

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, Environm. 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



[EU BREF-Draft \(9/2019\)](#)
[on Surface Treatment Using Organic Solvents](#)

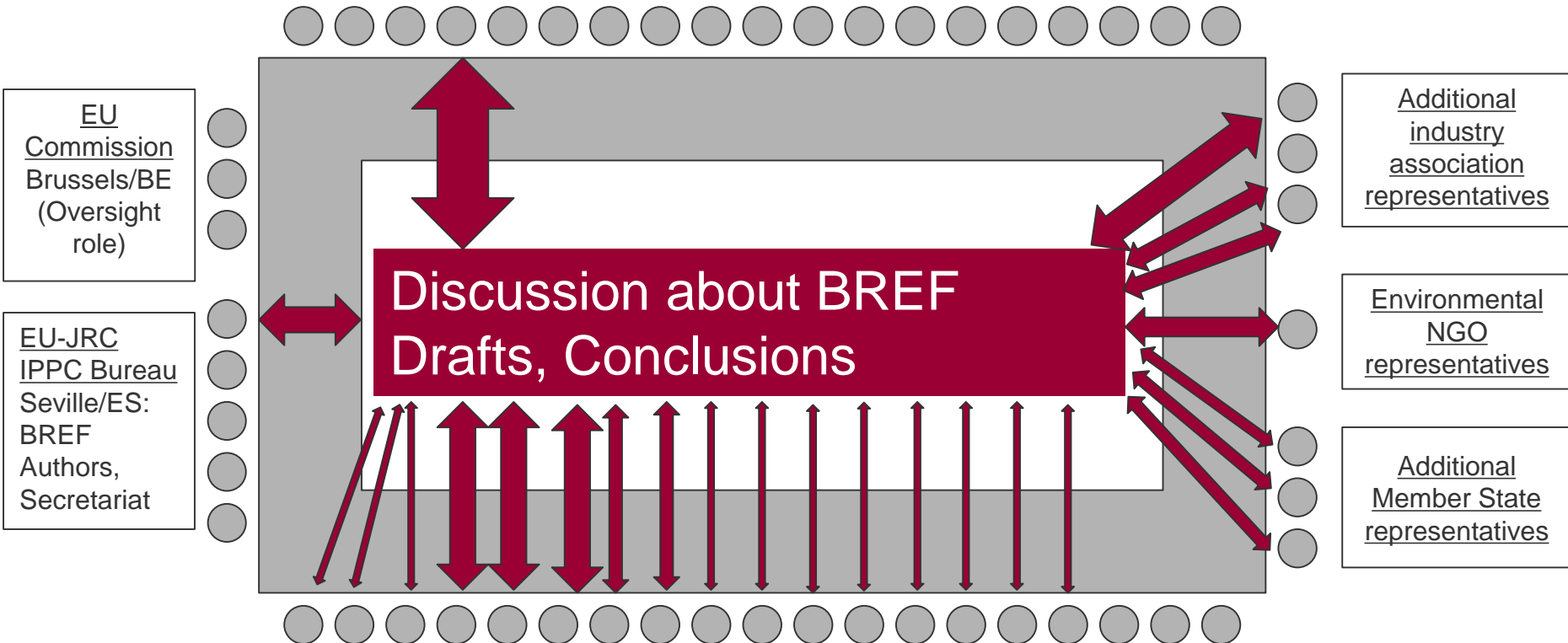
BAT Reference Document on Surface Treatment Using Organic Solvents (BREF STS)

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 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

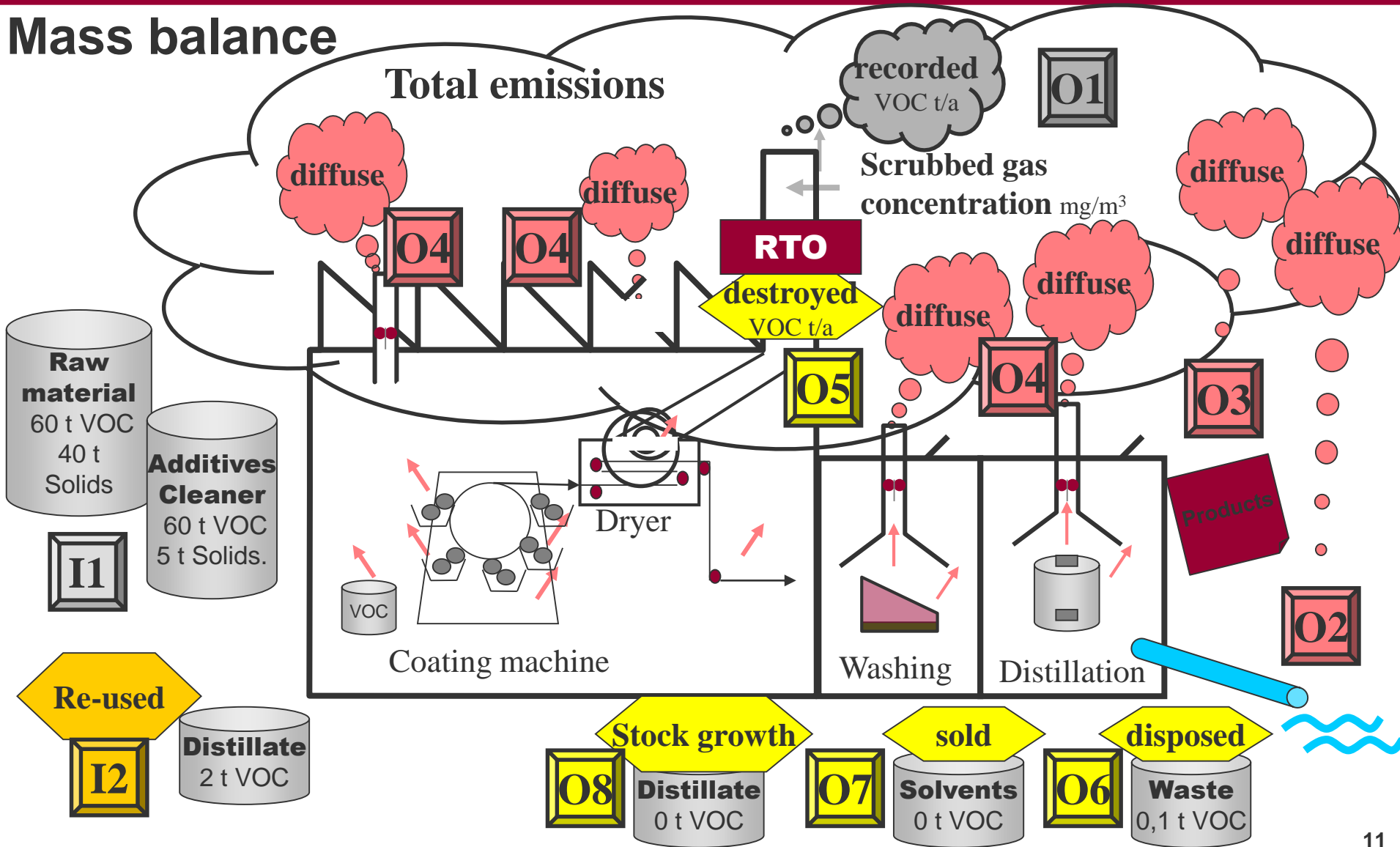
- ▶ Sampling of solvent content in waste (including in cleaning cloths)
- ▶ Measurements of **raw and clean flue gas** => removal by treatment system
- ▶ Precise recording of recovered quantities

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



VOC emission prevention

Solvent-free systems

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



Addition of hotmelt glue

Powder-based paints



Advantages:

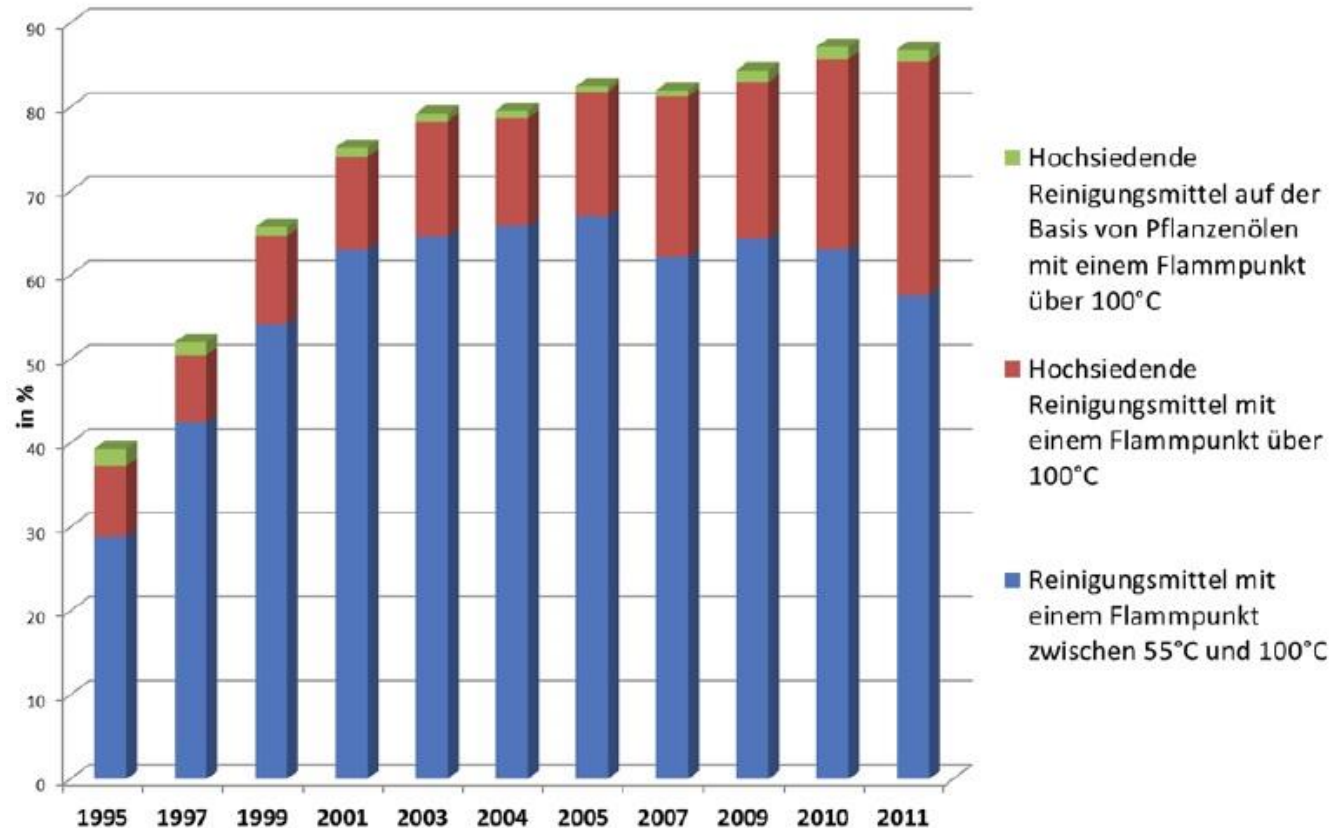
- ▶ No VOC emissions, improved safety (no fire risk)
- ▶ No gas treatment required

VOC emission prevention: VOC-free cleaning products

Manual and automatic cleaning (Offset printing industry)

Advantages:

- ▶ No VOC emissions where flash point $> 100^{\circ}\text{C}$
- ▶ Much lower VOC emissions where flash point $55 - 100^{\circ}\text{C}$



German Print and Media Association www.bvdm-online.de

VOC emission prevention: Water-based flexography

Advantages:

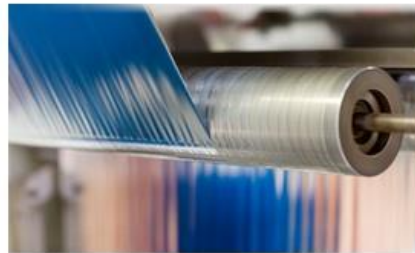
- ▶ 70% CO₂ reduction
- ▶ Less wear of printing plates

=>

Consistent printing with large print-runs



Services Sectors Innovations Service and quality Company Careers



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Fa. Folian/Groß Lüdershagen (DE/Stralsund)

www.folian.com

VOC emission prevention: VOC-free hydrocarbon cleaners

Metal coating (Fa. Ardagh, DE/Erftstadt)

- ▶ Advantage: No VOC emissions from parts cleaning



Manufacturer: Numafa Cleaning & Automatisations 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



KMU Loft Cleanwater
www.kmu-loft.de

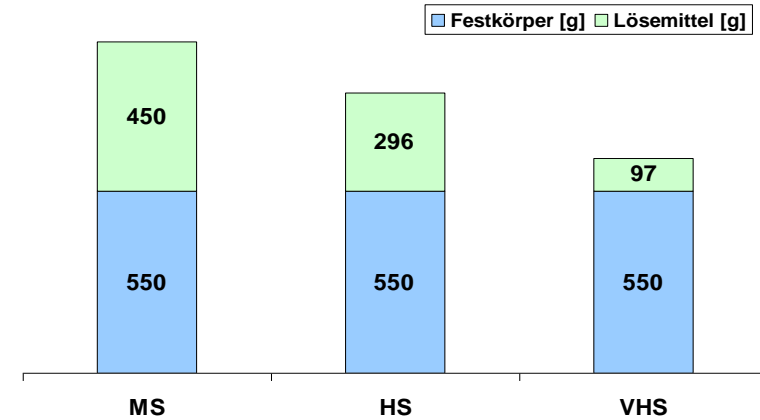
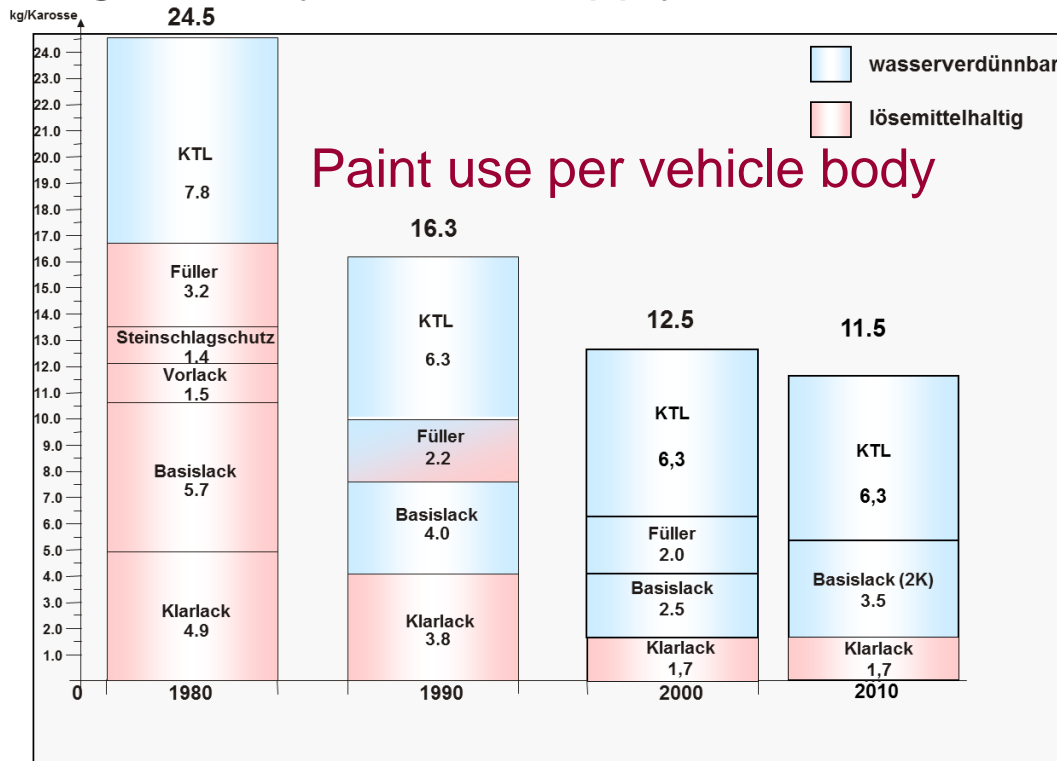
VOC emission reduction: apply less/alternative paint

Water-based paints and 2K-basecoats

Advantages: Reduced VOC emissions, significantly easier to apply

Solid and solvent content

conventional high-solid very high-solid



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



Sealed machines with automatic cylinder cleaning



Advantages:

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

VOC emission reduction: Less solvent handling

Filling station in the store



Filling station in the factory



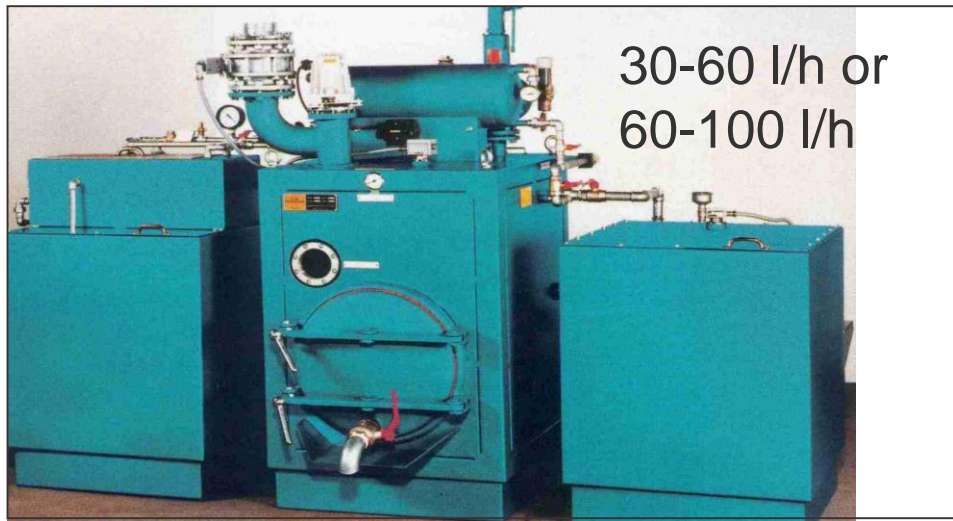
Advantages:

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

Recovery

Distillation / Condensation

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



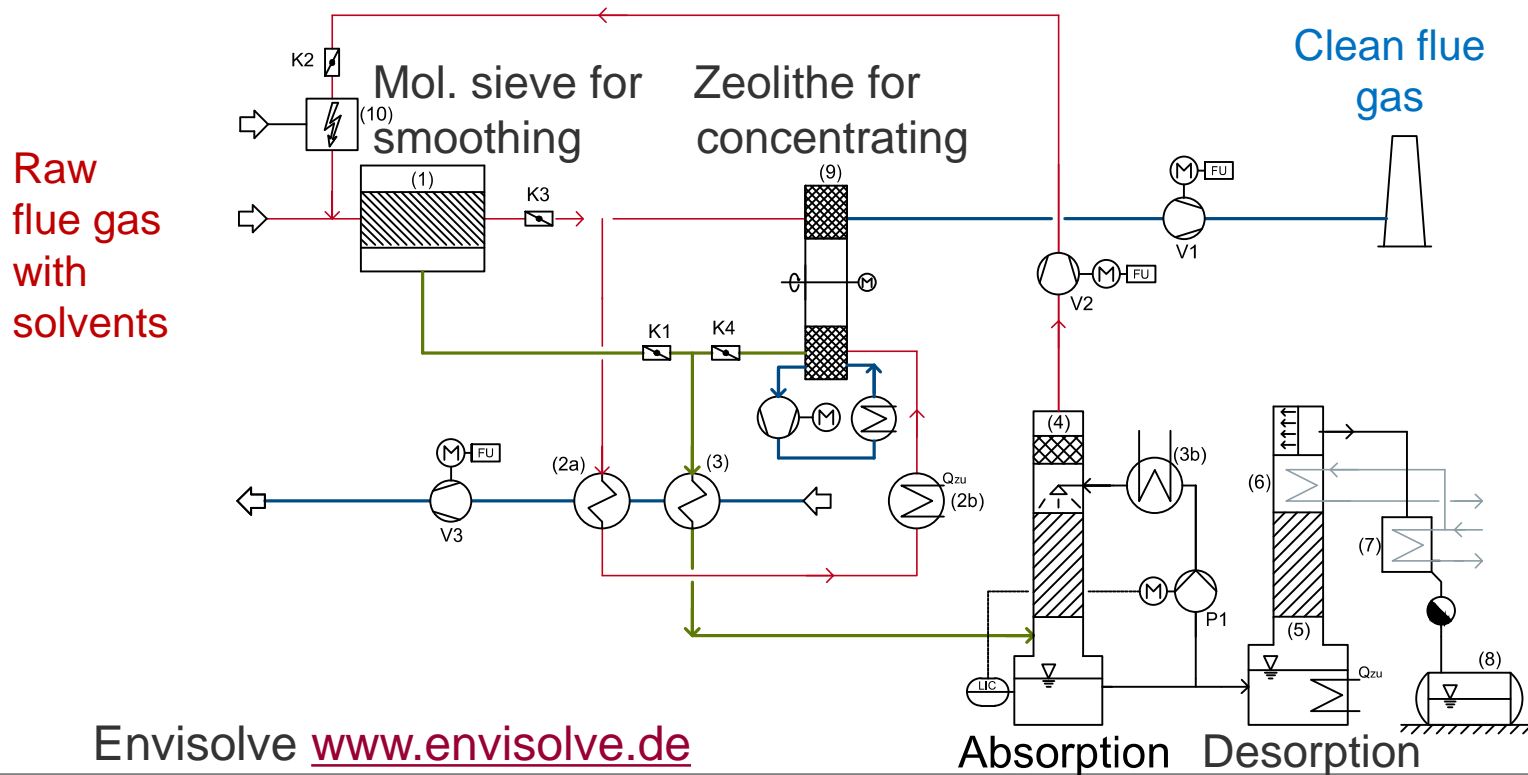
DW Renzmann Apparatebau

www.dw-renzmann.de

Recovery

Ad-/Absorption

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



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

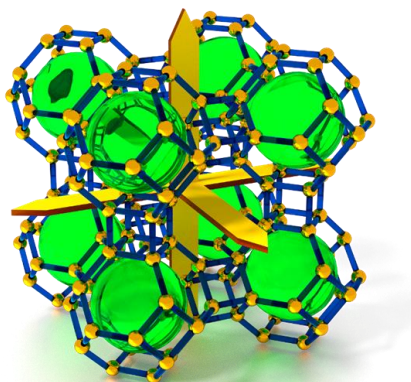
- ▶ Smoothing/buffering in a molecular sieve
- ▶ Concentrate in an adsorption wheel



Efficient destruction: Zeolite molecular sieve

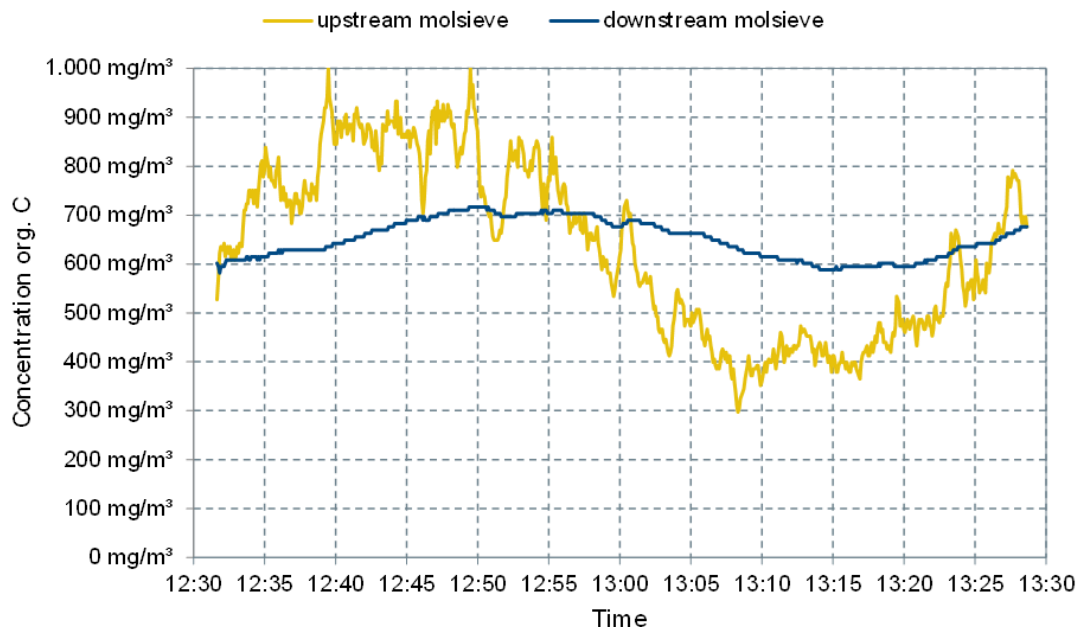
Advantages

- ▶ Storage of VOC
- ▶ Smoothing of VOC peaks



Zeolite pore structure

VOC concentration before and after mol. sieve



Envisolve www.envisolve.de

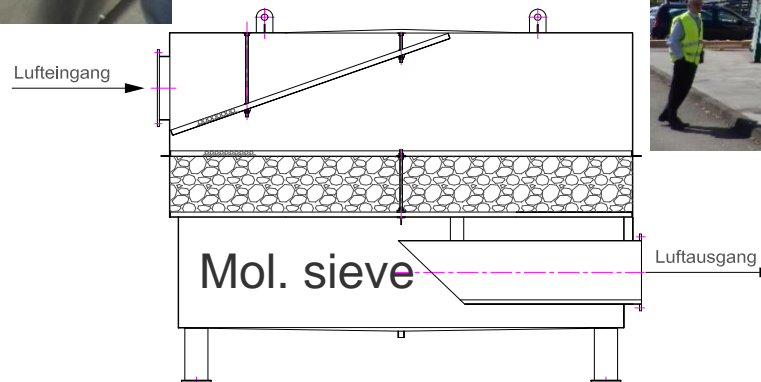
Efficient destruction

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

- ▶ Containment of VOC emission peaks, efficiency increase of RTO



Component washer

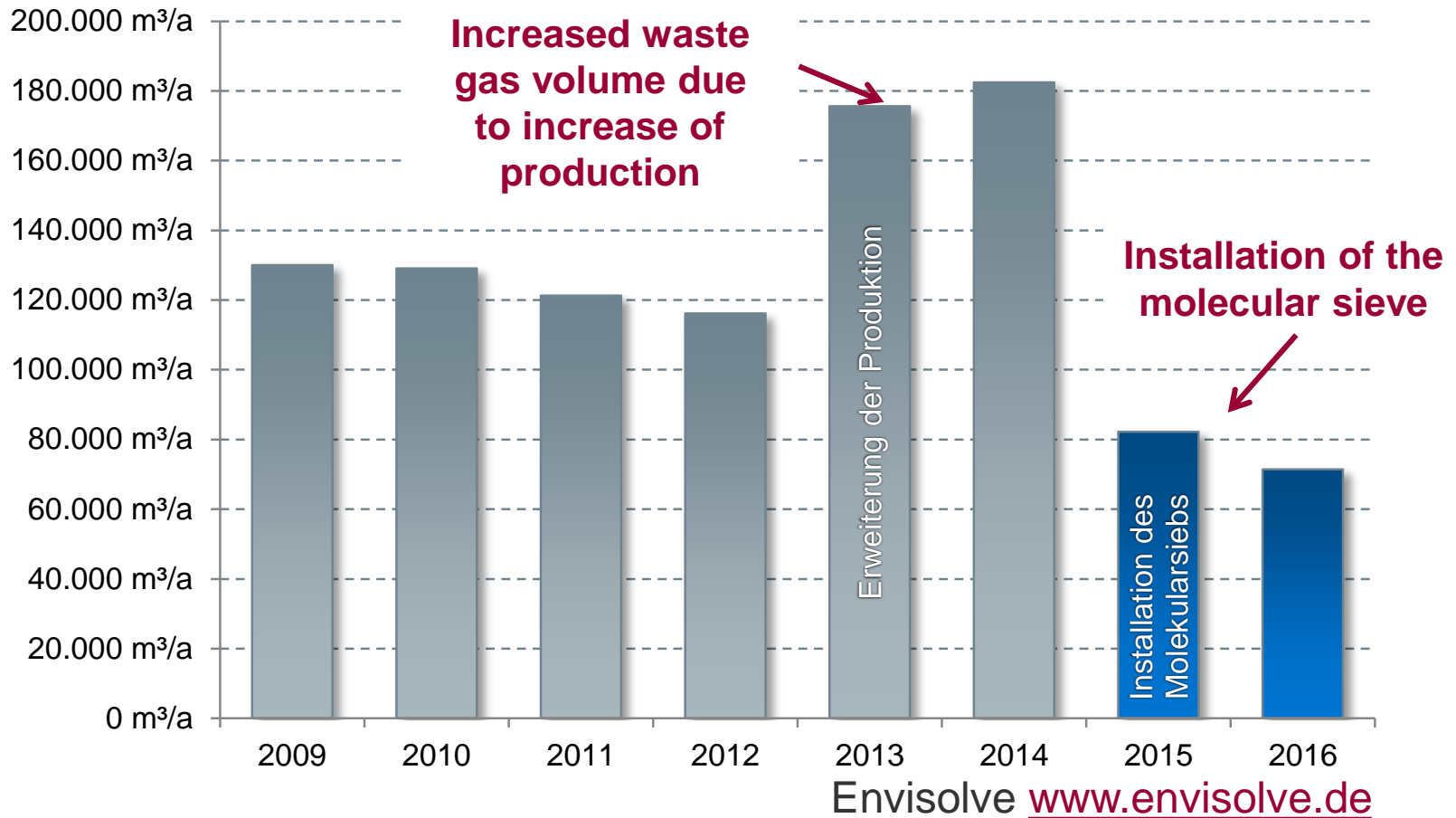


Regenerative Thermal Oxidation (RTO)

Envisolve www.envisolve.de

Efficient destruction: Molecular sieve before RTO

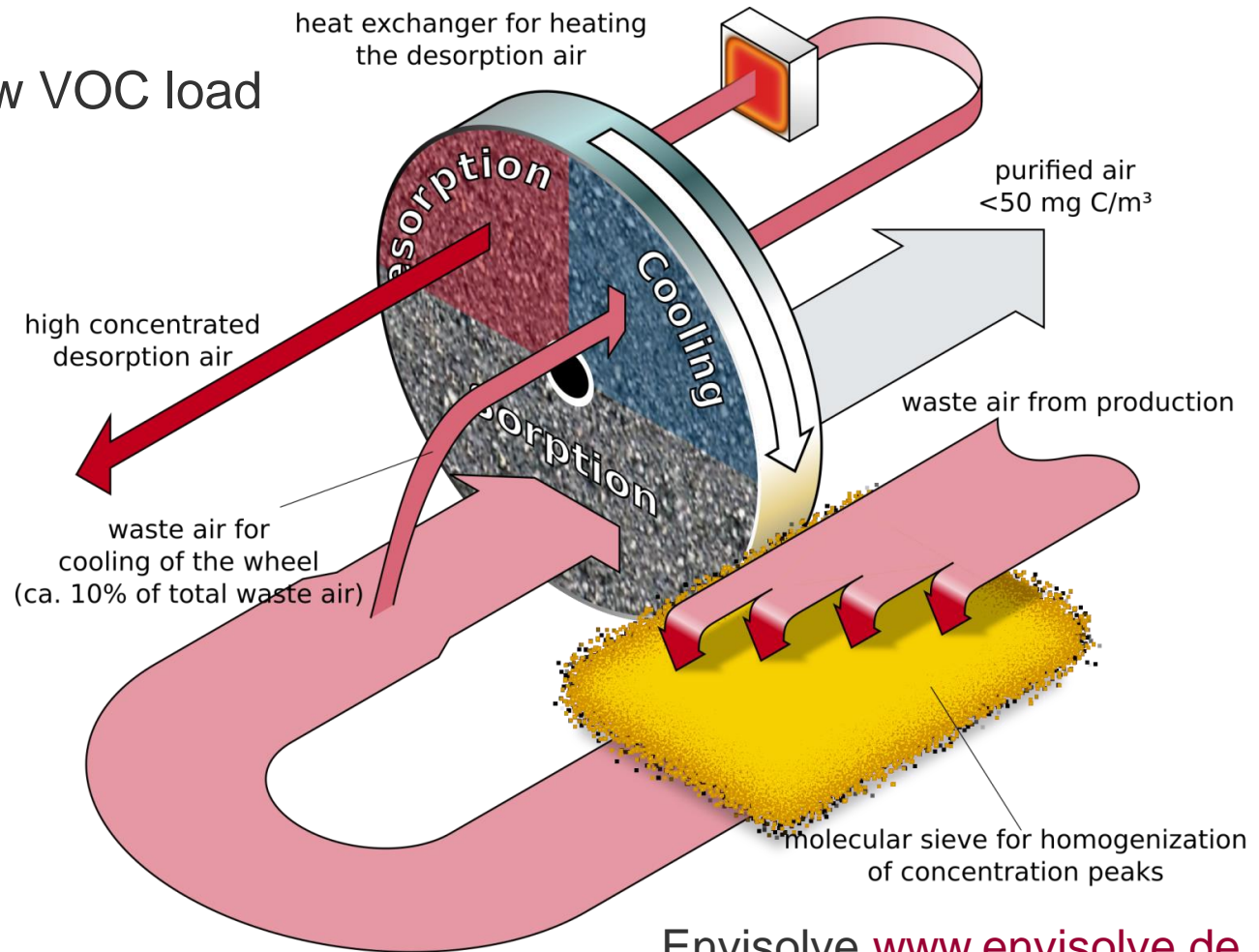
Natural gas savings at a flexographic printing installation



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

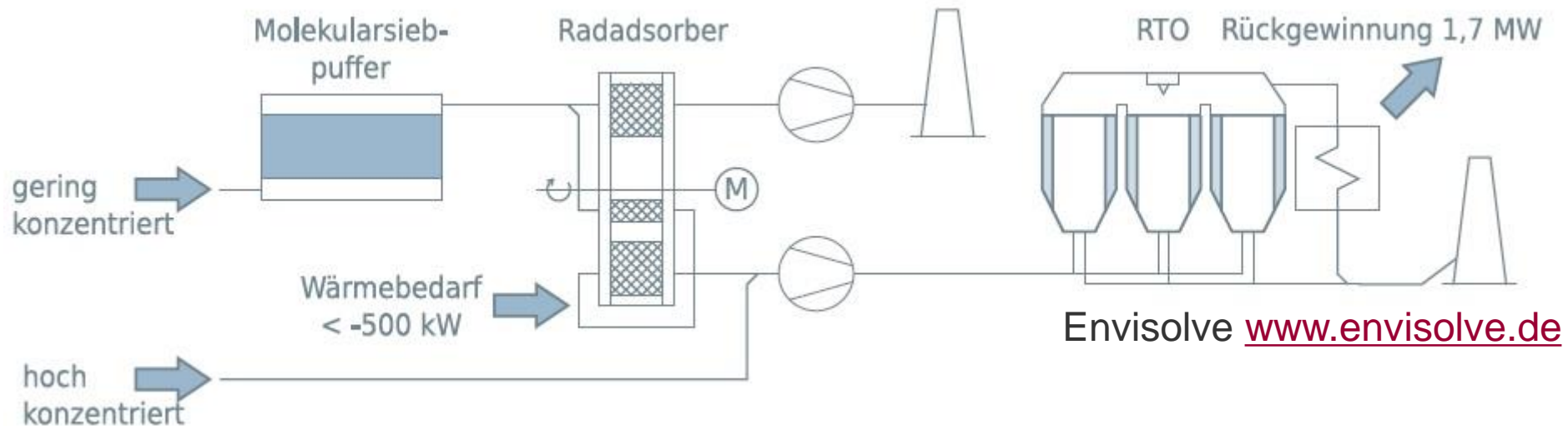


Envisolve www.envisolve.de

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)

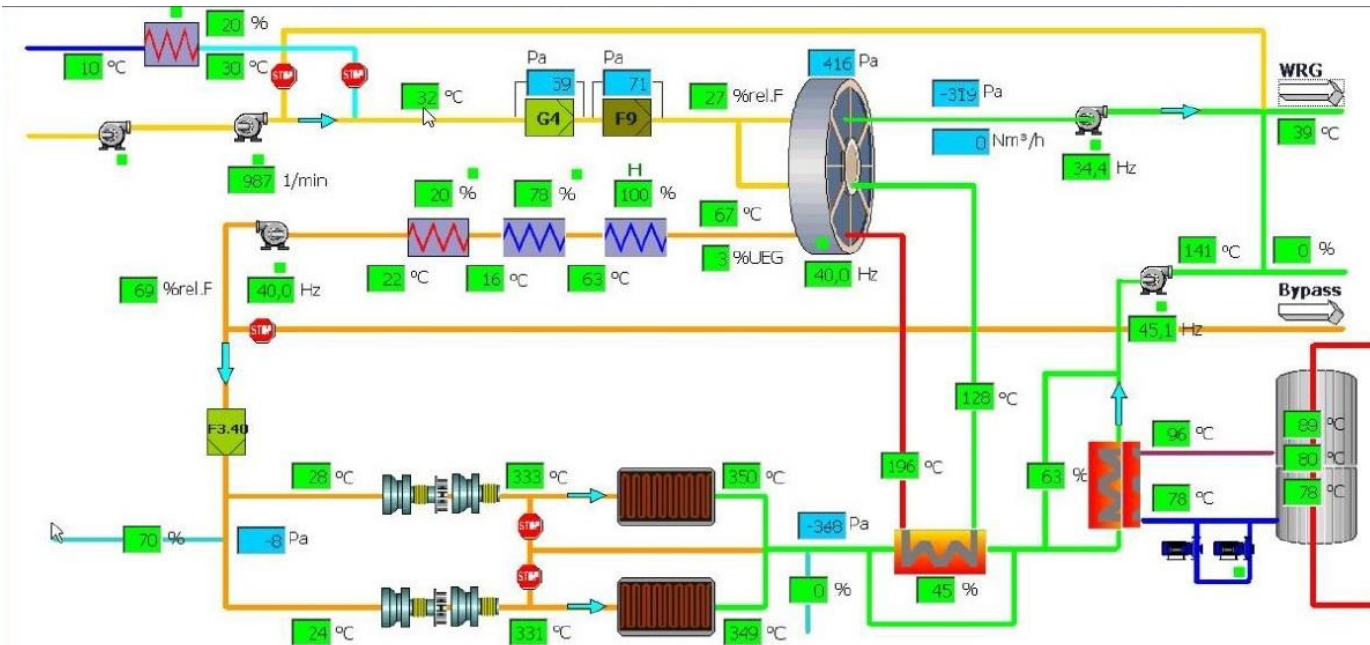
- ▶ Containment of VOC emission peaks, VOC concentration
- ▶ Use of VOC in two gas engines (CHP) - about 10 % share of fuel input
- ▶ Production of 1 MW heat, 800 kW electricity



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

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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