
# Episode 06 Apr. 2022

# Exhaust Air Treatment

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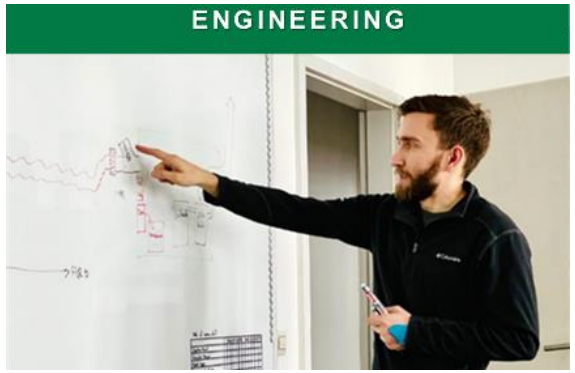
- Monthly a new topic for discussion
- 2 alternative meeting times from April
- Exchange of knowledge in wastewater
- Passion for sharing
- Get to know you!
- About Wastewater-Talk

| Episode | Topic | Content | Time (CET) |
|---|---|---|---|
| 01 | **Rat Control in Drainage Systems** | Environmental risks & application of waterproof baiting station in drainage systems | 05 Nov. 21 10:00 |
| 02 | **Drainage System Inspection (Drone & Boat)** | Innovative inspection of drainage systems using drone and camera-equipped boat | 02 Dec. 21 10:00 |
| 03 | **Extraneous Water Entrance Prevention** | Impacts of extraneous water & countermeasures? | 13 Jan. 22 10:00 |
| 04 | **Indirect Discharger Cadaster Investigation** | How to easily obtain full supervision over indirect discharger in your region? | 03 Feb. 22 10:00 |
| 05 | **Live Flow Monitoring in Drainage Systems** | Why is it so important to know the live-flow in our drainage system? | 03 Mar. 22 10:00 |
| 06 | **Exhaust Air Treatment in Wastewater Management** | Odour treatment through external equipments | 07 Apr. 22 10:00 & 15:00 |
| 07 | **Sulfide Balance in Drainage Systems** | Automatic calculation of sulfide balance & introduction to SULFIDUS | 05 May 22 10:00 & 15:00 |
| 08 | **Special Episode: IFAT Munich 2022** | What is new at the IFAT this year? | 02 Jun. 22 10:00 & 15:00 |

**since 1990**

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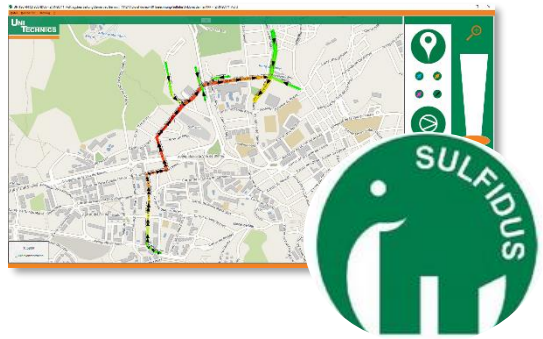
**since 2000**


UNITECHNICS PRODUCTS

## Engineering Consulting


## Indirect Discharger Investigation

## Sewer System Inspection




## Sulfide Balance SULFIDUS


## Odour & Corrosion


## Extraneous Water Seal

## Dosing & Exhaust Air Treatment

## Rat Control

# Exhaust Air

Air that is deliberately removed from the building envelope and rejected to the environment.

Building ventilation systems which are equipped with exhaust fans that work to draw air out of the buildings from strategic locations where low quality, moist or polluted air is likely to accumulate.

# Air exhausting impressions

## Odorant Emissions

- Hydrogen sulfide $H_2S$
- Ammonia $NH_3$
- VOC
- …

## Greenhouse Gas Emissions

- Nitrous oxide $N_2O$
- Methane $CH_4$
- …

## from …

- WWTPs
- Pumping stations
- Wastewater collection systems

# Limit values for hydrogen sulfide

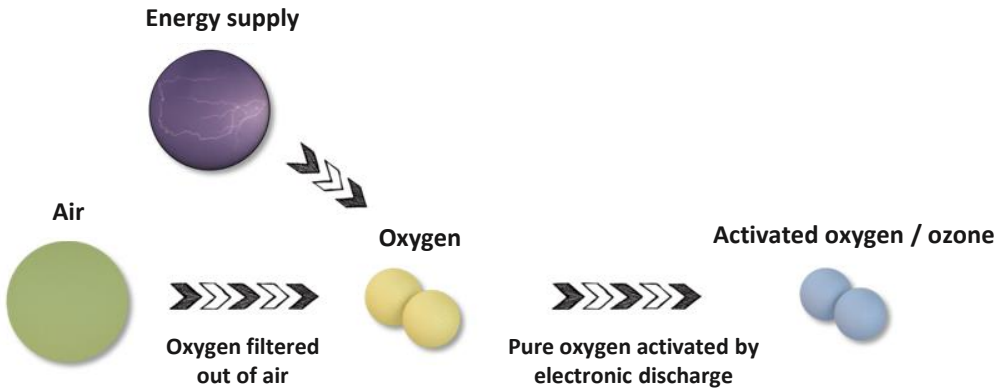

- **Odor:** recognized odor threshold for hydrogen sulphide **≥ 0.1 ppm**

- **Working safety:** working exposure limit value in the air **5.0 ppm**

- **Biogenic corrosion:** strong biogenic corrosion by $H_2S$ **≥ 0.5 ppm**

## Ozone Oxidation

- Ozone among the most powerful oxidizers
- Many industrial and consumer applications
- Disinfection in wastewater treatment
- Exhaust fumes from cars

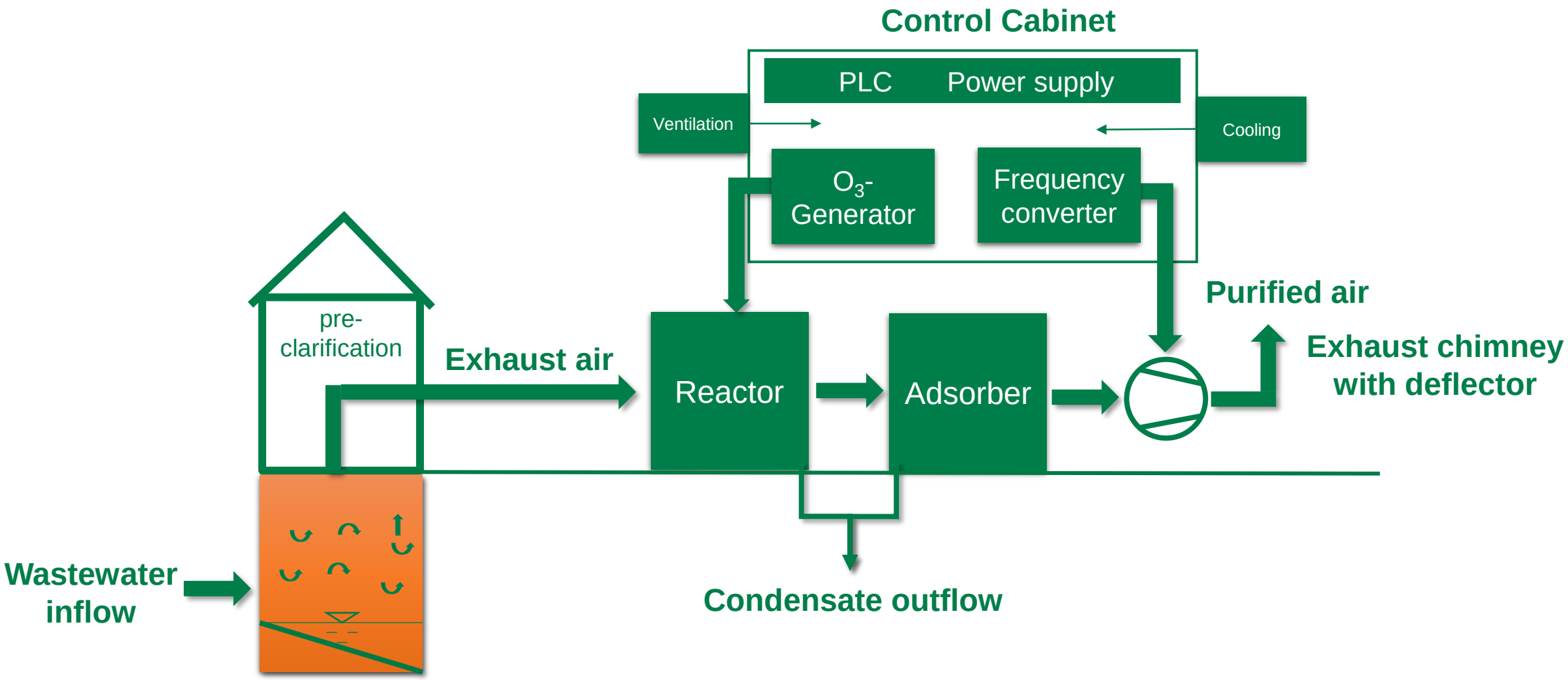


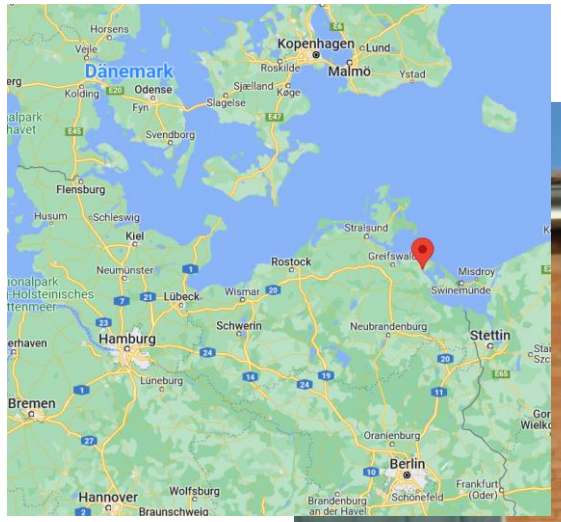

## Activated Carbon Adsorption

- The larger the surface, the higher the adsorption capacity
- Adsorption affinity!
- Use of impregnated activated carbon

# Degradation of odors and pollutants through ozone

| | Odor | Chemical formula | Reaction |
|---|---|---|---|
| **Hydrogen Sulphide** | Rotten eggs | $H_2S$ | $O_3 + H_2S \rightarrow SO_2 + H_2$ |
| **Ammonia** | Urine | $NH_3$ | $NH_3 + 3O_3 \rightarrow 3H_2O + N_2 + 3O_2$<br>reaction partly with $H_2O_2$ |
| **VOC**<br>(aldehydes / alcohols) | Solvent | Butyl acetate | $C_6H_{12}O_2 + 16O_3 \rightarrow 6CO_2 + 6H_2O + 16O_2$ |
| **Dimethyl sulfide** | Rotten vegetables | $C_2H_6S$ | Ozonolysis → dissolution of carbon compounds |
| **Mercaptans** | Cabbage | $CH_2SH$<br>Descendant of $H_2S$ | $CH_2SH + O_3 \rightarrow CH_3OH + SO_2$ |
| **Skatole** | Feces | $C_9H_9N$ | Attack on H-pyrrole ring → formation of aromatics (e.g., benzene) |
| **Benzene** | Pungently sweet | $C_6H_6$ | $C_6H_6 + 11O_3 \rightarrow 6CO_2 + 3H_2O + 11O_2$ |
| **Butyric acid** | Vomit | $C_4H_8O_2$ | $C_4H_8O_2 + 4O_3 \rightarrow 2CO_2 + 2H_2O + 4O_2$ |
| **Acetic acid** | Vinegar | $C_2H_4O_2$ | $C_2H_4O_2 + 4O_3 \rightarrow 2CO_2 + 2H_2O + 4O_2$ |


Control Cabinet
PLC
Power supply
Ventilation
Cooling
$O_3$-Generator
Frequency converter
pre-clarification
Exhaust air
Reactor
Adsorber
Purified air
Exhaust chimney with deflector
Wastewater inflow
Condensate outflow





- Wolgast, Germany
- Construction of an oxidation plant on the screening building

✓ Working and operational safety

1. Raw air to be exhausted
2. Condensate outflow
3. Oxidation reactor
4. Adsorber
5. Control cabinet with ozone generator
6. Exhaust chimney with deflector
7. Purified air

1. Ozone generator
2. Ozone sensor
3. Frequency converter
4. ON/OFF switch
5. Air conditioning
6. Control cabinet ventilation
7. Programmable logic controller (PLC)
8. Power supply/fuses

1. Louvre curtain to encapsulate the screening container
2. Exhaust pipe from the screening container
3. Free outlet
4. Exhaust fan
5. New ceiling panels

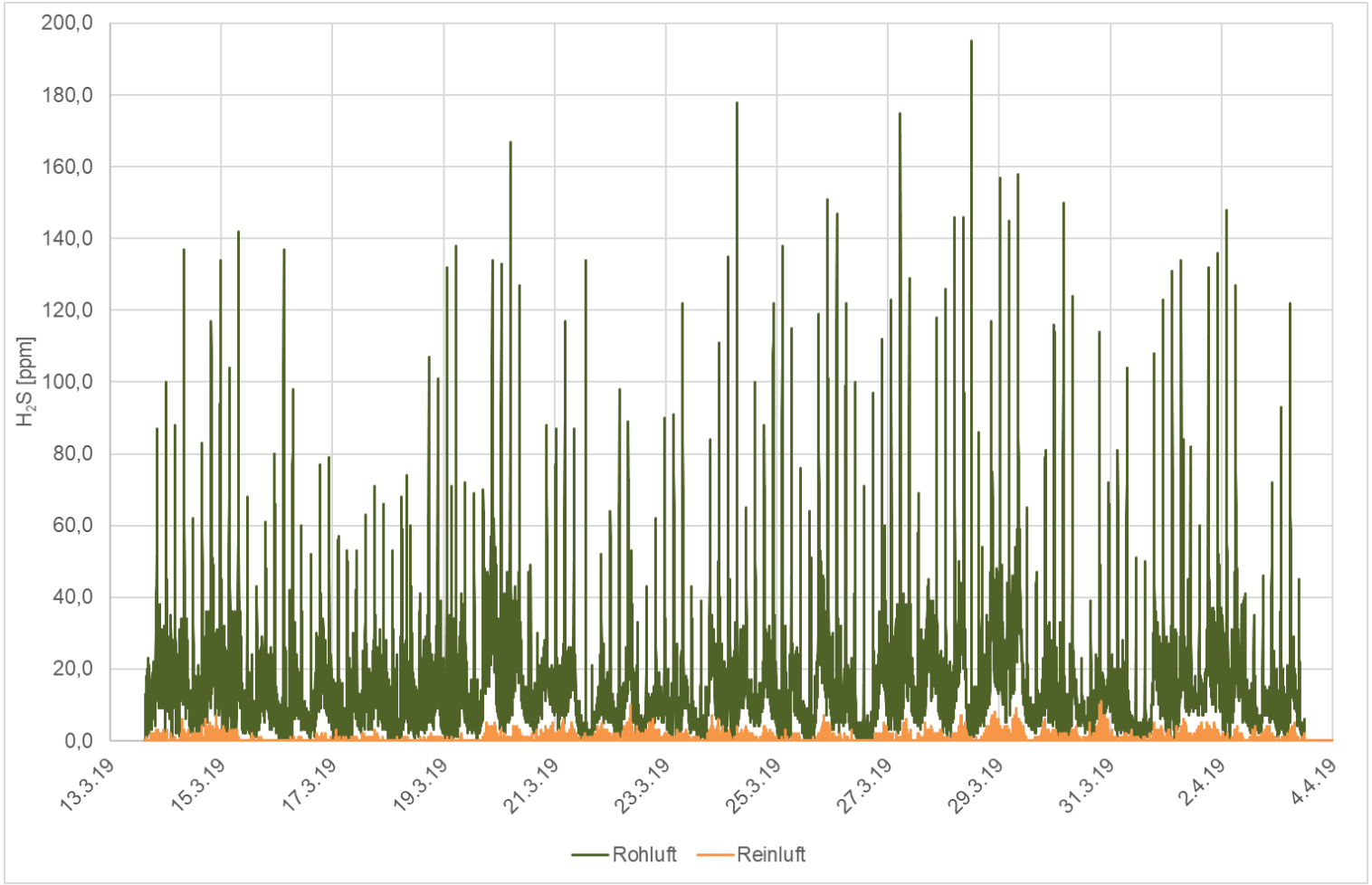

## Operation Results

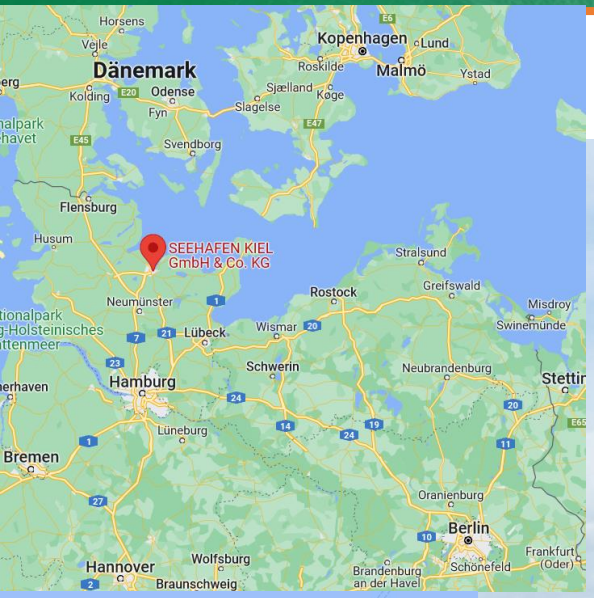
→ Ozone generator with 50% power

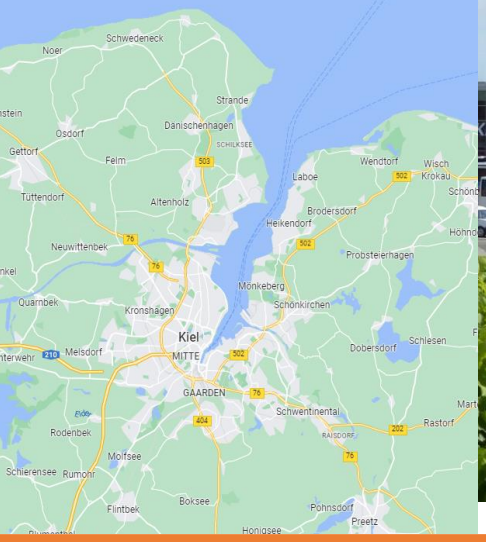
→ Exhaust fan output 350 m³/h

→ $H_2S$ peak value of 195 ppm

→ $H_2S$ removal to average 15 ppm





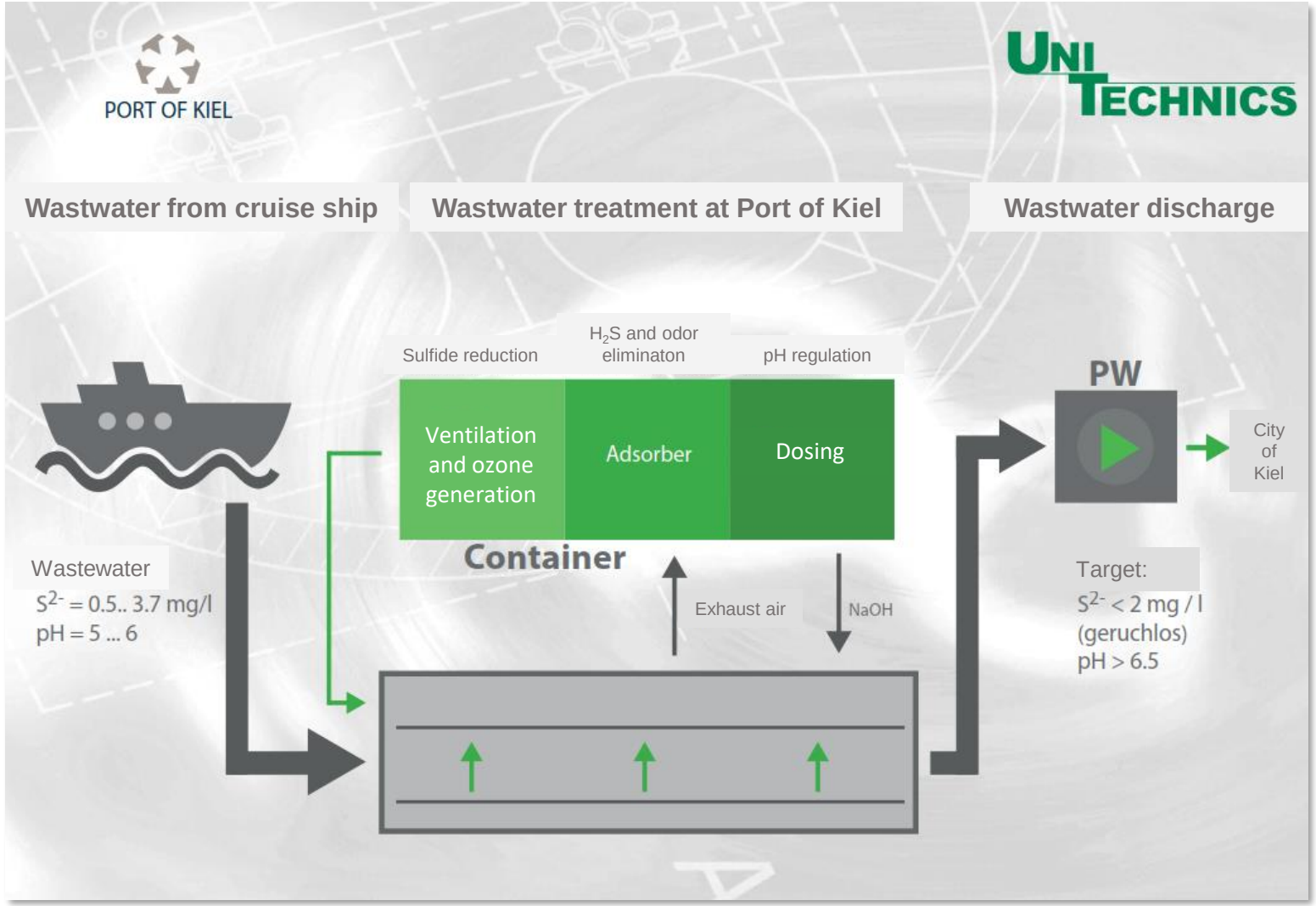





- Port of Kiel
- Construction of a wastewater and exhaust air treatment plant at the seaport

✓ Odor elimination

✓ Working and operational safety


PORT OF KIEL
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Wastewater from cruise ship
Wastewater treatment at Port of Kiel
Wastewater discharge
Sulfide reduction
H2S and odor eliminaton
pH regulation
Ventilation and ozone generation
Adsorber
Dosing
Container
Exhaust air
NaOH
PW
City of Kiel
Wastewater
S2- = 0.5.. 3.7 mg/l
pH = 5 ... 6
Target:
S2- < 2 mg / l
(geruchlos)
pH > 6.5


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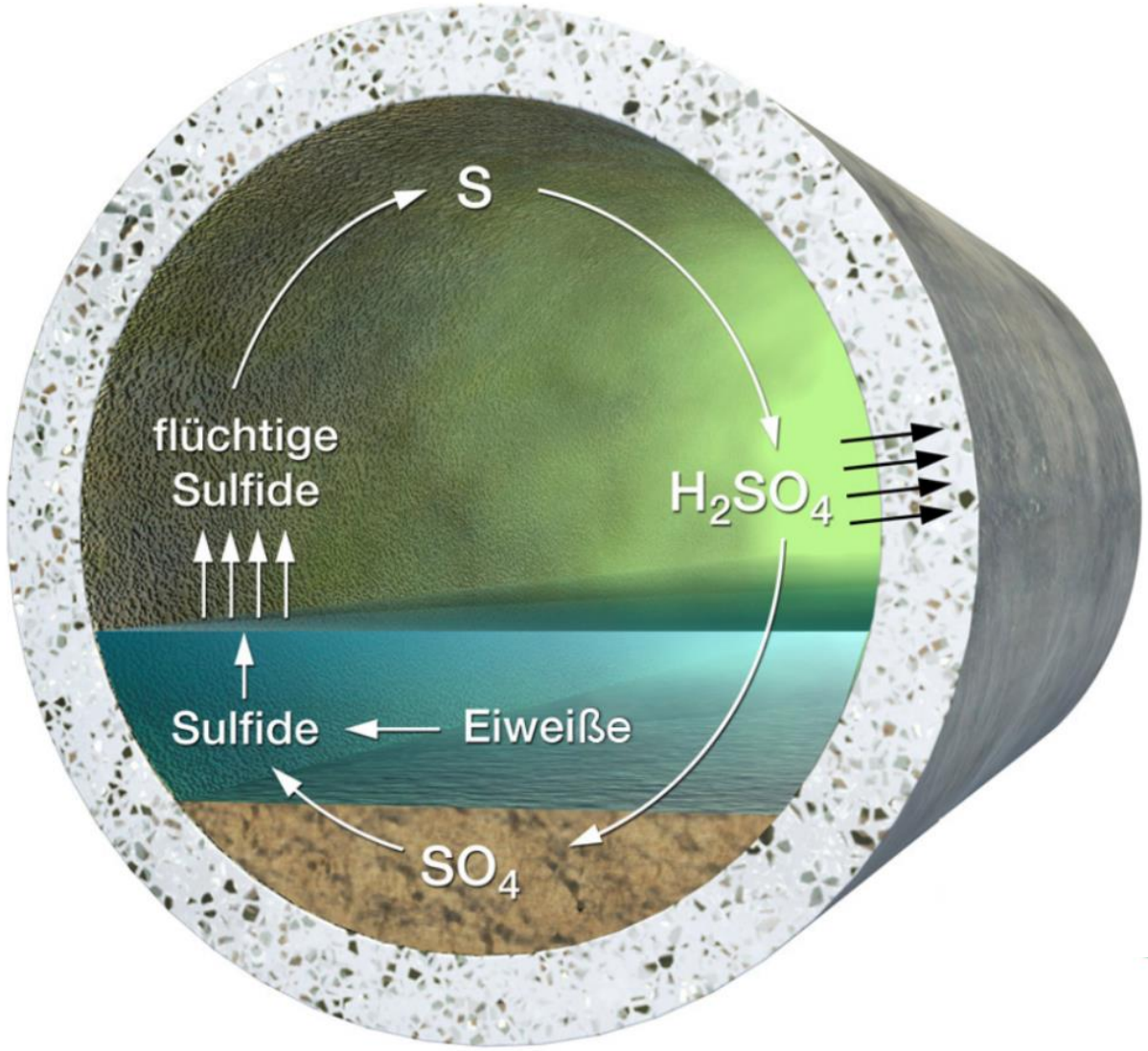
# Exhaust air treatment technology or application in your country?

# Thank you!

**See you next month**

**on 5th May**

**Ep. 07  Sulfide Balance in Drainage Systems**



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## INNOVATIONS FOR YOUR SEWAGE SYSTEM

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