WASTEWATER TREATMENT PLANTS

Wastewater is water, the quality of which

was changed by human activity. It is water that is produced, for example, by flushing toilets, showering, washing, cleaning, etc., but also water that has only e.g. changed temperature during use. Besides the **municipal wastewaters**, there are also **industrial wastewaters**. The level of their pollution greatly varies in dependence of the type of the industrial activity, and such waters often have a very specific composition. Industrial wastewaters commonly contain toxic substances such as heavy metals, dyes, industrial chemicals, or even radioactive substances. Industrial wastewaters are released e.g. from metal production, textile and food industry, etc. Very specific wastewaters are those from pharmaceutical industry and hospital complexes, since they usually contain a considerable amount of drugs, hormones, and pathogenic microorganisms – bacteria and viruses.

Polluted water cannot be returned to nature without prior cleaning – removal of excessive pollutants. That is happening at **wastewater treatment plants**. Specific industrial wastewaters are usually at first "adjusted" at **industrial wastewater treatment plants** to remove specific industrial pollution, for example, heavy metals. Subsequently, the "pre-treated" wastewater goes to **municipal wastewater treatment plants**, where it is mixed with municipal wastewater.

Sewer pipes

Trash racks

Gas tank

How does it work at a municipal wastewater treatment plant?

The wastewater flowing through the **sewage network** first flows through **trash racks** and **sand traps**, where **coarse dirt** is trapped (sand, branches, leaves, plastic bags, sanitary items, napkins and everything that people "flush" into the wastewater).

Subsequently, the wastewater is fed to **settling tanks**. Here, **fine undissolved substances** (fine sand and clay, cellulose fibres, particles of organic origin) are deposited, which results in the formation of **primary sludge**.

Then, the **organic substances** contained in the wastewater are removed in activation tanks by using **bacteria** that form the so-called **activated sludge**. These organisms use the organic waste as a source of energy for their growth, and **convert** it into carbon dioxide and water under high oxygen consumption.

Wastewater treatment plant Plzeň

Activation tank

The **activated sludge** is **separated** from the **treated water** in **sedimentation tanks**. The purified water may be returned to nature or it can be used for other purposes. Part of the sludge is returned to the activation tank, and the excess sludge is processed further.

However, such purified water is not always of sufficient quality to be discharged back to the nature. Therefore, after biological treatment, **tertiary treatment** may be required to remove **nitrogen and phosphorus** compounds, residual suspended solids, or **pathogens**. Filtration, **membrane filtration**, coagulation, **adsorption** or **chemical oxidation** (chlorination, ozonation) are most often used as the tertiary technology. Possibly, the purified water can be used as a source of **recycled water**. Recycled wastewater can be utilized in industry as **cooling water**, in agriculture **for irrigation** (USA, Israel), or as a raw material for **drinking water treatment** (Singapore, Namibia).

Primary sludge (from the settling tanks) and **excess activated sludge** are converted into **biogas** in digesters by **anaerobic** (air-free) **bacteria**. Biogas is stored in gas tanks and used for electricity generation or for heating purposes.

In 2018, *there were 2,677 WWTPs in the Czech Republic.*

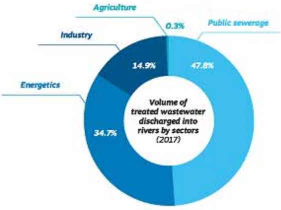
Almost 15% of the Czech population *is not connected to the public sewer system.*

The Greeks built *the first sewer systems more than 4000 years ago.*

Wastewater treatment plants *treat wastewater from households and industry.*

In 2018, there were *529 124 thousand m³ of wastewater discharged into the WWTPs.*

Activated sludge *consists of 95% decomposers (they decompose organic matter into simpler substances) and 5% consumers (they feed on organic matter).*



Did you know ...

- *...that we can use purified wastewater as technical water, for cooling, irrigation or recreation?*
- *...that the household wastewater can be divided according to its colour?*

Black water (from toilets)
- *brown water (faeces)*
- *yellow water (urine)*

Grey water (from the kitchen or bathroom)

Wastewater treatment plant Klatovy

VODA