General

Mine water from lignite mining is often characterized by an acidic pH and high iron and sulfate contents. Prior to discharge into receiving waters, these mine waters must be treated. In most cases an effluent concentration of < 3 mg/l is required for iron.

For mine water treatment a long-proven chemical method is often applied. It essentially involves raising the pH by adding lime and the selective oxidation of iron followed by flocculation and sedimentation. The addition of lime to raise the pH is an important cost factor in mine water treatment.

If the mine water contains a lot of dissolved carbonic acid, a physical desorption stage may be connected upstream the chemical stage. By selective stripping of CO₂ remarkable amounts of neutralizing agents can be saved in the chemical stage and operating costs are significantly reduced.
For application in mine water treatment FUCHS has developed special aerators that meet the specific requirements of this task:

- **AEROSTAR Aerators:** CO₂ Desorption
- **OXYSTAR Aerators:** Ferrous Iron Oxidation (Mine Water Model)

**FUCHS AEROSTAR Aerators**

- Removal of Dissolved Carbonic Acid
- Highly Efficient Stripping Process
- Significant Reduction of Lime Consumption

Treatment Plant “Schwarze Pumpe” (LEAG, formerly Vattenfall)

- Short-Term Amortization of Investments
- Versatile Mounting Options (Float / Bridge)

Treatment Plant “Am Weinberg” (LEAG, formerly Vattenfall)
For the first time in 2000, FUCHS OXYSTAR Aerators were used in the Lusatia lignite mining district (East Germany) to clean mine water containing ferrous iron. These aerators lead to an enhanced iron oxidation rate under the existing conditions, where the oxygen diffusion is the rate-determining step. Furthermore, the application of FUCHS Aerators caused increased throughput, optimal lime utilization and better sludge thickening, which led to a higher efficiency of the mine water treatment.
The mine water treatment plant Schleenhain is situated in the northeast of the open pit mine Vereinigtes Schleenhain (Saxony, Germany). Adding lime and oxygen to drainage water causes an increase of pH and a lowering of dissolved iron down to 3 mg/l.

**Brief description / Schleenhain**

Owner: MIBRAG  
Origin: Lignite Mining  
Treatment capacity: 60 m³/min (3 lines)  
Treatment objective: Ferrous Iron Oxidation  
Aerator type: FUCHS OXYSTAR Aerator  
18 x 11.0 kW  
Start-up: Aerators in operation since 2010
“Am Weinberg” Treatment Plant  →  Case Study 2

The modern mine water treatment plant “Am Weinberg” is located about 25 km south of Cottbus in Lusatia (Brandenburg, Germany). It was built on recultivated land on the edge of the open pit mine Welzow-Süd. This plant mainly consists of the combination of a physical and a chemical treatment stage. With the upstream CO₂ desorption the pH is raised and reduces the required lime use in the oxidation step to a minimum.

Brief description / Am Weinberg

Owner: LEAG (formerly Vattenfall)
Origin: Lignite Mining
Treatment capacity: 30 m³/min (2 lines)
Treatment objective: CO₂ Desorption and Ferrous Iron Oxidation
Aerator type:
- FUCHS AEROSTAR Aerator
  10 x 11.0 kW (CO₂ Desorption)
- FUCHS OXYSTAR Aerator
  16 x 11.0 kW (Ferrous Iron Oxidation)
Start-up: Aerators in operation since 2014
“Tzschelln” Treatment Plant   Case Study 3

The mine water treatment plant Tzschelln is located north of the power plant Boxberg in the recultivation area of the open pit mine Nochten (Saxony, Germany). In this plant drainage waters with very high iron concentrations of up to 700 mg/l are treated. The pH is between 4 and 5. The treatment plant basically consists of a chemical treatment stage in three lines, each with six aeration basins for iron oxidation. For pH raising and iron precipitation lime milk is added.

Brief description / Tzschelln

<table>
<thead>
<tr>
<th>Owner:</th>
<th>LEAG (formerly Vattenfall)</th>
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<tbody>
<tr>
<td>Origin:</td>
<td>Lignite Mining</td>
</tr>
<tr>
<td>Treatment capacity:</td>
<td>60 m³/min (3 lines)</td>
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<tr>
<td>Treatment objective:</td>
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<td>Aerator type:</td>
<td>FUCHS OXYSTAR Aerator</td>
</tr>
<tr>
<td></td>
<td>36 x 11.0 kW</td>
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<tr>
<td>Start-up:</td>
<td>Aerators in operation since 2004</td>
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</tbody>
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“Ronneburg” Treatment Plant  Case Study 4

In the plant Ronneburg (Thuringia, Germany) water from flooded mines is treated. This typical mining water has a pH in the acidic range and a high heavy metal content (mainly iron, nickel, zinc). The radioactive components play a minor role. The plant is scheduled to run for 25 years.

After an upgrade in 2010 treatment plant Ronneburg basically consists of three lines with four aeration tanks each and an upstream basin for CO₂ desorption. Lime precipitation is combined with partial sludge recirculation (HDS-process).

Brief description / Ronneburg

Owner: Wismut
Origin: Uranium Mining
Treatment capacity: 12.5 m³/min (3 lines)
Treatment objective: CO₂ Desorption and Separation of Heavy Metals
Aerator type: FUCHS AEROSTAR Aerator
            3 x 11.0 kW (CO₂ Desorption)
            FUCHS OXYSTAR Aerator
            12 x 11.0 kW (Separation of Heavy Metals)
Start-up: Aerators in operation since 2010
Mine Water Treatment Plants with FUCHS Aerators
- Installation Examples -

**Schwarze Pumpe**
Owner: LEAG - Lausitz Energie Bergbau AG (formerly Vattenfall Europe Mining AG)
Origin: Lignite Mining
Treatment Capacity: 170.0 m³/min
Treatment Objective (1): CO₂ Desorption
Aerator Type: FUCHS AEROSTAR Aerator
15 x 7.5 kW
Treatment Objective (2): Ferrous Iron Oxidation
Aerator Type: FUCHS OXYSTAR Aerator
12 x 15.0 kW

**Tzschelln**
Owner: LEAG - Lausitz Energie Bergbau AG (formerly Vattenfall Europe Mining AG)
Origin: Lignite Mining
Treatment Capacity: 60.0 m³/min (3 lines)
Treatment Objective: Ferrous Iron Oxidation
Aerator Type: FUCHS OXYSTAR Aerator
36 x 11.0 kW
Start-Up: 2004

**Ronneburg**
Owner: Wismut GmbH
Origin: Uranium Mining
Treatment Capacity: 12.5 m³/min (3 lines)
Treatment Objective (1): CO₂ Desorption
Aerator Type: FUCHS AEROSTAR Aerator
3 x 11.0 kW
Treatment Objective (2): Separation of Heavy Metals
Aerator Type: FUCHS OXYSTAR Aerator
12 x 11.0 kW
Start-Up: 2010
Schleenhain
Owner: MIBRAG mbH
Origin: Lignite Mining
Treatment Capacity: 60.0 m³/min (3 lines)
Treatment Objective: Ferrous Iron Oxidation
Aerator Type: FUCHS OXYSTAR Aerator
18 x 11.0 kW
Start-Up: 2010

Am Weinberg
Owner: LEAG - Lausitz Energie Bergbau AG
(formerly Vattenfall Europe Mining AG)
Origin: Lignite Mining
Treatment Capacity: 30.0 m³/min (2 lines)
Treatment Objective (1): CO₂ Desorption
Aerator Type: FUCHS AEROSTAR Aerator
10 x 11.0 kW
Treatment Objective (2): Ferrous Iron Oxidation
Aerator Type: FUCHS OXYSTAR Aerator
16 x 11.0 kW
Start-Up: 2014

Profen
Owner: MIBRAG mbH
Origin: Lignite Mining
Treatment Capacity: 120.0 m³/min (4 lines)
Treatment Objective: Ferrous Iron Oxidation
Aerator Type: FUCHS OXYSTAR Aerator
40 x 11.0 kW
Start-Up: 2017 / under construction

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