Bonnes pratiques dans la gestion des solvants

Good practice for preventing and reducing solvent emissions

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Ökopol – Institut für Ökologie und Politik GmbH

- Clients: EU Commission, Environment Agencies, Ministries, Associations, Industries

**Chemicals policy**
/ REACH

**Sustainable products**
/ Eco-labelling

**Industrial emissions**
/ Best Available Techniques (BAT)

**Resources and circular economy**

**Environmental management**
Outline

- Industrial Emissions Directive (IED) and BAT
- New BREF document (BREF STS)
- Solvents
- VOC emissions prevention and reduction
- Solvent recovery
- Use of VOC emissions
- Summary
EU Industrial Emissions Directive (IED)

- BREFs describe "Best Available Techniques" (BAT)
- Applicable to installations using ≥ 150 kg/h or ≥ 200 t/a of solvents
- Requirements also for installations under this threshold (e.g. IED Annex VII)

BREFs and their relation to the IED:

- Basis for permitting of IED installations in Europe
- Aim: Harmonisation of EU-wide requirements

BAT Conclusions (= Extract from the BREFs):

- Contain binding BAT associated emission values (to air and water)
- Give examples of technology with which emission values can be met

Entry into force

- For new and significantly modified plants: 1st Quarter 2020
- For existing plants: 4 years after publication (i.e. 2024)
Best available techniques – EU Definition in the IED

- BAT: Most effective and advanced stage in the development of activities and their methods of operation
- BAT: Basis for emission limit values and other permit conditions, in order to prevent or, where that is not practicable, to reduce emissions and impacts on the environment as a whole.
  - ‘best’: techniques which are most effective in achieving a high general level of protection of the environment as a whole.
  - ‘available’: technique is sufficiently developed for implementation to be economically and technically viable; technology is reasonably accessible to operators;
  - ‘techniques’: the technology used, and the way in which the installation is designed, built, maintained, operated and decommissioned.

(IED Article 3(10))
BREF – Standard structure

- Preface
- Contents page
- Scope

1. General information on the sector
2. Applied processes and techniques
3. Current emission and consumption levels
4. Techniques to consider in determination of BAT
5. Best available technique (BAT) conclusions
6. Emerging techniques
7. References
8. Glossary
## BAT Reference Document on Surface Treatment Using Organic Solvents (BREF STS)

1. General information on surface treatment with organic solvents
2. Printing (heatset, gravure printing, printing of packaging)
3. Manufacture of winding wire
4. Manufacture of coated abrasives
5. Manufacture of adhesive tape
6. Large-scale vehicle coating
7. Vans, lorries, lorry cabins
8. Buses and coaches
9. Trains
10. Farm and construction machinery
11. Coating of ships and yachts
12. Coating of aircraft
13. Other metal surfaces
14. Coil coating
15. Metal packaging
16. Plastic component coating
17. Coating of wooden surfaces
18. Wood impregnation
19. Manufacture of mirrors
20. General techniques
21. Best available techniques
22. Emerging techniques
EU Information exchange

- Determination of Best Available Techniques (BAT)

Industry representatives: European sectoral associations and supporters (company representatives)

EU Commission Brussels/BE (Oversight role)

EU-JRC IPPC Bureau Seville/ES: BREF Authors, Secretariat

Discussion about BREF Drafts, Conclusions

Additional industry association representatives

Environmental NGO representatives

Additional Member State representatives

EU Member State representatives: Old-EU: esp. AT, DE, DK, ES, FI, FR, IT, NL, PT, SE, UK. New-EU: CZ, PL, SK: Gov. officials, supporters (e.g. National Industrial Institutes)
Key steps for reducing solvent use and emissions

Environmental management system
- Recording of solvent input and output
- Planning and testing of integrated improvement measures

Prevention and reduction
- Solvent system => water-based or dry systems
- High-solid paints, reduce number of coating layers

Recovery
- Distillation, Ad-/Absorption, Condensation

Efficient solvent destruction
- Optimise capture (reduce volume)
- Homogenise and increase concentration
- Use energy content for heat recovery (CHP, RTO, thermal oil)
Environmental management system

Recording of inputs
- Manufacturer data (only substances with vapour pressure > 0.1 hPa)
- Monitor returns/stock changes

Recording of outflows / emissions
- Sampling of solvent content in waste (including in cleaning cloths)
- Measurements of **raw and clean flue gas** => removal by treatment system
- Precise recording of recovered quantities

Planning and testing of improvement measures
- Is emission prevention or reduction possible?
- Can emission locations be better encapsulated?
- Do peaks in emissions occur?
- Is it possible to make use of electricity/heat/cold?
- Set objectives and review them (specific indicators)
Mass balance

Total emissions

- Diffuse
- Recorded VOC t/a
- Scrubbed gas concentration mg/m³
- Destroyed VOC t/a

Raw material
- 60 t VOC
- 40 t Solids

Additives
- Cleaner 60 t VOC
- 5 t Solids

Coating machine
- Dryer

RTO

Distillation

Washing

Stock growth
- Distillate 0 t VOC

Distillate
- 2 t VOC

Re-used

Sold
- Solvents 0 t VOC

Sold
- Waste 0.1 t VOC

Disposed

Luxembourg, 15 October 2019 - Tebert
VOC emission prevention

Solvent-free systems

- Water- or powder-based paints
- Water- or UV-based printing inks
- Hotmelt glues (e.g. lamination)

Advantages:

- No VOC emissions, improved safety (no fire risk)
- No gas treatment required
VOC emission prevention: VOC-free cleaning products

Manual and automatic cleaning (Offset printing industry)

Advantages:

- No VOC emissions where flash point > 100°C
- Much lower VOC emissions where flash point 55 - 100°C

German Print and Media Association [www.bvdm-online.de](http://www.bvdm-online.de)
VOC emission prevention: Water-based flexography

Advantages:

- 70% CO₂ reduction
- Less wear of printing plates => Consistent printing with large print-runs
VOC emission prevention: VOC-free hydrocarbon cleaners

Metal coating (Fa. Ardagh, DE/Erftstadt)

- Advantage: No VOC emissions from parts cleaning

Manufacturer: Numafa Cleaning & Automatisation [www.nufama.com](http://www.nufama.com)
VOC emission prevention: Alkali-based parts cleaning

Packaging printing (Fa. Rahning/Bünde)

- **Advantages:** No VOC emissions from parts cleaning,
- Alkali recirculation,
- Wastewater evaporation (low waste)

DW Renzmann Apparatebau [www.dw-renzmann.de](http://www.dw-renzmann.de)

KMU Loft Cleanwater [www.kmu-loft.de](http://www.kmu-loft.de)
VOC emission reduction: apply less/alternative paint

Water-based paints and 2K-basecoats

Advantages: Reduced VOC emissions, significantly easier to apply

Paint use per vehicle body

Advantages of high-solids:
- Paint use reduced: -15% to -35%
- VOC emissions reduced: -34% to -78%

Axalta, Resource efficiency congress 2014
VOC emission reduction: Less solvent handling

**Automatic colour mixing system**

**Advantage:** VOC emissions reduced, better colour quality
VOC emission reduction: Less solvent handling

Direct solvent addition into machines

Advantages:
- VOC emissions reduced by sealed pipes
- Safety improved by use of fewer containers in the factory

Sealed machines with automatic cylinder cleaning
VOC emission reduction: Less solvent handling

Filling station in the store

Advantages:

- VOC emissions reduced by fewer open containers
- Safety improved by use of smaller containers in the factory

Filling station in the factory
Recovery

Distillation / Condensation

- Used solvent / cleaner, paint/ink residues
- Advantages: saves resources, reduces waste

30-60 l/h or 60-100 l/h

DW Renzmann Apparatebau

www.dw-renzmann.de
Recovery

Ad-/Absorption

- Adsorpton in activated carbon, desorption with steam or
- Absorption in hydrocarbon, desorption with heat:

Raw flue gas with solvents

Clean flue gas

Envisolve [www.envisolve.de](http://www.envisolve.de)
Efficient destruction

Optimise capture: reduce waste gas volume

- Encapsulate / seal machines (also possible for old machines)
- Adjust extraction according to solvent emissions
- Recirculation of waste air with low VOC load

Homogenise concentration

- Smoothing/buffering in a molecular sieve
- Concentrate in an adsorption wheel
Efficient destruction: Zeolite molecular sieve

Advantages

- Storage of VOC
- Smoothing of VOC peaks

VOC concentration before and after mol. sieve

Zeolite pore structure

Envisolve [www.envisolve.de](http://www.envisolve.de)
Efficient destruction

Molecular sieve after component washer (Fa. Debatin, DE/Bruchsal, Flexodruck)

- Containment of VOC emission peaks, efficiency increase of RTO

Component washer

Regenerative Thermal Oxidation (RTO)

Envisolve [www.envisolve.de](http://www.envisolve.de)
Efficient destruction: Molecular sieve before RTO

Natural gas savings at a flexographic printing installation

Increased waste gas volume due to increase of production

Installation of the molecular sieve

Envisolve www.envisolve.de
Efficient destruction: Mol. sieve and adsorption wheel

Process principles

- Waste air with a low VOC load is adsorbed
- Purified air with $< 50 \text{ mgC/m}^3$ emitted
- Desorption of concentrated waste gas
- Molecular sieve upstream for smoothing of emission peaks

Envisolve [www.envisolve.de](http://www.envisolve.de)
Efficient destruction: Molecular sieve and adsorption wheel before RTO

**Flexographic printing installation (Fa. Bischof & Klein/Konzell)**
- Containment of VOC emission peaks, VOC concentration
- Efficiency increase of RTO, heat recovery from RTO

**Metal finishing (Fa. Stork/Dortmund)**
- VOC emission homogenisation, Efficiency increase of RTO
Efficient destruction: Molecular sieve, adsorption wheel, and CHP

Metal finishing (Fa. EOT, DE/Lüdenscheid)

- Containment of VOC emission peaks, VOC concentration
- Use of VOC in two gas engines (CHP) - about 10 % share of fuel input
- Production of 1 MW heat, 800 kW electricity
Efficient destruction: Molecular sieve, adsorption wheel, and CHP

Manufacture of rubber components (Fa. Kächele, DE/Weilheim)

- VOC concentration
- Use of VOC in six microturbines (CHP)

E-quad Power Systems [www.microturbine.de](http://www.microturbine.de)
Summary

Know your solvent input and output!
- Record them
- Plan improvements

Where possible, prevent and reduce emissions
- Test solvent-free systems
- Can you apply less coating layers?

Recovery
- Save resources, reduce waste

Efficient destruction
- Handle the lowest possible quantity
- Reduce VOC peaks, increase concentration
- Make use of VOC energy content!
Many thanks for your attention

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