

# WASTEWATER-TALK

International exchange

**Episode 07 May. 2022**

## **Sulfide Balance in Drainage System**

Klaus Jilg, Siqi Tong & Raghu Chebrolu

## Wastewater-talk

monthly new theme

International exchange

Wastewater is an issue  
that absolutely needs  
to be clarified



**Klaus Jilg**

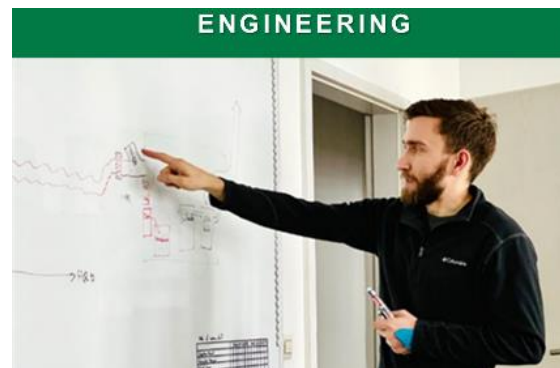
Expert on odor and  
other wastewater issues

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



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PRODUCTS



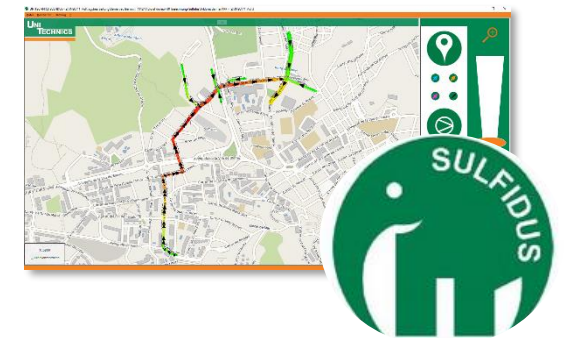
**Engineering Consulting**



**Indirect Discharger Investigation**



**Sewer System Inspection**



**Sulfide Balance SULFIDUS**



**Odour & Corrosion**



**Extraneous Water Seal**



**Dosing & Exhaust Air Treatment**



**Rat Control**



## Development of water consumption per capita

Liter / (capita · day), Germany

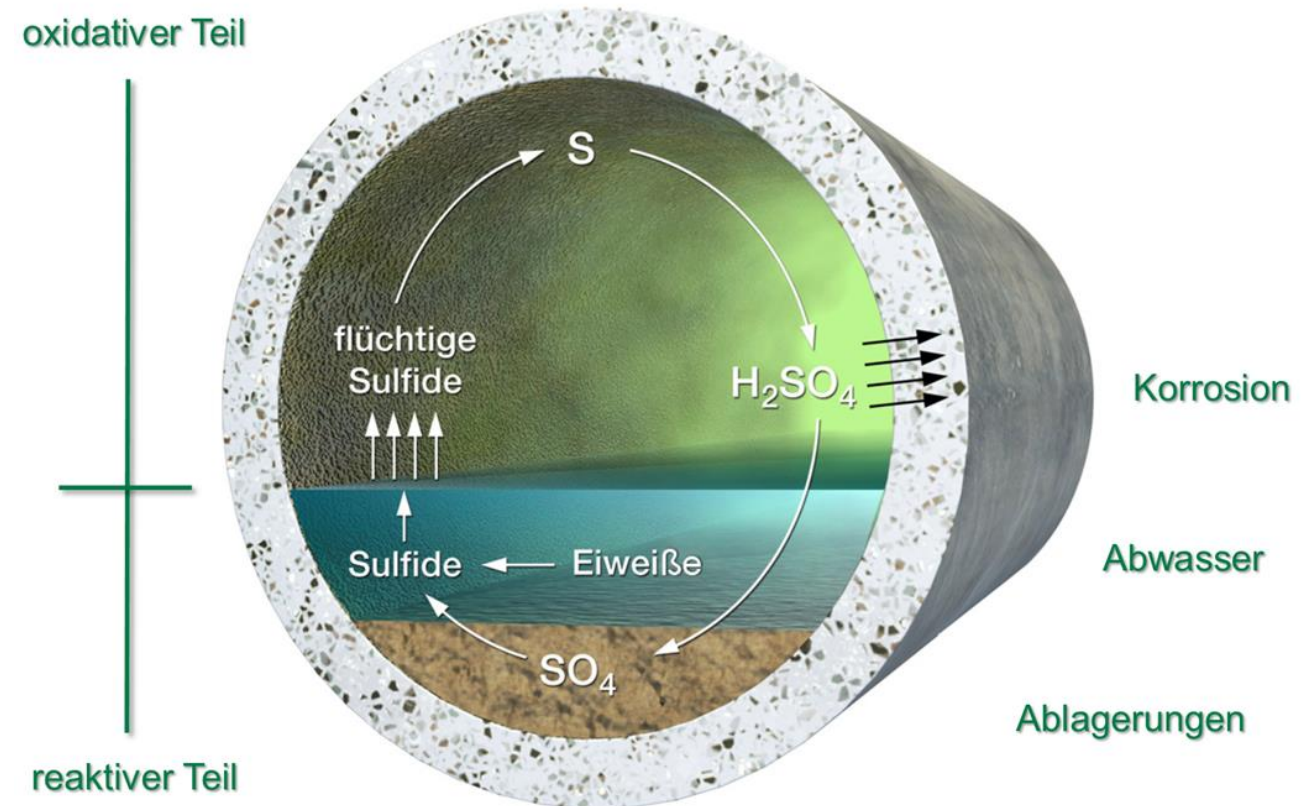


- Decreasing water consumption and wastewater generation
- Longer retention time in the sewer systems
  - Formation of malodour such as  $H_2S$
- Ventilations holes on the manhole covers
  - Emission of  $H_2S$  from sewer systems
  - Complaints from citizens





- Long residence time of wastewater leads to fouling smells and corrosion in the pressure pipelines
- Concrete pipelines are corroded at a rapid phase which reduces the lifetime of the pipelines
- Due to the rapid corrosion many municipalities have to spend more money for sanitation works in the sewers





### Sulfidberechnung und H2S-Emission

### Anlage 2-1

Abwasserüberleitung KA Waldhausen - Glashütte Seite 1

Nr.	Druckleitungsbereich	Leitungslänge [m]	D <sub>innen</sub> [mm]	Abwassermenge Q <sub>z</sub> [m³/d]	BSB <sub>5</sub> [mg/l]	Sulfat [mg/l]	Abwassertemp. [°C]	pH-Wert Abwasser [-]	anfängl. Abwasseralter [h]	Sauerstoffgehalt [mg/l]
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### Sommer Sulfidberechnung und H2S-Emission

### Anlage 2-1

Abwasserüberleitung KA Waldhausen - Glashütte Seite 2

Nr.	Druckleitungsbereich	Volumen Druckleitung	mittlere Fließzeit	kritische Fließzeit	mittlere Fließgeschw.	Sulfidbildung	Sulfid-zuleitung	Sulfid-gehalt gesamt	Sulfid-fracht	pot. Abluftmenge bei 0,1 ppm	mittlere Haltungslänge Folgekanal
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### Sommer Sulfidberechnung und H2S-Emission

### Anlage 2-1

Abwasserüberleitung KA Waldhausen - Glashütte Seite 3

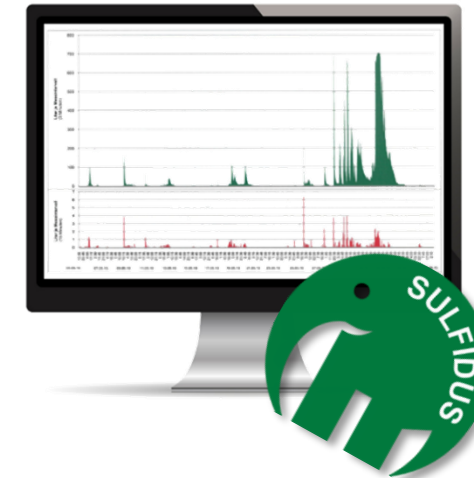
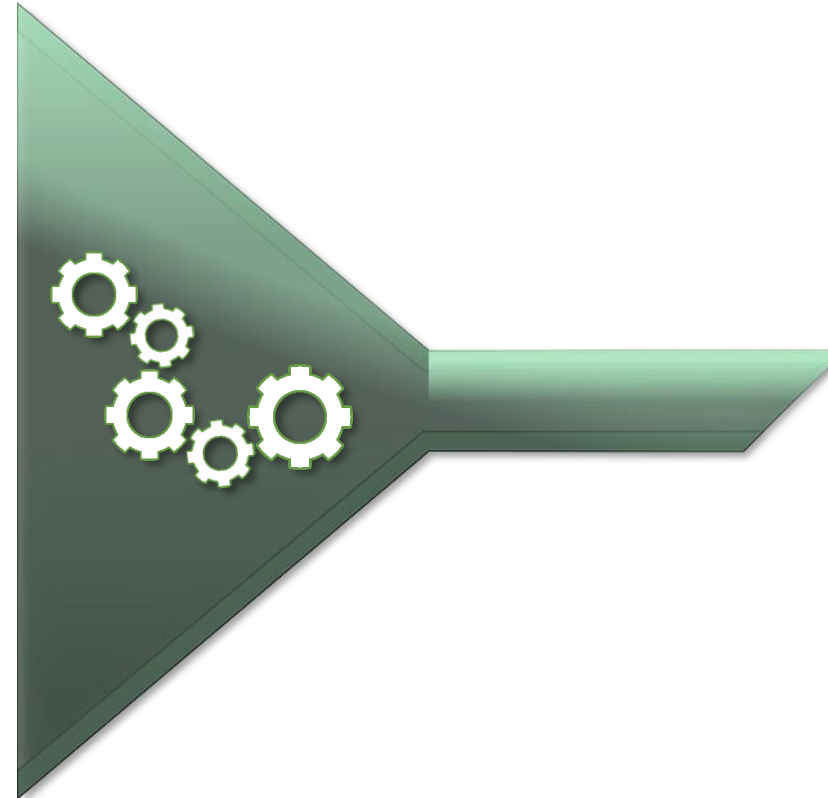
Nr.	Druckleitungsbereich	Länge Kanal [m]	Anzahl vorhandener Haltungen [Stück]	rechn. Emissionsstrecke [m]	gesamter Kanal betroffen	Sauerstoff-zehrung in der Leitung [mg/l]	Rest-Sulfid-gehalt [mg/l]	emittierte Sulfid-fracht [g/d]	ca. Abluftmenge bei 0,1 ppm [m³/d * *)	antilige H2S-Emission
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Tabelle 2: Wesentliche Ergebnisse der H<sub>2</sub>S-Bilanz, bei 0,20 l/m<sup>3</sup> Fällmitteldosierung (Anlage 2-2)

Leitungsabschnitt	Sulfidbildung [mg/l]	Sulfidfracht [g/d]	pot. Abluftmenge bei 0,1 ppm [m³/d * *)	rechn. Emissionsstrecke [m]	gesamter Kanal betroffen
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Tabelle 3: Wesentliche Ergebnisse der H<sub>2</sub>S-Bilanz, bei 0,10 l/m<sup>3</sup> Fällmitteldosierung (Anlage 2-3)

Leitungsabschnitt	Sulfidbildung [mg/l]	Sulfidfracht [g/d]	pot. Abluftmenge bei 0,1 ppm [m³/d * *)	rechn. Emissionsstrecke [m]	gesamter Kanal betroffen
<b>Sommer</b>					
1 KA Waldhausen - Hochpunkt Druckleitung (Stat. 4+296 km)	7,91	1.053	7.017.000	geschl. DRL	geschl. DRL
2 von Stat. 4+296 km - Ortsnetz Glashütte Schacht S 01480043	0,00	1.053	7.017.000	1.900	ja
3 Ortsnetz Glashütte S 01480043 - Überleitungssammler Schacht S 01480023	0,00	318	2.118.000	1.230	ja
<b>Winter</b>					
1 KA Waldhausen - Hochpunkt Druckleitung (Stat. 4+296 km)	2,03	258	1.717.000	geschl. DRL	geschl. DRL
2 von Stat. 4+296 km - Ortsnetz Glashütte Schacht S 01480043	0,00	258	1.717.000	1.100	nein
3 Ortsnetz Glashütte S 01480043 - Überleitungssammler Schacht S 01480023	0,00	0	0	0	nein



- **Digitalization** of drainage systems
- **Simulation** of complex metabolic processes under different situations
- **Calculation** of  $O_2$  consumption and  $H_2S$  formation
- **Visualization** of results for better understanding
- **Identification** of odour emission and biogenic corrosion development at early stage
- **Optimization** of drainage systems for operators and planners





## Workflow of sulfide balance by SULFIDUS

### Analyze

- Access to data
- Input parameters
- H<sub>2</sub>S measurement

### Modeling

- Emission tracking
- Potential of damage

### Options Comparison

- Penstock layout
- Fe-Dosing
- Calcium Nitrate dosing
- Biofilter
- Manhole filter
- Exhaust air treatment

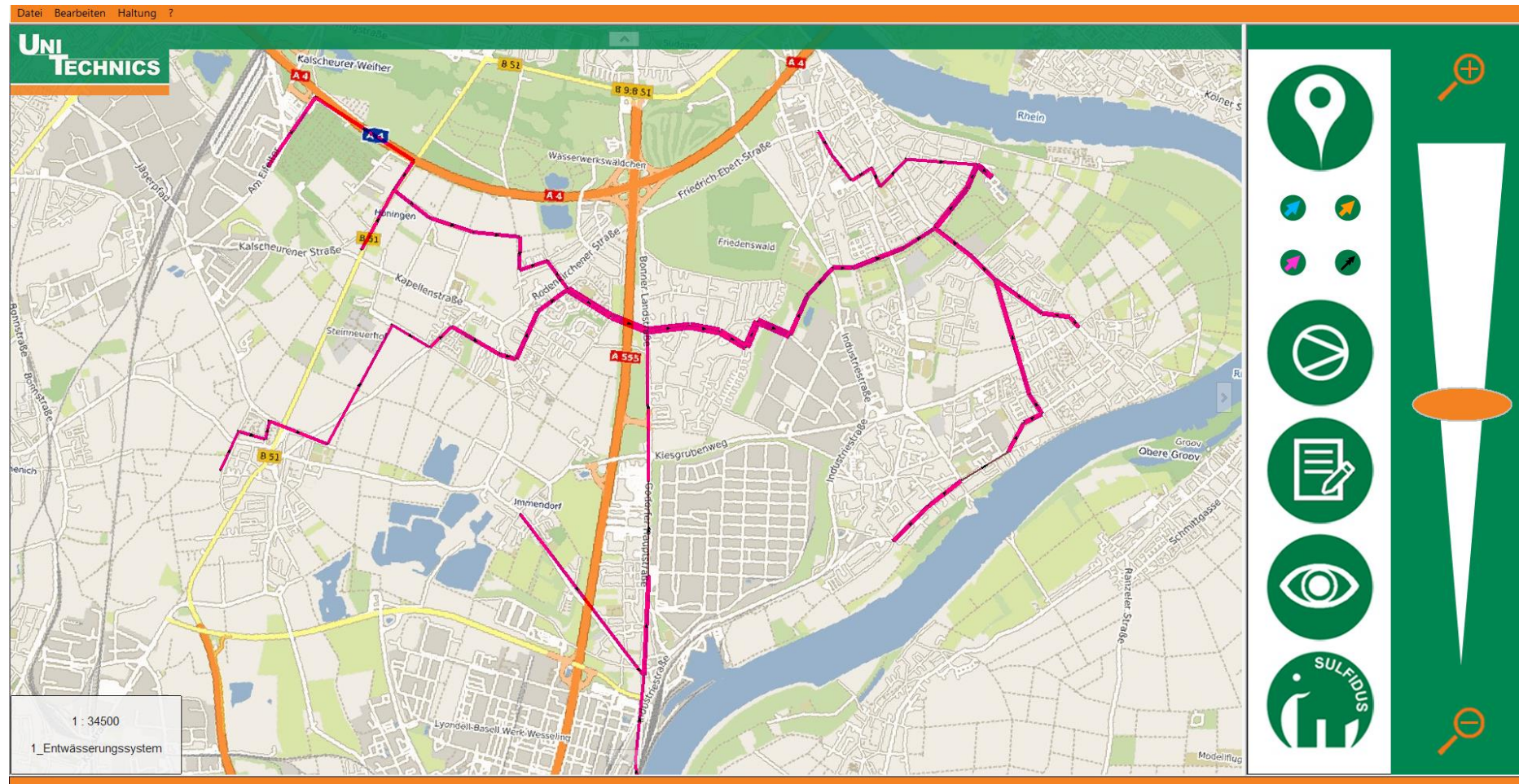
### Results

- Operational safety
- Dimensioning
- Investment
- Operational costs

### Implementation

- Project planning
- Offer provision
- Construction supervision
- Other tests

## SULFIDUS Interface





## Basic Data

Abschnitt 32579233\_5939735\_32578801\_5939668 -/7 (32579233\_5939735-32578801\_5939668) Schm... X

Basisdaten Erweitert Berechnungsergebnisse

Attribut	Wert
length of sewer [m]	436.68
hydraulic shape	0
nominal pipe size (width) [mm]	129.84
nominal pipe size (high) [mm]	125
upper manhole level [m]	129.84
lower manhole level [m]	126.00
wastewater quantity [m³/d]	1663.08
COD concentration [mg/l]	574.53
sulfate concentration [mg/l]	51.53
sulfide concentration [mg/l]	0.26
temperature [°C]	18
pH [-]	7.09
dissolved oxygen [mg/l]	0
dosage of iron (30% solution) [l/d]	0
dosage of nitrate (35% solution) [l/d]	0

Cancel OK

## Additional Data

Abschnitt 32579233\_5939735\_32578801\_5939668 -/7 (32579233\_5939735-32578801\_5939668) Schm... X

Basisdaten Erweitert Berechnungsergebnisse

Attribut	Wert
Name	32579233_5939735_3257...
name of start node	32579233_5939735
name of end node	32578801_5939668
type of sewer	D
type of drainage system	Schmutz
operating roughness [mm]	1.5
slope [per thousand]	8.79
secondary inflow_ wastewater quantity [m³/d]	0
secondary inflow_ sulfide concentration [mg/l]	0
secondary inflow_ dissolved oxygen [mg/l]	0
secondary inflow_ COD concentration [mg/l]	0
secondary inflow_ sulfate concentration [mg/l]	0
secondary inflow_ temperature [°C]	0
secondary inflow_ pH [-]	0
end node value for exhaust air	0

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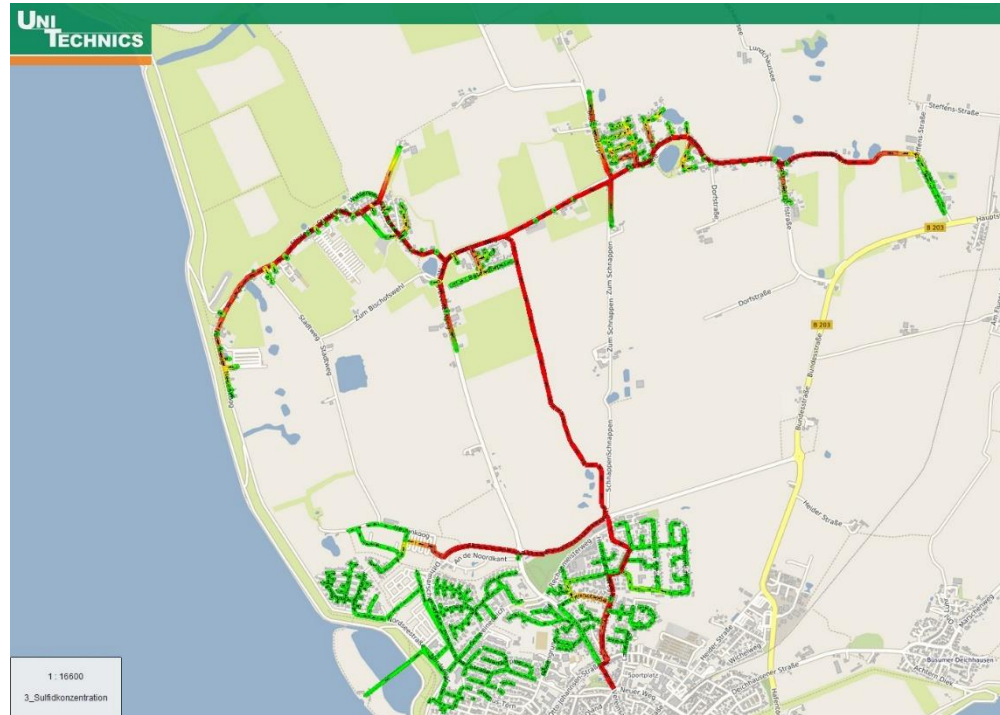
## Results

Abschnitt 32584780\_5943337\_32584674\_5943254 -/25 (32584780\_5943337-32584674\_5943254) Sch... X

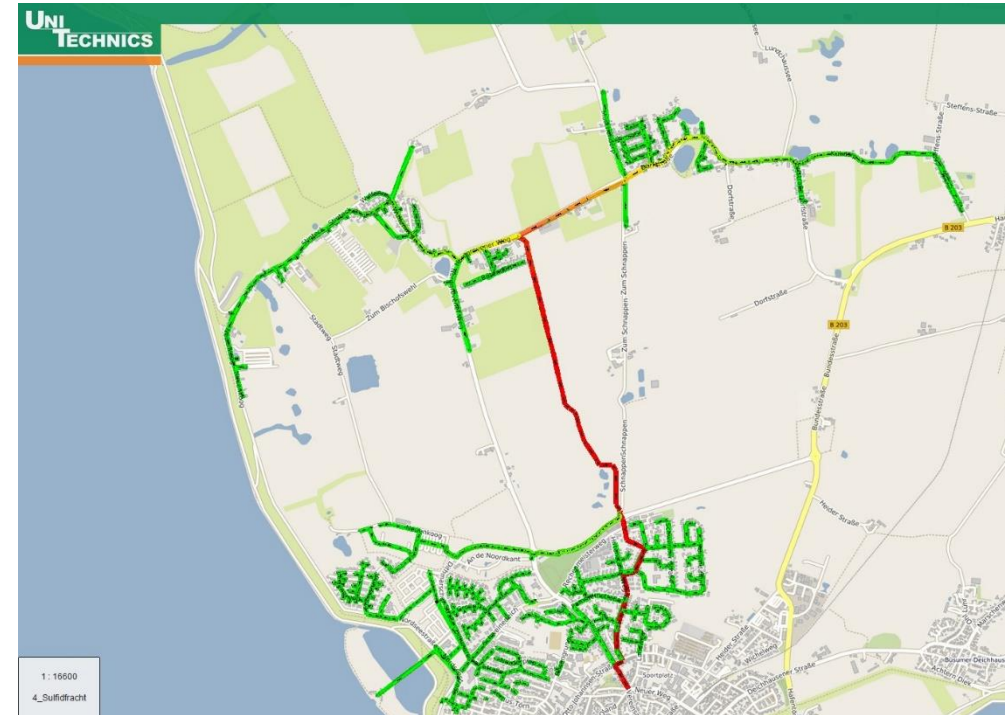
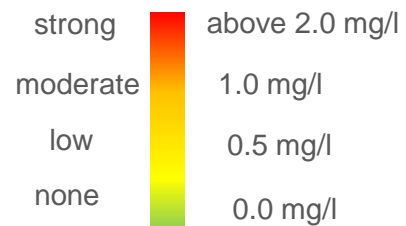
Basisdaten Erweitert Berechnungsergebnisse

Attribut	Wert
start sulfide inflow [mg/l]	0
start total sulfide [mg/l]	0.01
start sulfide load [g/d]	8.45
end oxygen demand [mg/l]	0
sewer sulfide formation [mg/l]	0.01
end total sulfide [mg/l]	0.01
end sulfide load [g/d]	8.45
exhaust air volume for smell perception 0,1 ppm [m³/d]	94000

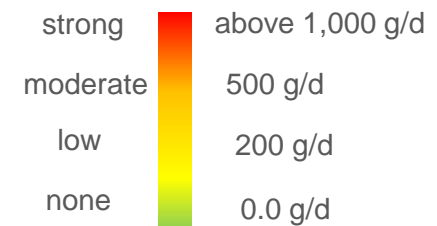
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Odour / Sulfide concentration



Corrosion / Sulfide load







**Chemical Dosing Station  
(Fe<sup>2+</sup>)**



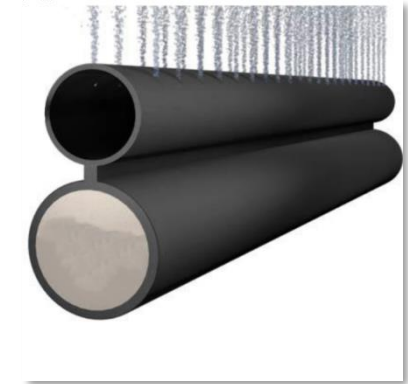
**Chemical Dosing Equipment  
(NO<sub>3</sub><sup>-</sup>)**



**ClO<sub>2</sub> Dosing**



**Compressed Air Flushing**



**Linear Ventilation**



**Penstock Extension**



**Exhaust Air Treatment**



**Manhole Filter**



**Corrosion-proof Construction**

others...





**Sulfide monitoring / simulation  
applications in your knowledge?**



# Thank you!

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See you next month  
on 2<sup>nd</sup> June

Ep. 08 Special Episode  
IFAT Munich 2022

IFAT



Gewinne eine Drohne!

UNITECHNICS Stand in der Halle B3 Stand 411



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