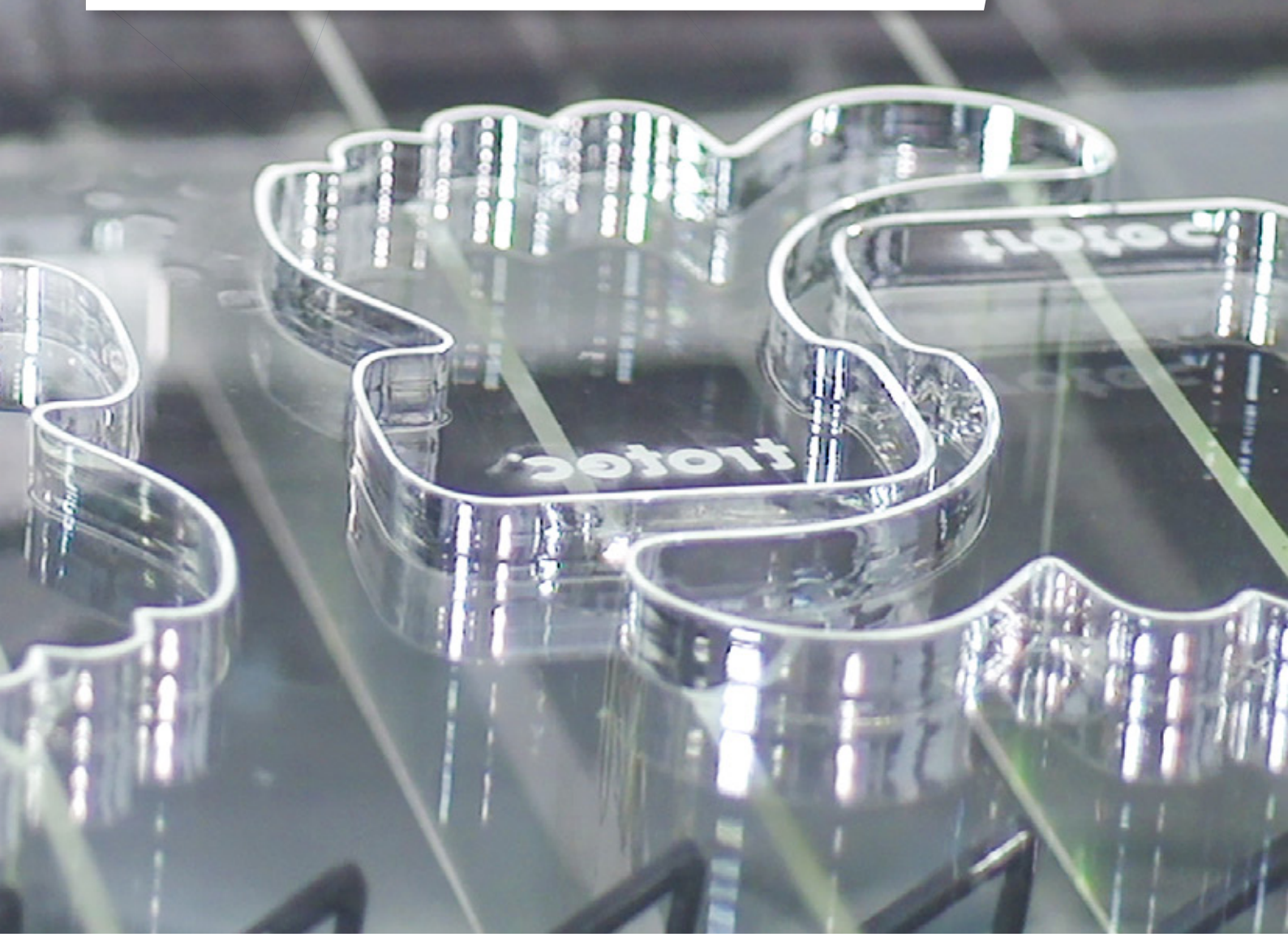
trotec

Trotec eBook Advantages of laser cutting acrylic



SETTING NEW STANDARDS

1 / Laser technology in acrylic processing – always a win!

Our customers confirm: Due to lower processing costs, acrylic processing with laser technology is up to 88% cheaper than milling!

Using lasers in acrylic processing offers unbeatable advantages compared to other technologies:

Comparison of cut edges

No post-processing of the material is required: Manual quality flame polishing of the milling edge is costly and time-consuming. It also carries the risk of damaging or even completely destroying the workpiece if handled incorrectly. The laser cut produces crystal clear cut and polished edges and inner contours without the need for post-processing of the material. In addition, cast PMMA is cut burr-free. There is no need for time-consuming deburring.

One tool for all geometries and materials

When milling, a separate cutting tool is required for different materials, geometries and material thicknesses. The laser beam is the universal „tool“ for all geometries and material thicknesses. Tool or grinding costs are eliminated.

Non-contact material processing

When milling acrylic, the sheet material must be clamped and often fixed with a vacuum. During laser processing, no pressure is exerted on the material (no clamping or other fixtures required). Simply insert the material and start lasering. This saves time and money in material preparation.

More sales through new applications

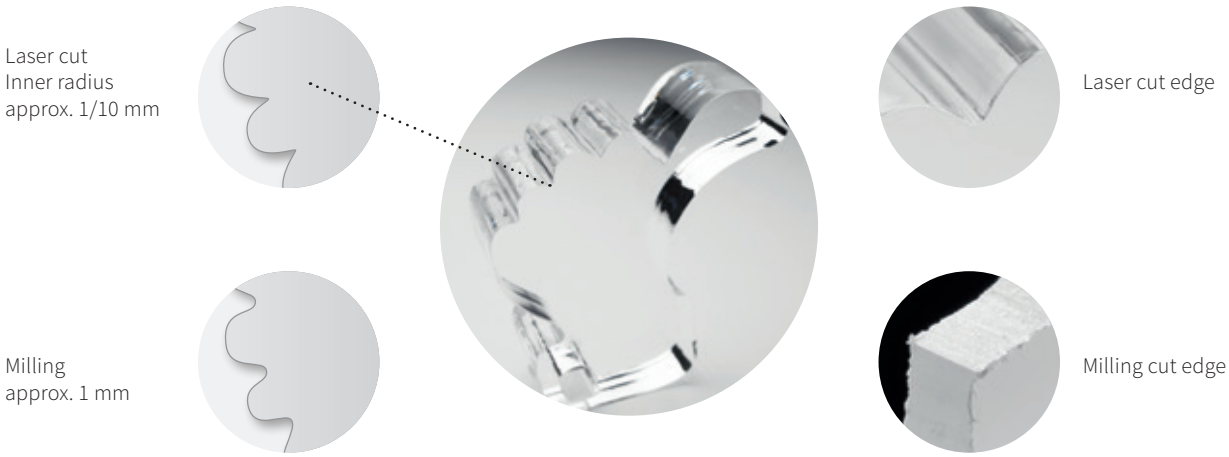
Even the finest geometries are possible with lasers. You can also use the laser for high-quality photo engravings. In combination with flame-polished inner edges, fresh opportunities open up for new applications and sales.

Less waste

With laser processing, there is no swarf, which is expensive to dispose of. Vapours are immediately extracted and filtered in the processing area. This also saves you time cleaning the system.

Best fit and repeat accuracy

The fine laser beam allows wear-free work with maximum precision. This means that all parts are reliably precise. You avoid costs from rejects and repeated production.



Product Examples

Interior signage made from printed acrylic

Displays in unusual shapes

Acrylic letters for various purposes


Laser cutting creates crystal-clear cut edges


Display printed from extruded acrylic


Illuminated letters

No flame polishing - even with fine inner radii


Impressive photo engraving

2 / Advantages of laser technology for acrylic cutting

Material processing process

Laser	Construction/ Design	Processing	Finished Product		
Saw	Construction/ Design	Clamping/ vacuum setup	Processing	Cleaning/ polishing	Finished Product
Mill	Construction/ Design	Clamping/ vacuum setup	Processing	Cleaning/ polishing	Finished Product

What are the advantages of laser processing in this industry?

- **Flame-polished cut edges without post-processing of material** → no material post-processing required
- **One "tool" for all geometries and material thicknesses** → No tool costs
- **No wear or breakage of the "tool"** → Avoidance of grinding and tool costs
- **Non-contact material processing (no pressure on the material)** → Material doesn't need to be clamped and no vacuum is required to fix the material in place → avoidance of material preparation effort
- **Cutting of very fine geometries** → More sales through new applications
- **Manual quality flame polishing requires trained personnel and can lead to destruction of the workpiece if used incorrectly** → Avoidance of edge finishing and rejects
- **Flame-polished inner contours (mostly impossible or difficult to do with manual edge finishing)** → More sales through new applications
- **Less waste (acrylic swarf)** → acrylic vapours are extracted immediately → No cleaning costs
- **Burr-free cutting of cast PMMA** → No edge finishing
- **Best fit and repeat accuracy** → Avoidance of rejects
- **High-quality photo engraving possible** → More sales through new applications

3 / Standardised cost estimate for calculating operating hours

The following values were developed in cooperation with Trotec customers.

They show average values for hourly machine rates, hourly personnel rates as well as utilisation of the laser. This can be used to calculate a profit that can be achieved with the laser per year.

Costs / h*	**Calculative depreciation for wear and tear**	$13.08		**$85,000.00 Replacement value / 5 years AFA = $17,000.00**
1300 h operation	**Imputed interest**	$1.96		**$85,000.00 Replacement value * 6% Interest = $2,550.00**
	Maintenance & space	$1.66		**2% of replacement value = $1,700.00; space = 25m² * 18 /m²**
	Energy	$0.86		**200 W = 11kw * 0.12 KW / h * 65% utilisation = $1,716.00**
	Filters	$2.31		**60 kg activated carbon + prefilter = $3,000.00**
	Laser tube	$2.54		**3 years at $9,900.00 Refill = $3,300.00 p.a.**
	Hourly machine rate	**$22.40**	**$22.40**	
	Operator	$4.60		**$23 at 20% utilisation (multiple machines operated at the same time)**
	Designer	$7.00		**$35 at 20% utilisation**
	Total hourly rate	**$34.00**		
Yield / h	**Cut yield m**	$1.50		**incl. data preparation**
	Cutting rate m/h	45		**Average 750 mm/min**
	Total yield	**$67.50**	**$67.50**	
Profit / h			**$33.50**	
Utilisation p.a.		1300 h		**200 days at 10 h = 2,000 h Total capacity; 1,300 (65%) laser hours; 300 (15%) set-up; 100 (5%) maintenance; 300 (15%) idle time**
Profit p.a.			**$ 43,554.60**	**Utilisation p.a. * Profit / h**
			Amortisation after 24 months	

4 / Example acrylic processing customer from Austria

Founded: 1987
Employees: 20
Laser hours: 1300 h p.a.

Production volume: 200 days p.a.
Production area: 1800 m²
Laser used: SP1500, 200 W

Production costs p.a.

Comparison of milling vs. laser processing

Cost type	Milling	Laser	Difference
Clamping material & creating vacuum	$10,500 ($35 / h * 300 h)	$ 0	
Edge finishing (flame polishing)	$70.000 ($35 / h * 2000 h)	$ 0	
Other set-up time and machine cleaning	$3,500 ($35 / h * 100 h)	$3,500 ($35 / h * 100 h)	
Filter costs	$ 0	$3,000 (60 kg activated carbon))	
Work head	$6,000 ($30 * 200 heads p.a.)	$4,000 (1/2 refill p.a.)	
	$90,000	**$10,500**	**$79,500**

Cost/yield type

Cost-/Type of yield	Rotary	Laser	Difference
Investment	$29,000	$115,000	-$86,000
Process costs p.a.	$90,000	$10,500	$79,500
Additional profit contribution p.a. (new application acrylic engraving, etc.)	$ 0	$10,000	$10,000
Cost advantage after 1 year of production			**$3,500**
after 2 years of production			**$93,000**
after 3 years of production			**$182,500**

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