Cleaning of organic exhaust air flow in the wall paper industry

Werner Zondler
Dürr Systems GmbH
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Group structure

DÜRR AG

Paint and Assembly Systems

- Paint Systems
- Application Technology
- Environmental and Energy Systems
- Factory Assembly Systems

Measuring and Process Systems

- Balancing and Diagnostic Systems
- Cleaning and Filtration Systems
Environmental and Energy Systems - EES

Europe
- Stuttgart, Germany

America
- Plymouth, MI, USA

Asia
- Seoul, Korea
- Shanghai, China

VOC destruction focus
Core products: Oxidizer, Adsorber, Flue gas scrubber, DeNOx, Wet electrostatic precipitator
EES - Technologies and Business Fields

Business Fields

Automotive and Industrial Paint System

Printing and Coating Industry

Chemical Industry

Pharma Industry

Petro Chemical

- Technology center of excellence in Germany and USA, Implementation phase in Asia
- Successful assembly of references with our leading technology in our key branches and for our key customers, incl. in new markets (e.g. Asia)
Flexible Environmental Technologies for different business fields
Facility integrated Know how with exhaust air treatment systems
# EES - Experiences in Technologies *Ecopure®*

- Years in Business: 39
- Installation Locations: 40 Countries
- Number of Installations: > 3,000
  - Regenerative Thermal Oxidisers (RTO/RL/FTO): 1,500
  - Thermal Oxidiser for Exhaust Gases and Waste Liquids (VAR): 60
  - Recuperative Thermal Oxidisers (TAR): 1,200
  - Recuperative Catalytic Oxidisers (KAR): 300
  - NOx Reduction (DeNOx): 20
  - Rotary Concentrators (KPR/KCR): 300

## Installation Size

<table>
<thead>
<tr>
<th>Size</th>
<th>Smallest Size</th>
<th>Largest Size</th>
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<td></td>
<td>800 Nm³/h</td>
<td>1,200,000 Nm³/h</td>
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Thermal Oxidisers
• FTO  Flameless regenerative thermal oxidiser
• RTO/RL  Regenerative thermal oxidiser
• VAR  Thermal oxidiser for exhaust gases and waste liquids
• TAR  Recuperative thermal oxidiser

Catalytic systems
• RCO  Regenerative catalytic oxidiser
• KAR  Recuperative catalytic oxidiser
• DeNOx  NOx Control systems

Adsorption systems
• KPR  Rotary concentrator
• KFA  Carbon fibre adsorber

Absorption systems
• VNA  Venturi scrubber
• ENJ  Envirojet
• FGA  Flue gas scrubber
Ecopure® RTO - Exhaust air purification plants
Ecopure® TAR - Exhaust air purification plants
The problem
Problem to be solved

• Removal of plasticizer vapors from the exhaust air
• Removal of solvent vapors from the exhaust air
• Removal of offensive odors
Possible methods of air pollution control

Catalytic air pollution control

• Pros
  Low combustion chamber temperature
  Low operating costs
  Low capital investment costs
  Small footprint and light in weight

• Cons
  Catalysts are susceptible to damage
  Several units are required to treat large exhaust air volumes
Possible methods of air pollution control

Adsorption

• Pros
  Saves resources through re-use
  Low operating costs of overall system
  No direct CO₂ emissions

• Cons
  Recovered desorbate does not have the initial quality
  Secondary purification stages (rectifier columns) necessary
  Complex technology, high maintenance requirements
  Solvent costs are currently still low
Oxidation - *Ecopure®* RTO Technology

Organic solvents
Halogenated compounds
Explosible gases
Ammonia, Sulphur, oils or dust
Aerosols, droplets or condensate
Organic dust
Liquids

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Ecopure® RTO Regenerative Thermal Oxidizer

Purified exhaust air

Scavenging air

burner

regenerative heat exchanger

solvent-laden exhaust air
Ecopure® RTO
Typical Temperature profil of a RTO
Oxidation - *Ecopure®* RTO Technology
Design details – erection works on site

- Short assembly time by extensive pre-assembly in the manufacturing
- Structure of only two large elements
• Pros
  Low primary energy input, autothermal from approx. 2 g VOC/Nm³
  Low operating costs
  Very good clean gas emission levels
  No problems when pollutant concentration and pollutant type change

• Cons
  Large footprint and heavy in weight
  High combustion chamber temperature (NOx formation),
  Critical when exhaust air contains SiO2
The solution
Ecopure® - TAR in the wallpaper industry
Components of the INWALL Systems

- Compact device
- Steam boiler
- Thermal oil boiler
- Fresh air heat exchanger
- Boiler
Ecopure® TAR

- Solvent Laden Air
- Clean Exhaust Air
- Hot By-pass Damper
- Secondary Reaction Chamber
- Primary Combustion Chamber
- Tubular Heat Exchanger
- Burner
Oxidation - *Ecopure*® TAR Technology
Manufacturing and assembly at Dürr Zistersdorf, Austria
Installation of *Ecopure®* TAR
Energy Demand INWALL System

- Natural gas consumption
- Energy of pollution
- Preheating unit in the compact device
- Thermal capacity of the exhaust air
- Heat emission for the exhaust air preheating unit

1. Heat recovery for production heat = natural gas consumption
2. Category temperature plant with and without exhaust air purification
3. Further heat recovery production for production heat = benefit

Energy demand vs Energy economy
Production line in the wall paper industry
Company Stork/NL

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Ecopure® TAR in the wallpaper industry

Ecopure TAR 1135

Thermal oil heat exchanger
$Q_n = 1.612 \text{ kW}$

Exhaust air heat exchanger

Hot water heat exchanger
$Q_n = 1.062 \text{ kW}$

Stack

Natural gas
100 mbar

Compressed air
6 bar

760°C

$t = 490°C$

260°C

$t = 330°C$

$t = 250°C$

$t = 160°C$

Expansion vessel

Thermal oil back-up boiler
2.400 kW

Production

Emergency air

30,000 Nm$^3$/h
160°C
Ecopure® TAR Exhaust air purification plant

Company Sellotape – Producer of Tape coating
After Market Services

Feasibility Studies
Permit Assistance
On-Site Testing and Data Collection
Inspections & Repair
Upgrades & Retrofit

On-Site Programs

• Performance Contracts
• The TOTAL Solution™
How to contact Dürr

Thanks to innovative, leading-edge technologies, global presence and committed staff members Dürr creates value for its customers.

Dürr stands for technological excellence and system solutions in plant and special machinery engineering. We have our own operations in 25 countries, where we are in close reach of our customers.

Contact phone no.: +49 711 136-1055
sales.environmental@durr.com
www.durr.com