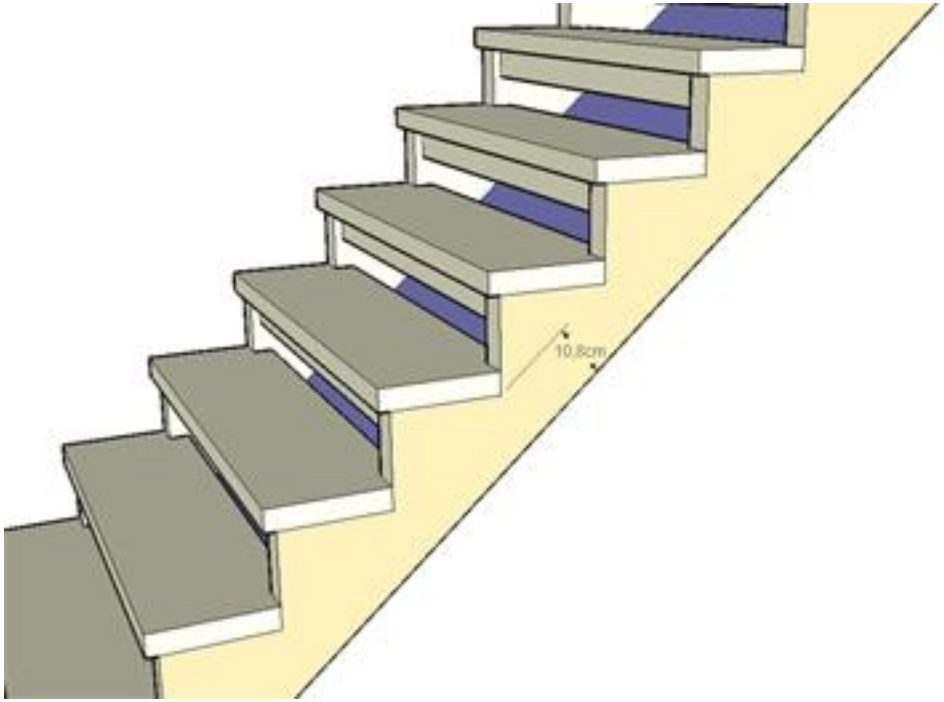
- **Den tekniska utvecklingen inom plasmaskärning..går snabbt!**



Tekniken går snabbt framåt

- **Finstråleplasma 1998**

- 12.7 mm Mild Steel 100-Amp

- **Finstråleplasma 2010**

- 50 mm Mild Steel 400-Amp

Skapar helt nya möjligheter……

Men också nya problem……

Miljöproblem….

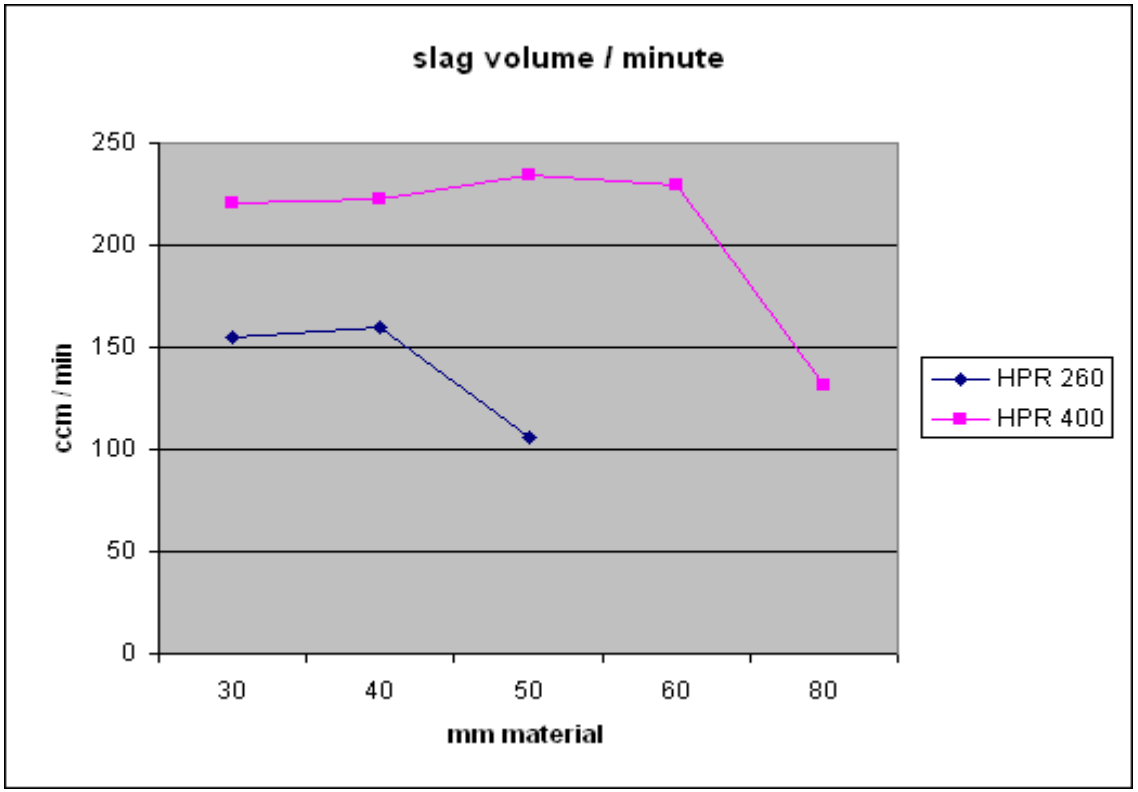
Think „Green“ while Plasma Cutting!

- **Torr Plasma**
  - Stoff -
  - Rök
  - Ljud
  - (UV)-Radiation Strålning

- **EU regulations on**
  - Air Pollution at Workplaces
  - Ljud at Workplaces
  - Radiation at Workplaces

- **Under Water Plasma**
  - Stoff
  - Rök
  - Ljud
  - (UV)-Radiation

- **Cost of protecting the Environment**
  - Productivity
  - Quality of Cut



Slag volume

234 ccm/min is 14 l /h

Change in filter layout required !

Attention: HPR400XD…genererar 46% mer stoff!

- **Stoff**

  From 0,03 Micron to macroscopic (clustered)

- **Rök**

=> **Rök utsug nödvändigt**

- **Ljud**

  Mer än 130 db(A)

=> **Ljud skydd nödvändigt**

- **(UV)-Strålning**

  Solbrun på några minuter

  Flash burn (of the eyes) from exposure to light emitted from plasma arc within minutes

=> H**ud och ögonskydd nödvändigt**

- **Stoff (EN 481)**

  Common Air Pollution Threshold

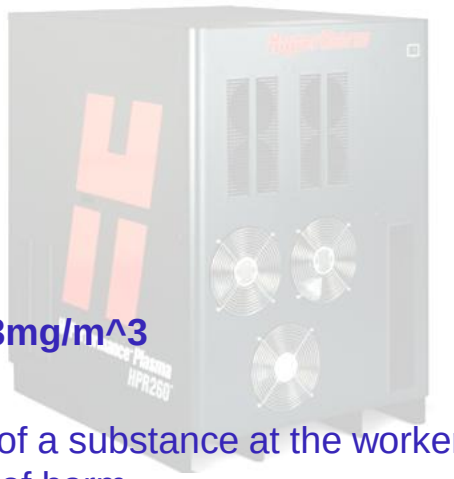
  - Concentration of alveolar Stoff particles
    - A-Stoff **3mg/m^3** D_{50} = 4µm
  - Concentration of respirable Stoff particles
    - R-Stoff **10mg/m^3**
  - **For Cutting Applications use A-Stoff limit of 3mg/m^3**

  Workplace exposure limit (WEL)

  - Threshold of the time weighted average concentration of a substance at the workers place with respect to a reference exposure time. Defines the limit of harm.

  Bio hazards

  - Aluminum*
  - Lead (Pb)*
  - Cadmium (Cd)
  - Chromate (Cr-VI-Compounds)
  - Cobalt (Co)
  - Manganese (Mn)*
  - Nickel (Ni)
  - * Bio threshold exists



- **Stoff (EN 481)**

  Material specific coefficient

  - Air way and lung polluting substances — e.g. Iron-Oxides
  - Toxic and toxic-irritative substances — e.g. Manganese-Oxide, Copper-Oxide
  - Carciogenic substances — e.g. Cr(VI)-Compounds, Nickel-Oxide

  Process specific coefficients

  - Low emission rates (< 1mg/s)
  - Intermediate emission rates
  - High emission rates
  - Very high emission rates (>25 mg/s)

applies to Torr Plasma cutting

Fume extractor is a must !

Fläkt- och filter är alltid nödvändigt

- **Ljud (European Community Directive 2003/10/EG)**

  Lower triggering Level

  - $L_{EX,8h}$ >= 80 dB(A) or $L_{pC,peak}$ >= 135 dB(C)
    - Instruction
    - Offer ear protection
    - Offer preventive medical checkup

  Upper triggering Level

  - $L_{EX,8h}$ >= 85 dB(A) or $L_{pC,peak}$ >= 137 dB(C)
    - Mark noisy areas and limit access
    - Force workers to use ear protection
    - Initiate frequent preventive medical checkup
    - Set up Ljud reduction program

Ljud exposure comparison for $L_{EX,8h}$ >= 85 dB(A)

Ljud level / dB(A)	85	88	91	94	97	100	103	115
Exponerings tid / hrs	8	4	2	1	0,5	0,25	0,125	0,008
Exponeringstid / min				60	30	15	7,5	0,5

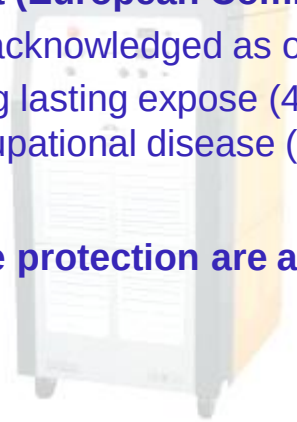
Hörselskydd och program för reduktion av ljud är ett krav!

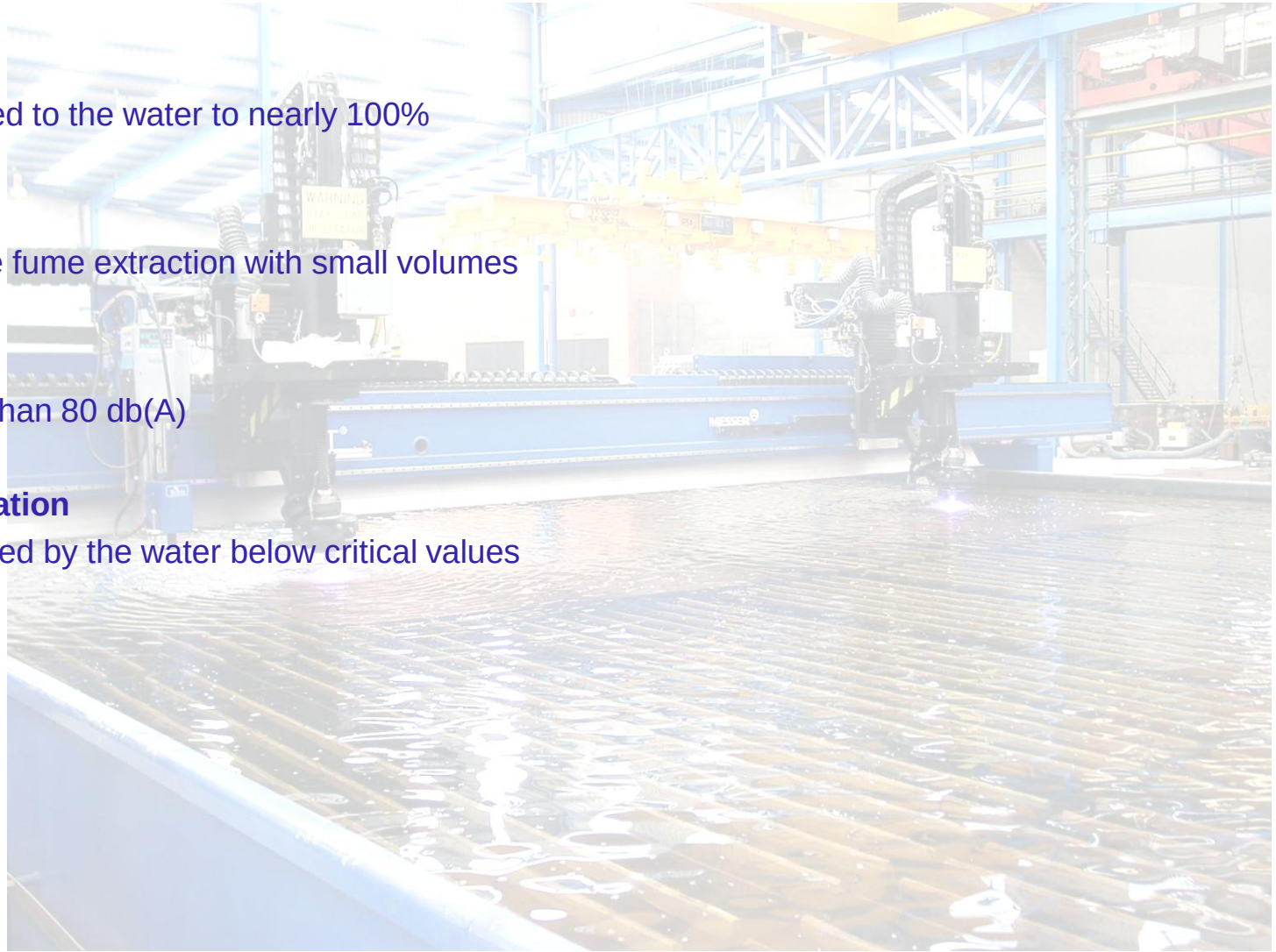
- **Radiation of light (European Community Directive 2006/25/EG)**

  Skin cancer acknowledged as occupational disease

  - Long lasting expose (40 years) to welding (or cutting?) light emissions results in recognized occupational disease (Judgment of German Social Court of Dortmund in 2005 (Az: S 36 U 155/03))

Skin and eye protection are a must !



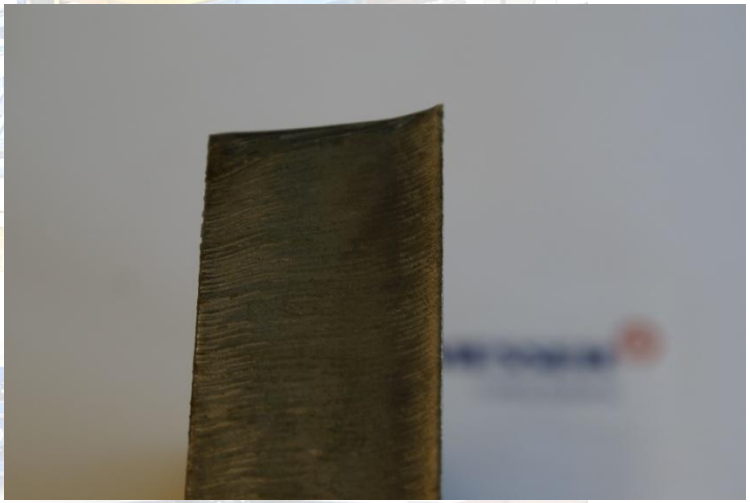


- **Stoff**
  Bonded to the water to nearly 100%
- **Rök**
  Above fume extraction with small volumes
- **Ljud**
  Less than 80 db(A)
- **(UV)-Radiation**
  Damped by the water below critical values

- **Productivity**
  - Produktiviteten blir 5 – 10% lägre
  - UWP kräver större yta
  - UWP kräver ngt högre investering
  - UWP resulterar I våta plåtar och detaljer
  - UWP tillåter inte all typ av märkning
  - UWP problem med Aluminium (Hydrogen)

- **Quality of Cut**
  - UWP resultar I sämre snitt kvalitet

- **Conclusion**
  - I nästan samtliga fall är användandet av UWP, kopplat till miljö faktorer.



Torr Plasma for comparison

The End