

# Trotec eBook Advantages of laser cutting acrylic

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

Our customers confirm: Due to the 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:

## The cut edges in comparison

No post-processing of material 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 edges and inner contours without post-processing of the materials. 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 tool head 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 fixation). Simply insert and start lasering. This saves time and money in material preparation.

## More sales through new applications

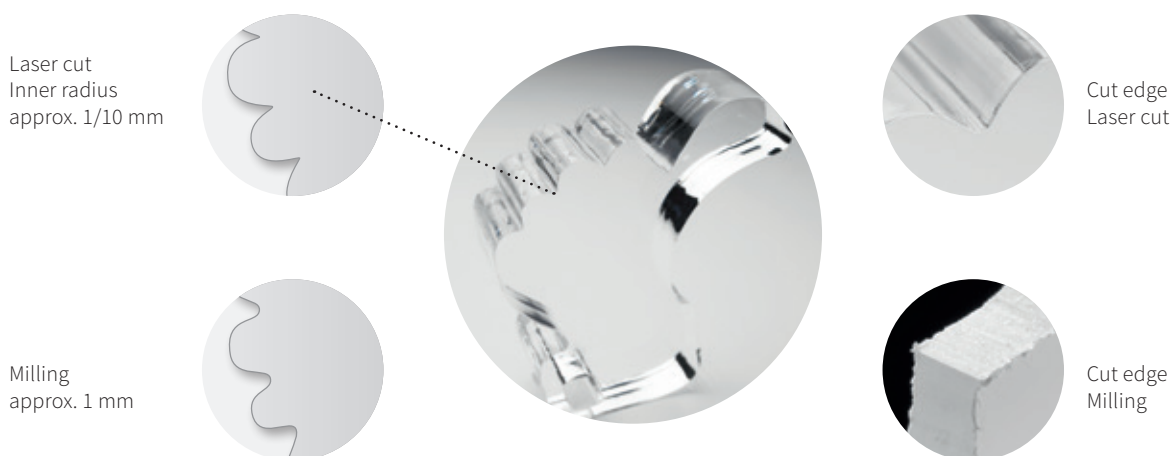
Even the finest geometries are possible with lasers. You can also use the laser for high-quality photo engravings. In combination with flame-polished inner edges, doors open to new applications and sales.

## 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



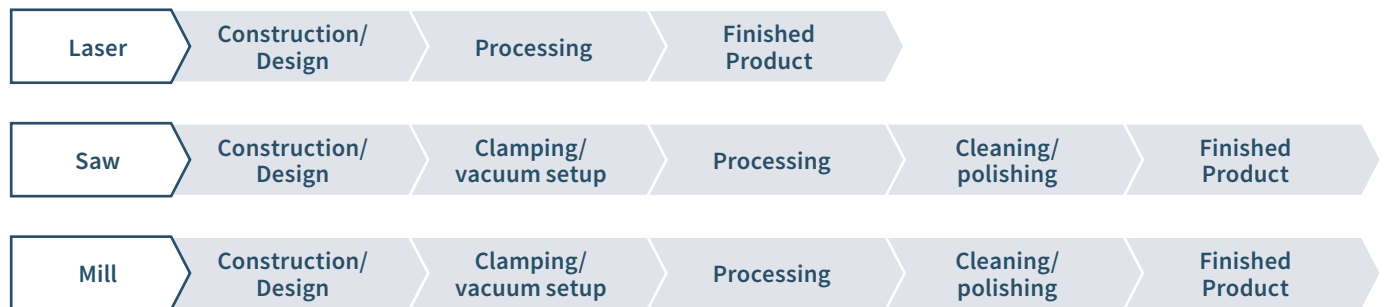
No flame polishing - even with fine inner radii



Impressive photo engraving

## 2 / Advantages of laser technology for acrylic cutting

Material processing process





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 AFA (depreciation for wear and tear) | € 13.08 |             | 85,000.00<br>Replacement value / 5 years<br>AFA = € 17,000.00                                                                                  |
| 1300 h operation | Imputed interest                                 | € 1.96  |             | 85,000.00<br>Replacement value * 6%<br>Interest = 2,550.00                                                                                     |
|                  | Maintenance & space                              | € 1.66  |             | 2% of replacement value =<br>1,700.00; space = 25m <sup>2</sup> * 18 /m <sup>2</sup>                                                           |
|                  | Energy                                           | € 0.86  |             | 200 watts = 11kw * 0.12 KW / h *<br>65% utilisation = 1,716.00                                                                                 |
|                  | Filters                                          | € 2.31  |             | 60 kg activated carbon + prefilter =<br>3,000.00                                                                                               |
|                  | Laser tube                                       | € 2.54  |             | 3 years at 9,900.00 Refill =<br>3,300.00 p.a.                                                                                                  |
|                  | Hourly machine rate                              | € 22.40 | € 22.40     |                                                                                                                                                |
|                  | Operator                                         | € 4.60  |             | € 23 at 20% utilisation (multiple<br>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<br>Total capacity;<br>1,300 (65%) laser hours;<br>300 (15%) set-up;<br>100 (5%) maintenance;<br>300 (15%) idle time |
| Profit p.a.      |                                                  |         | € 43,554.60 | Utilisation p.a. * Profit / h                                                                                                                  |
|                  |                                                  |         |             | Amortisation after 24 months                                                                                                                   |

## 4 / Example acrylic processor customer from Austria



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

**Production volume:** 200 days p.a.  
**Production area:** 1800 m<sup>2</sup>  
**Laser used:** SP1500, 200 watts



Production costs p.a.

Comparison of milling vs. laser processing

| Cost type                              | Milling                            | Lasering                            | Difference      |
|----------------------------------------|------------------------------------|-------------------------------------|-----------------|
| Clamping material & creating vacuum    | € 10,500<br>(€ 35 / h * 300 h)     | € 0                                 |                 |
| Edge finishing (flame polishing)       | € 70,000<br>(€ 35 / h * 2000 h)    | € 0                                 |                 |
| Other set-up time and machine cleaning | € 3,500<br>(35 € / h * 100 h)      | € 3,500<br>(35 € / h * 100 h)       |                 |
| Filter costs                           | € 0                                | € 3,000<br>(60 kg activated carbon) |                 |
| Work head                              | € 6,000<br>(€ 30 * 200 heads p.a.) | € 4,000<br>(1/2 refill p.a.)        |                 |
|                                        | <b>€ 90,000</b>                    | <b>€ 10,500</b>                     | <b>€ 79,500</b> |

Cost advantage of a Trotec laser

| Cost/yield type                                                               | 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                                     |          |           | <b>€ 3,500</b>   |
| after 2 years of production                                                   |          |           | <b>€ 93,000</b>  |
| after 3 years of production                                                   |          |           | <b>€ 182,500</b> |

TROTECLASER.COM

***trotec***

Trotec Laser Ltd.  
T +44 (0)191 580 1184  
[enquiries@troteclaser.co.uk](mailto:enquiries@troteclaser.co.uk)

