FUCHS
A Metawater Company

Aeration
Mixing
Experts

FUCHS Mine Water Treatment

Case Studies

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.

Treatment Plant „Tzschelln“ (LEAG, formerly Vattenfall)

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 CO_2 remarkable amounts of neutralizing agents can be saved in the chemical stage and operating costs are significantly reduced.

FUCHS Enprotec GmbH
Stocktal 2 · 56727 Mayen · Germany
office +49 2651 8004-0 · fax +49 2651 8004-135
info@fuchswater.com · www.fuchswater.com

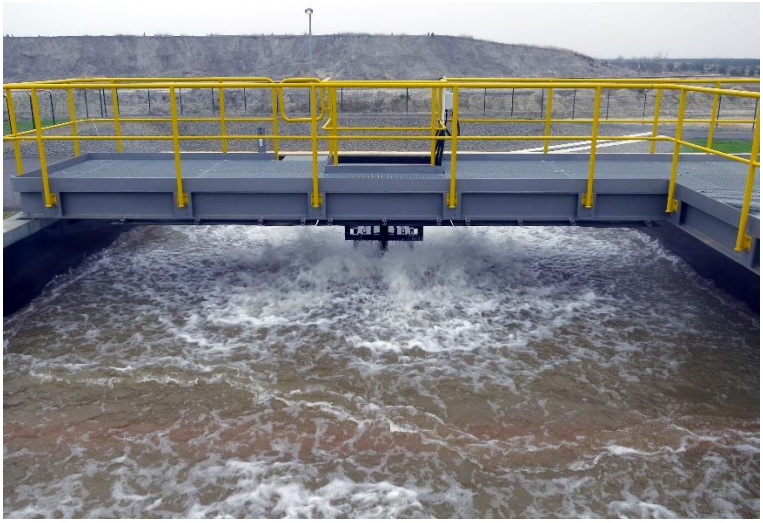
For application in mine water treatment FUCHS has developed special aerators that meet the specific requirements of this task:

- **AeroStar Aerators**: CO_2 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)



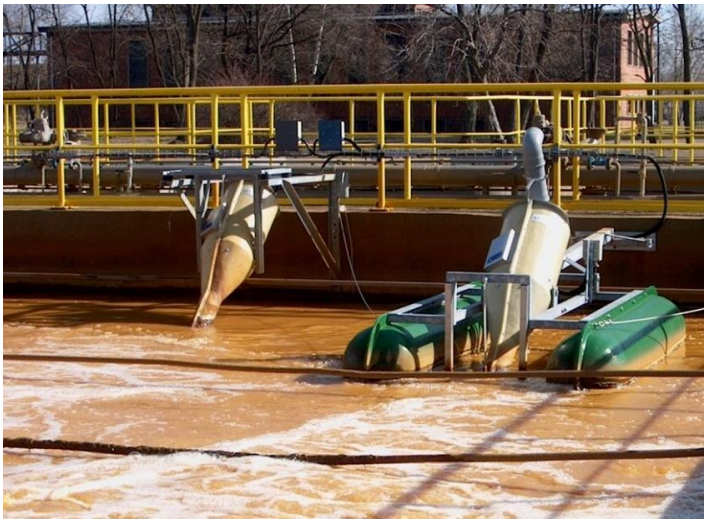
- **Short-Term Amortization of Investments**
- **Versatile Mounting Options (Float / Bridge)**

Treatment Plant “Am Weinberg” (LEAG, formerly Vattenfall)

FUCHS OxyStar Aerators

- **Enhanced Iron Oxidation Rate**
- **High-Efficiency Mixing and Circulation**
- **Optimal Lime Utilization**
- **No Spraywater**

Treatment Plant “Ronneburg” (Wismut)



Treatment Plant „Schwarze Pumpe“ (Vattenfall)

- **Versatile Mounting Options (Float / Bridge / Wall)**
- **Easy Handling**

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.

“Schleenhain” Treatment Plant ⟶ Case Study 1

Treatment Plant “Schleenhain” (MIBRAG)

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 / 15 hp
Start-up:	Aerators in operation since 2010

FUCHS OxyStar Aerators

FUCHS OxyStar Aerators

“Am Weinberg” Treatment Plant ⟶ Case Study 2

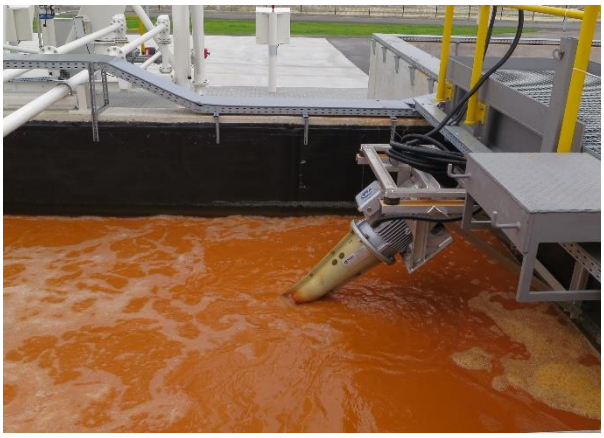
The modern mine water treatment plant “Am Weinberg” is located about 25 km south of Cottbus in Lusatia (Brandenburg, Germany).
It was built on recultivated land on the edge of the open pit mine Welzow-Süd. This plant mainly consists of the combination of a physical and a chemical treatment stage.
With the upstream CO_2 desorption the pH is raised and reduces the required lime use in the oxidation step to a minimum.

Treatment Plant “Am Weinberg” (LEAG, formerly Vattenfall)

Brief description / Am Weinberg

Owner:	LEAG (formerly Vattenfall)
Origin:	Lignite Mining
Treatment capacity:	30 m³/min (2 lines)
Treatment objective:	CO_2 Desorption and Ferrous Iron Oxidation
Aerator type:	FUCHS AeroStar Aerator
	10 x 11.0 kW /15 hp (CO_2 Desorption)
	FUCHS OxyStar Aerator
	16 x 11.0 kW / 15 hp (Ferrous Iron Oxidation)
Start-up:	Aerators in operation since 2014

FUCHS AeroStar Aerators



FUCHS OxyStar Aerators

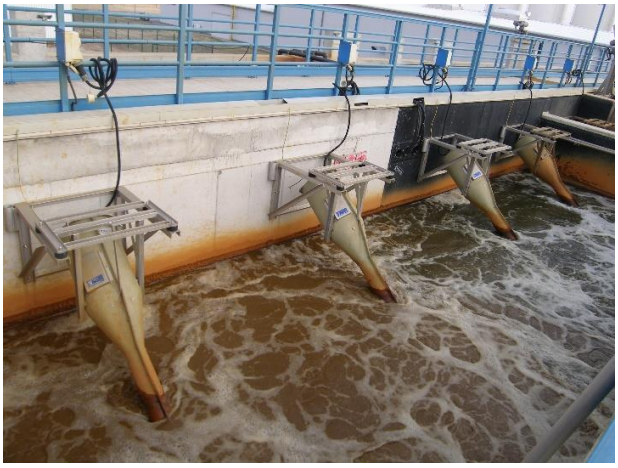
“Tzschelln” Treatment Plant → Case Study 3

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.

Treatment Plant “Tzschelln” (LEAG, formerly Vattenfall)

Brief description / Tzschelln

Owner:	LEAG (formerly Vattenfall)
Origin:	Lignite Mining
Treatment capacity:	60 m³/min (3 lines)
Treatment objective:	Ferrous Iron Oxidation
Aerator type:	FUCHS OxyStar Aerator
	36 x 11.0 kW / 15 hp
Start-up:	Aerators in operation since 2004



FUCHS OxyStar Aerators

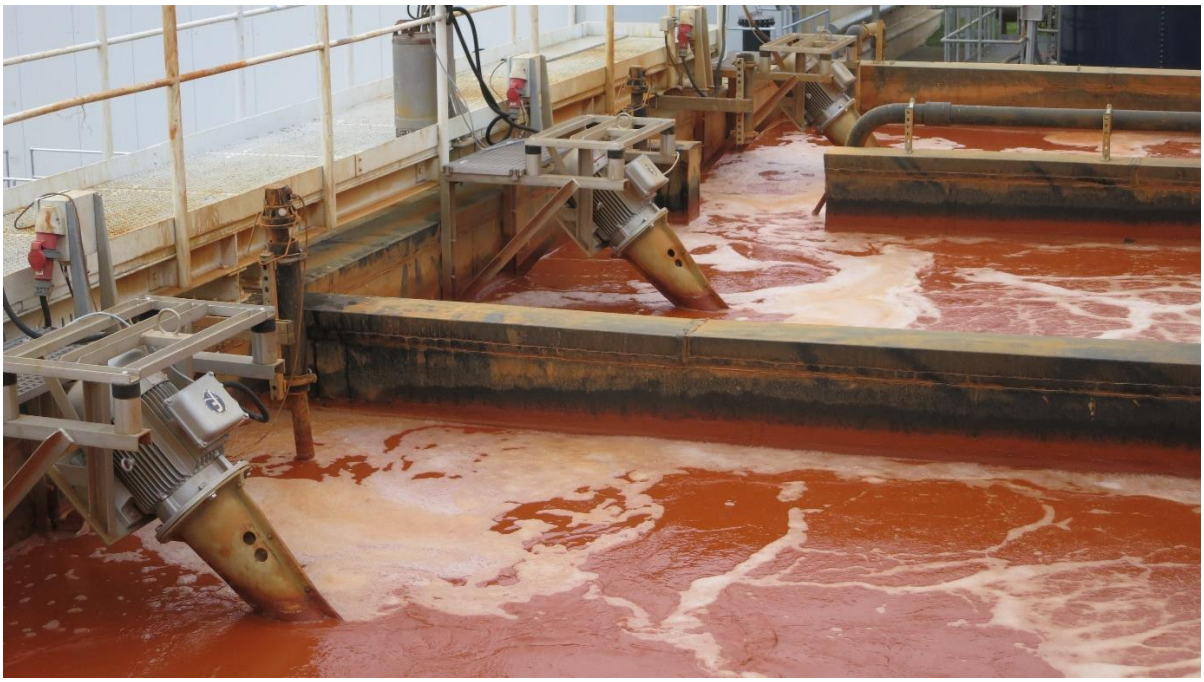
FUCHS OxyStar Aerators

"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 CO_2 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:	CO_2 Desorption and Separation of Heavy Metals
Aerator type:	FUCHS AeroStar Aerator 3 x 11.0 kW / 15 hp (CO_2 Desorption) FUCHS OxyStar Aerator 12 x 11.0 kW / 15 hp (Separation of Heavy Metals)
Start-up:	Aerators in operation since 2010



FUCHS OxyStar Aerators

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):	**CO_2 Desorption**
Aerator Type:	FUCHS AeroStar Aerator 16 x 7.5 kW / 10 hp
Treatment Objective (2):	**Ferrous Iron Oxidation**
Aerator Type:	FUCHS OxyStar Aerator 12 x 15.0 kW / 20 hp
Start-Up:	2000 / 2004 / 2019

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 / 15 hp
Start-Up:	2004

Ronneburg

Owner:	Wismut GmbH
Origin:	Uranium Mining
Treatment Capacity:	12.5 m³/min (3 lines)
Treatment Objective (1):	**CO_2 Desorption**
Aerator Type:	FUCHS AeroStar Aerator 3 x 11.0 kW / 15 hp
Treatment Objective (2):	**Separation of Heavy Metals**
Aerator Type:	FUCHS OxyStar Aerator 12 x 11.0 kW / 15 hp
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 / 15 hp
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):	**CO_2 Desorption**
Aerator Type:	FUCHS AeroStar Aerator 10 x 11.0 kW / 15 hp
Treatment Objective (2):	**Ferrous Iron Oxidation**
Aerator Type:	FUCHS OxyStar Aerator 16 x 11.0 kW / 15 hp
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 / 15 hp
Start-Up:	2017

Lamersdorfer Graben

Owner:	RWE Power AG
Origin:	Lignite Mining
Treatment Capacity:	7.8 m³/min (1 line)
Treatment Objective:	**Ferrous Iron Oxidation**
Aerator Type:	FUCHS OxyStar Aerator 8 x 7.5 kW / 10 hp
Start-Up:	2020

Plessa

Owner:	LMBV - Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft mbH
Origin:	Lignite Mining
Treatment Capacity:	96.0 m³/min (3 lines)
Treatment Objective:	**Ferrous Iron Oxidation**
Aerator Type:	FUCHS OxyStar Aerator 9 x 7.5 kW / 10 hp
Start-Up:	2021 / under construction

2021-01-12

Contact:

FUCHS Enprotec GmbH
Stocktal 2 · 56727 Mayen · Germany
office +49 2651 8004-0 · fax +49 2651 8004-135
info@fuchswater.com · www.fuchswater.com