Laser cutting: old challenges – modern solutions

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Bystronic

- Founded: 1986
- Headquarters: Niederönz, CH
- Conzzeta: 1994

Field of activity:
- systems for **sheet metal processing**
Key figures 2017

856 Mio. CHF
774 Mio. € / 867 Mio. $

Revenue

2417
Employees

116 Apprentices

Revenue › core activities

Revenue › market regions

2% *
18%
12%
68%

* Secondhand machines
Laser cutting – fiber lasers

ByStar Fiber

BySprint Fiber

BySprint Fiber XXL

BySmart Fiber
Physics of cutting process – Fiber vs. CO2

Fiber ($\lambda=1\mu\text{m}$)

CO2 ($\lambda=10\mu\text{m}$)

Angle of incidence $\nu$ [deg]

Absorption [a.u.]

Thin sheet

Cutting direction

Thick sheet
Technology components for improving cutting
Robustness and performance

- **power scaling**
  (4kW -> 6kW -> 10kW -> 12kW -> ?)

- **process gas**

- **process optimisation**

- **optics**

- **beam shaping technologies**
Cost comparison for mild steel and stainless steel (assist gas N2)

- Fiber 8000 N2
- Fiber 10000 N2
- Fiber 12000 N2

More parts/h, same costs as 10kW

More parts/h and less costs
Process optimization

- Piercing with “no time” up to 10mm.
- Increased efficiency by optimized process sequence.

Example mild steel 6mm

- High speed process scanning with constant cutting speed thanks optimized path calculation.
- Increase productivity compared with conventional processing up to 400%.
different optical setups without collimation

1. End cap
2. Fix or adaptive mirror
3. Protective glass
4. Process monitoring
5. Additional beam shaping optics
6. Plano mirror
7. Process monitoring
principle optical setup without collimation optics

- no collimation
- only three transmissive optics (end cap, lens & protective glass)
- rel. focal shift <2%/kW
- short thermalisation time

small spot size (short Rayleigh length)
large spot size (long Rayleigh length)
flame cut in «low quality» mild steel 20mm

Bystronic BeamShaper

- field of application: flame cutting of mild steel 10 / 12 / 15 / 20 / 25 / 30mm
- higher process stability
- better cutting edge quality – in particular for «low quality» mild steel
- up to 28% higher cutting speeds in «commercial grade» mild steel

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