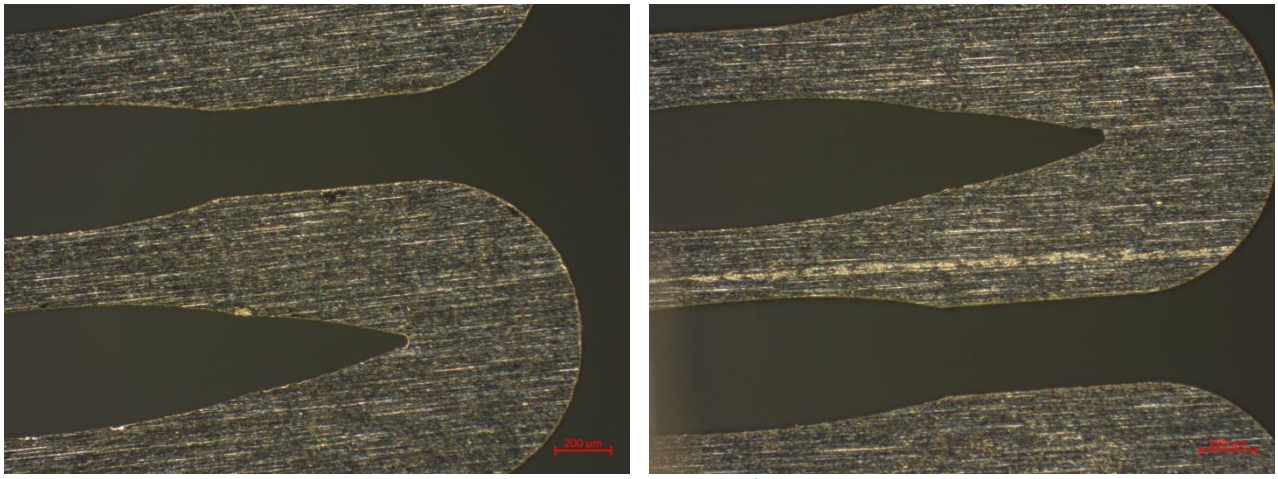
For these experiments, the LCS300, Nd:YAG laser, has been selected as the most suitable machine configuration available in the lab.
In the tables below, the optimized processing parameters used in the experiments are summarized:

	**SYSTEM**	Machine	LCS300
		Fixing type	Clamped
	**PARAMETERS FOR MICROJET®**	Nozzle diameter	30 *µm*
		Protect gas	He
		Rate of flow	1.1 *L/min*
		Waterjet pressure	400 *bar*
		Working distance	10 *mm*
	**PARAMETERS FOR LASER**	Laser type	L51G
		Wavelength	532 *nm*
	Parameters for cutting	Laser frequency	6 *kHz*
		Pulse width	120 *ns*
		Power in water Jet	5.5 *W*
	**CUTTING PARAMETER**	**Number of passes**	**1**

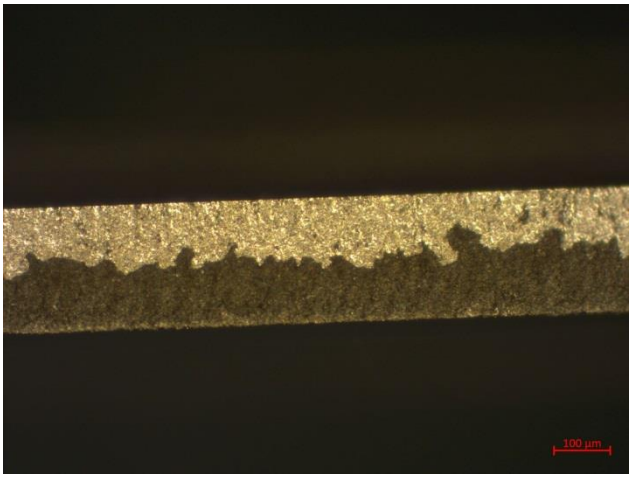
Piece Development Number	Cutting Speed	Cutting Time
1	0.1 *mm/s*	36 min 45 s
2	0.4 *mm/s*	9 min 32 s
3	0.8 *mm/s*	5 min 01 s
4	1.2 *mm/s*	3 min 30 s
Production	1.2 *mm/s*	3 min 30 s

RESULTS

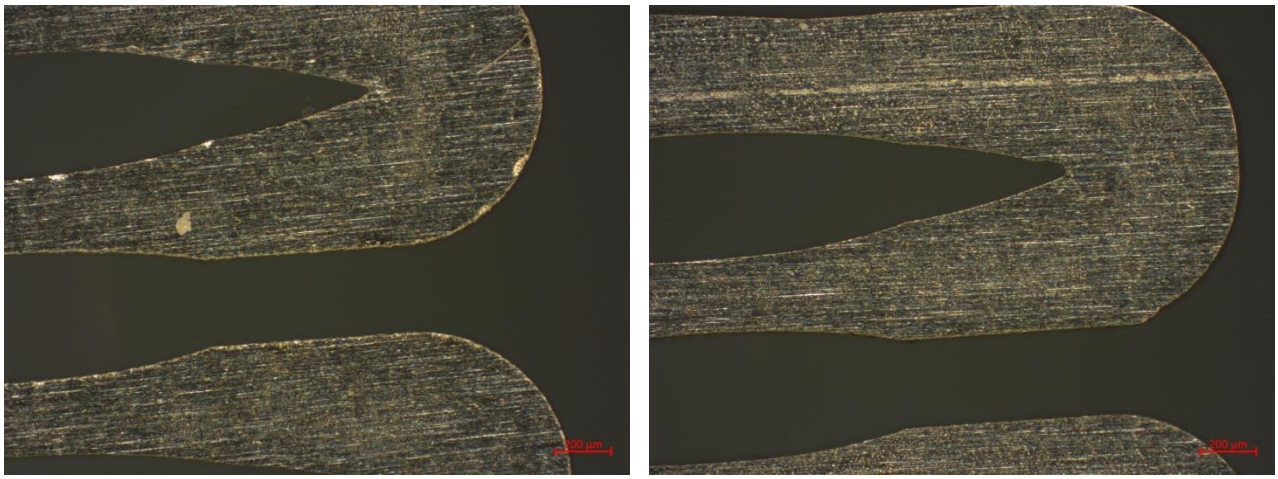
The following pictures show an overview of the cutting quality obtained with the LaserMicroJet®:



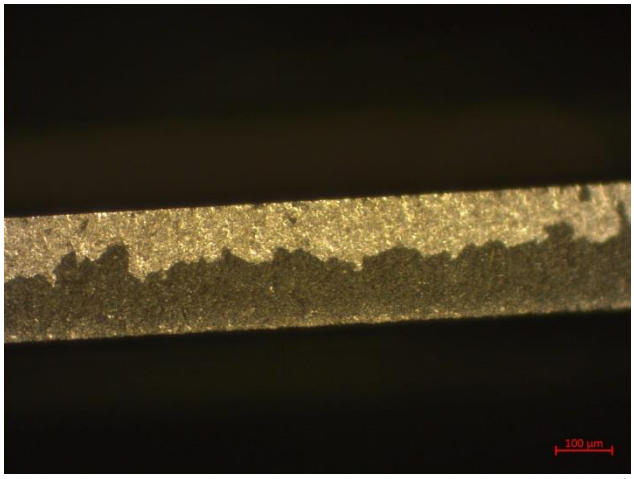
PICTURE 4 and 5: Picture of the pattern for a speed of 0.1 mm/s, frontside at left and backside at right



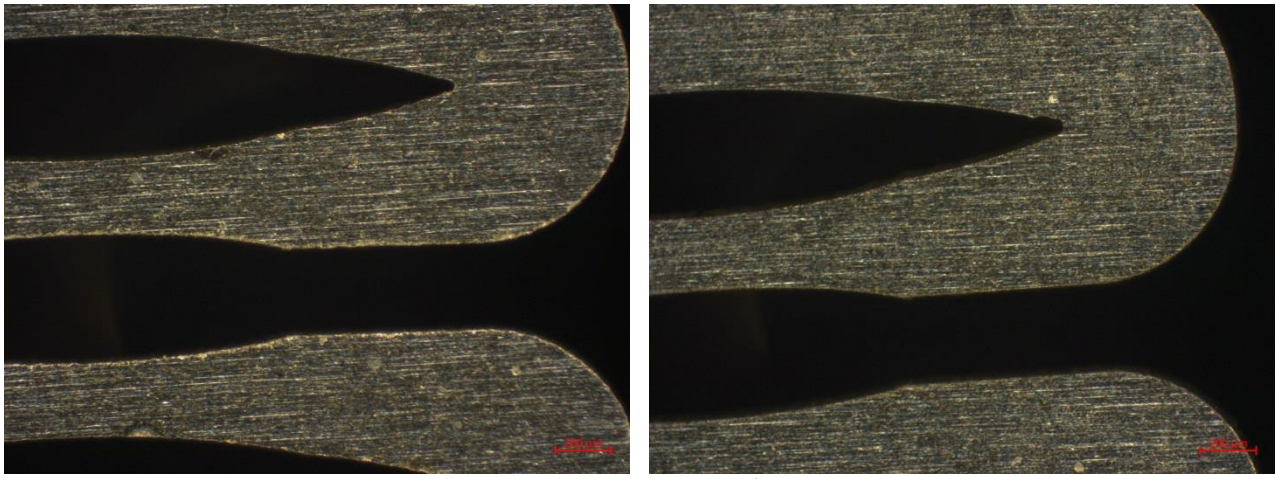
PICTURE 6: Picture of the edge of cutting for a speed of 0.1 mm/s



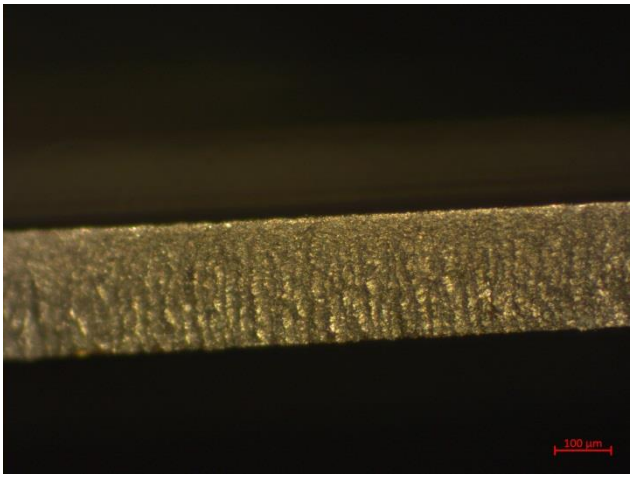
PICTURE 4 and 5: Picture of the pattern for a speed of 0.4 mm/s, frontside at left and backside at right



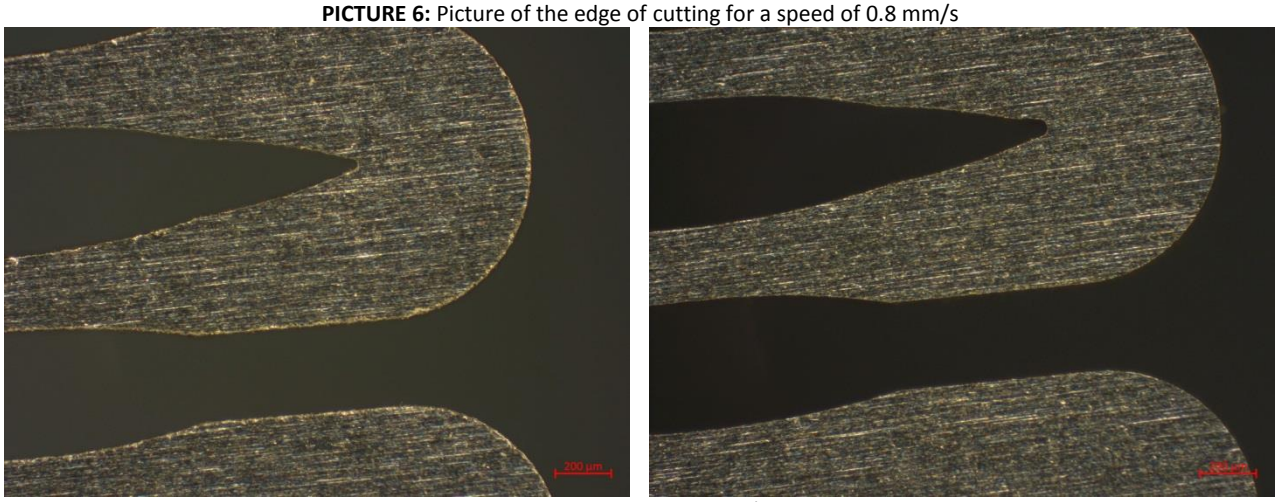
PICTURE 6: Picture of the edge of cutting for a speed of 0.4 mm/s



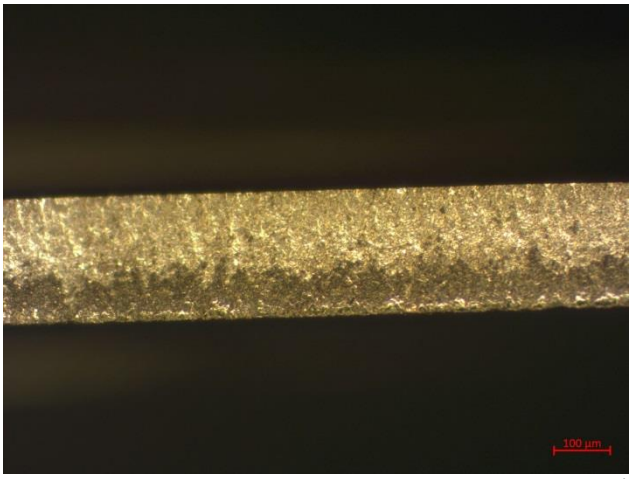
PICTURE 4 and 5: Picture of the pattern for a speed of 0.8 mm/s, frontside at left and backside at right



PICTURE 6: Picture of the edge of cutting for a speed of 0.8 mm/s



PICTURE 4 and 5: Picture of the pattern for a speed of 1.2 mm/s, frontside at left and backside at right



PICTURE 6: Picture of the edge of cutting for a speed of 1.2 mm/s

CONCLUSION

A stainless steel plate cutting was investigated on SYNOVA LCS 300.
This machine is based on the MicroJet® technology and combines the advantages of a high energy pulsed fiber 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 preventing particle contamination, advantages that are essential for metals cutting with high quality.

The tests show that:

- This special shape is cut with times between 3 min 30 s and 36 min 45 s according to your quality needs

We are open to further discuss your needs regarding:

- Control of the final dimensions according to the compensation offset.
- Improve the edge quality.
- Reduce the cutting time with the same cutting quality by optimizing laser parameters and cutting strategy

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