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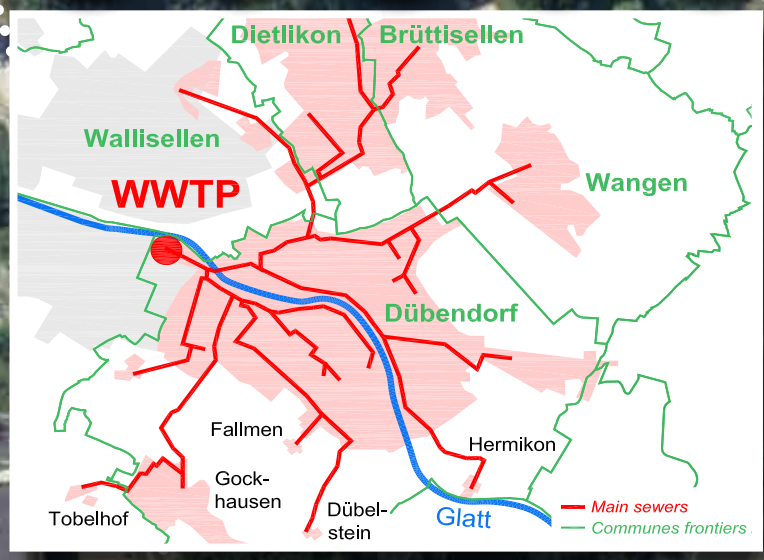
First ozonation facility at a municipal WWTP in Switzerland

Site of ozonation

Dübendorf Dietlikon Wangen Brüttisellen Wallisellen



When it opened in 1964, the NEUGUT wastewater treatment plant (WWTP) was one of the first plants treating municipal wastewater in Switzerland.
From 1987 to 1993, it was overhauled to incorporate four treatment steps – mechanical treatment, biological treatment, phosphate removal and sand filtration. In 2012 / 2013, it is being upgraded with a micropollutant reduction step – Switzerland's first full-scale ozonation facility. This will ensure state-of-the-art water protection for the Glatt.

Key figures
- **Treatment capacity 150,000 population equivalents**
- **Current load 105,000 population equivalents**
- **Treats 20–50 million litres of wastewater per day**
- **Biological treatment performance 96–99%**

Planning / execution

HOLINGER INGENIEURBÜRO GUJER AG eawag aquatic research

June 2013

Micropollutants in surface waters

The Federal Office for the Environment (FOEN) defines micropollutants as follows:

“Micropollutants” is a collective term for organic trace compounds or heavy metals which occur in the aquatic environment in very low concentrations (billionths to millionths of a gram per litre). Even at these low concentrations, they can have adverse effects on aquatic life or affect drinking water resources.

In Switzerland, more than 30,000 such substances are used regularly in innumerable products – in industry and commerce, households and agriculture. After use, products such as pharmaceuticals, personal care products, X-ray contrast agents, cleaning agents, pesticides and material protection agents (e.g. wood preservatives and facade coatings) may find their way into the aquatic environment.

Persistent compounds used in large quantities can be particularly problematic for surface waters. Substances can enter these waters either dissolved or bound to suspended particles.

Wastewater treatment

The NEUGUT WWTP currently removes carbon and nutrients such as nitrogen and phosphorus from wastewater. However, micropollutants are not (or only partly) removed by existing treatment steps, and so they can enter the Glatt in treated effluents.

Thanks to the new ozonation step – added to existing methods – organic micropollutants will now also be eliminated from wastewater. The upgraded NEUGUT WWTP incorporates the following treatment steps:

Step 1: Mechanical treatment
Step 2: Biological treatment
Step 3: Phosphate removal
Step 4: Ozonation followed by biologically active sand filtration

NEUGUT WWTP (150,000 PE)

Switzerland’s first full-scale ozonation facility

The NEUGUT WWTP is to build and operate Switzerland’s first full-scale ozonation facility for the removal of micropollutants from municipal wastewater.

In April 2012, based on the findings of the FOEN “MicroPoll Strategy” project, a revision of the Water Protection Act was released for consultation. Around 100 of Switzerland’s 700-plus WWTPs are affected by the proposed amendment to the legislation. Collectively, these plants treat around 50% of the country’s wastewater.

Thanks to the pioneering spirit of the communes of Dübendorf, Dietlikon, Wangen-Brüttisellen and Wallisellen, it will now be possible to accumulate long-term experience with full-scale ozonation operations at the NEUGUT WWTP.

Switzerland’s first full-scale ozonation installation is to be used to optimize this process and to develop the following aspects in cooperation with the Dübendorf-based aquatic research institute Eawag and other partners:

- measurement and monitoring programme
- various control strategies for optimum ozone dosing
- reliability of the system and measurement technology in long-term operation
- efficiency of various biological treatment processes following ozonation

Ozonation

Ozonation has been successfully employed for decades in drinking water treatment as a method of disinfection and to remove taste and odour compounds.

Ozone is a highly reactive gas which also attacks persistent compounds in water and can thus eliminate micropollutants. The ozonation step is integrated between secondary clarification and filtration.

Ozone production
Ozone is produced on-site from liquid oxygen. The liquid oxygen tank is located outside the building.

Ozone generator
The ozone needed for the process is generated from liquid oxygen by electrical discharge. This requires electricity.

Ozonation reactor
In the ozonation reactor, ozone is mixed with wastewater and reacts with the contaminants. Ozone is injected into the wastewater via ceramic diffusers. By reacting with the organic micropollutants in wastewater, ozone can eliminate their adverse effects. The ozonation reactor is sealed gas-tight.

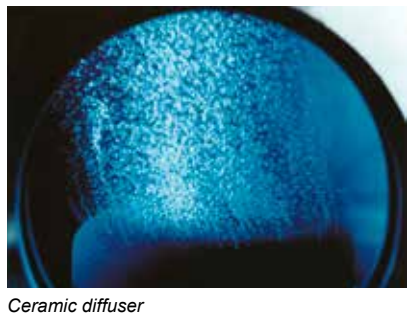
Residual ozone destructor
Off-gas from the ozonation reactor is passed through a residual ozone destructor to ensure that ozone concentrations in ambient air comply with legal requirements.

Filtration
Existing sand filtration is used as a biologically active treatment step. Here, the oxidation products of ozonation are biologically decomposed.

Safety of operating personnel
To ensure safety, ozone and oxygen sensors are installed. If these are activated, the system is automatically switched off and high volumes of air are introduced into the room (emergency ventilation).

Process monitoring
The process is continuously monitored and regulated by online measurements and a process control system.

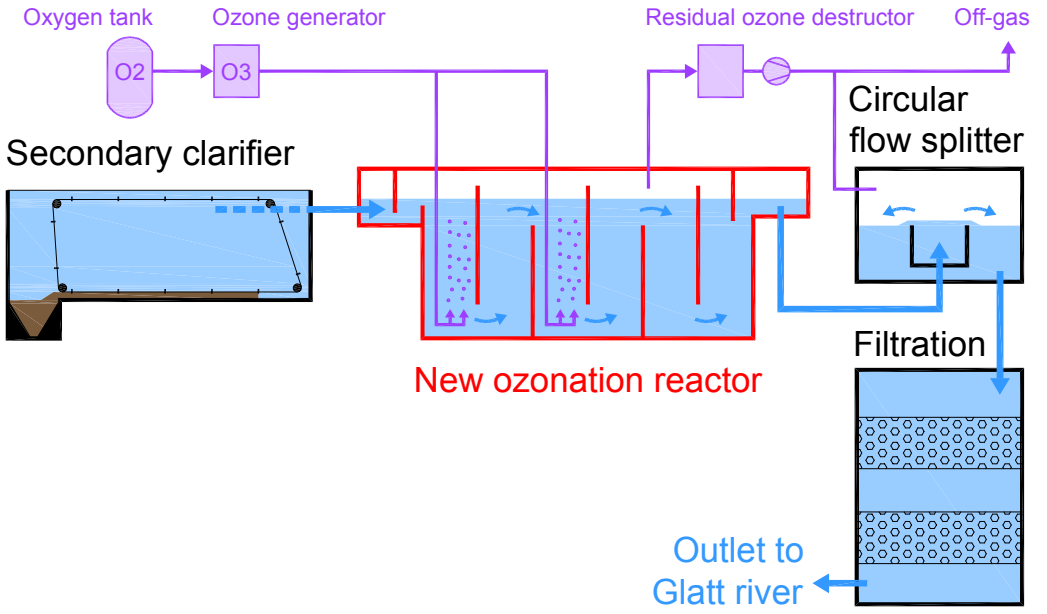
Ozone generator



Ceramic diffuser

Downstream sand filter

Exterior view of filtration facility



Results

Thanks to ozonation and biologically active sandfiltration, the ecotoxicity of treated wastewater is significantly reduced compared to the current treatment.

Reduced inputs of organic micropollutants into the Glatt promote long-term protection of flora and fauna and also of groundwater resources.