

Fibre laser cutting of thick metal sheets

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- Equipment for fibre laser cutting
- Personal for fulfilling the task
- Fibre laser cutting in different positions
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- Conclusion
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Background of the task

- Dismantling of nuclear power plants
- Cutting of different types of steel with thicknesses up to 30 mm
- Minimisation of emission of contaminated material during cutting process
- Economical efficiency of the whole dismantling process
- Tests were done for cutting of the „safety container“
- „Safety container“ is a sphere made of carbon steel ($t=30\text{mm}$)
- The sphere has a diameter of 27 m
- Cutting in different positions

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Equipment for fibre laser cutting

Mobile Base Station with laser source YLR 10.000 (manufacturer IPG)



Chiller
(63 A net connection)

Storage cabinet

Laser source
(63 A net connection)

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Testing set up at SLV M-V



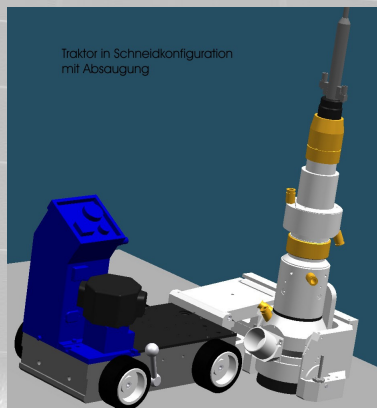
Device for turning the plate to simulate different cutting positions



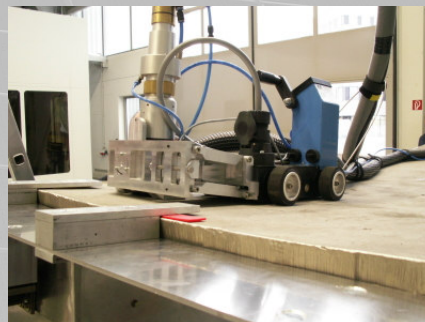
Original plates from the „safety container“ (sphere) were used

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Adapted cutting head with tractor



schematically



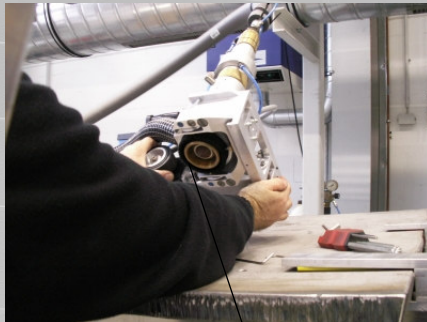
Tractor on test plate

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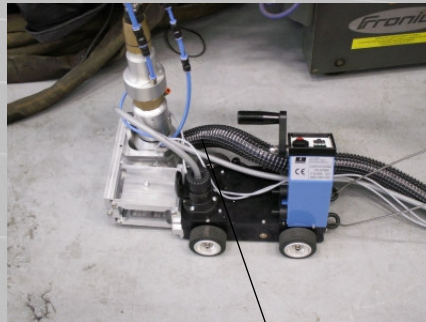
Adapted cutting head with tractor

- Sensors for measuring the distance between tractor and plate
- Internal Si-sensors for measuring secondary radiation
- Follower roll for constant distance between cutting nozzle and plate
- Brushes around the process area
- Exhaust system for the process area

Safety equipment above and below the plate



Rings and brushes around the process area



Exhaust system for process area

Safety equipment above and below the plate



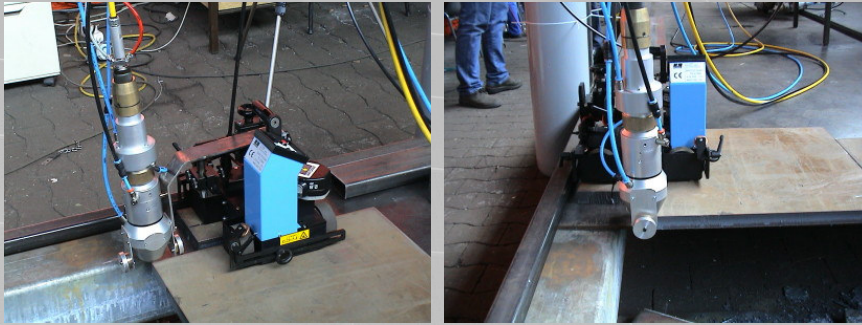
Beam catcher below the plate with exhaust system in different positions

Qualification of personal before and during the tests

- Theoretical and practical course comparable to the qualification „laser beam specialist“
- The course had a focus to cutting and manual and mechanised guided laser systems
- One day theoretical and practical lessons about laser safety during this course
- Tests were done under supervision of experienced staff

Fibre laser cutting in different positions

Pre tests with first tractor prototype in horizontal position

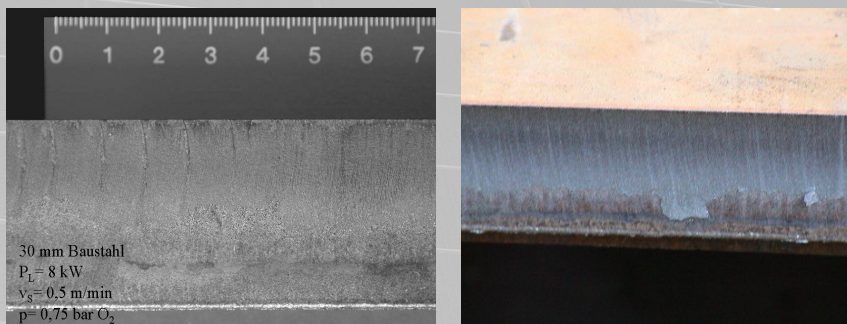


Magnetic tractor GLUMAG (Servisoud) with adapted cutting head

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Fibre laser cutting in different positions

Pre tests with first tractor prototype in horizontal position



Carbon steel, Sheet thickness 30 mm, cutting speed 0,5...1,0 m/min

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Tests for qualification of the process with the end user



During cutting tests in horizontal position

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Tests for qualification of the process with the end user

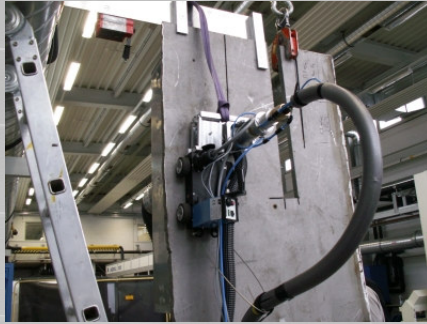


During cutting tests in 45° down position

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Fibre laser cutting in different positions

Tests for qualification of the process with the end user



During cutting tests in vertical down position and in PB position

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Fibre laser cutting in different positions

Tests for qualification of the process with the end user



Some results from testing



Finished !!

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Tests for comparison of the two processes with plasma technology



Plasma cutting with exhaust system above and below the plate

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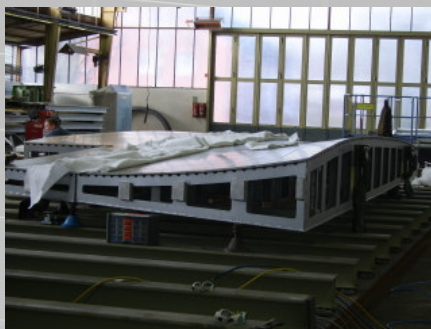
Comparison between Plasma and Laser cutting

- Increasing the cutting speed about 100% with laser cutting possible
- Reduction of the emissions about 60% with laser cutting possible
- Reduction of the cutting gap about 60% with laser cutting possible
- Increasing the sheet thickness about 100% with plasma cutting possible
- Investment costs significantly lower with plasma cutting in this case

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- Technology and equipment are applicable for cutting thick materials
- Laser cutting in different positions is possible with good results
- Mobility of the whole equipment is an essential factor for the task
- Safety issues has been fulfilled (laser safety as well as radiation)
- Minimisation of emission can be reached by using laser cutting
- Cutting speed with laser is higher compared with plasma cutting
- Mobile laser systems in dismantling offering technological benefits
- Mechanised laser equipment is usable for different tasks

Welding of a tool for manufacturing of airplane parts



Three dimensional seam with appr. 7 m in length

Welding of a tool for manufacturing of airplane parts



Tractor with laser welding head

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