Biological Wastewater Treatment Plant (Continues Flow System) of Town Kardzhali (Bulgaria)

Wastewater treatment plant of town Kardzhali just before start-up

- **Dimension load:** 75,000 population equivalents
- **Population:** 58,500 population equivalents
- **Industry:** up to 16,500 population equiv.
- **Sewer system:** combined system
- **Process target:**

BOD_5	<	25.0 mg/l
COD	<	125.0 mg/l
N_{total}	<	15.0 mg/l
P_{total}	<	2.0 mg/l
TSS	<	35.0 mg/l

- **Mechanical wastewater treatment:** automatic coarse screen, pumping station, 2-street compact pre-treatment station, each consisting of fine screen, aerated "Cylindrical grit separator", grease trap and screw press
- **Pre-treatment:** 2-street primary settling tank (circular tank)
- **Aeration technology:** disc membrane aerators supplied by rotary piston blowers
- **Sludge-treatment:** anaerobic digestion with simultaneous production of biogas for production of current and as independent power supply
- **Sludge-dewatering:** high performance centrifuge with SIMP-drive and addition of polymer
- **First start-up (biological stage):** 2014
- **Second start-up (sludge stage):** 2015
- **Final acceptance test:** 2015
- **Wastewater quantities:** 5,960 m^3/d (dry weather)
  1,495 m^3/h (rainy weather)
- **Control concept:** fully automatic operation with Siemens-SPS, SCADA-central control and remote maintenance
- **Operation results:**

BOD_5	<	10.0 mg/l
COD	<	61.0 mg/l
N_{total}	<	8.0 mg/l
P_{total}	<	1.0 mg/l
TSS	<	15.0 mg/l

- **Biological 2-street purification phase:** activated sludge station with continuous flow process, design according to A131, including nitrification as well as upstream, denitrification
- **Features:** UV-disinfection, production of biogas and use of energy by block heating station, high flexible adaptability to different load situations

2-street compact pre-treatment station, completely made of stainless steel including high-performance "Walzensandfang"

Two compact pre-treatment stations are operating in parallel and purify the wastewater with a volume stream of up to 450 l/s. Coarse solids as well as sand and grease are reliable separated within the narrowest space. At the same time, the separated sand is released by a downstream sand washer from organic material.

Installation of fine bubble disc aerators (including protection covering before start-up)

Totally two circular tanks with a whole volume of 11,700 m³ / ea. (designed as combined reactor with final sedimentation inside) are treating the wastewater by the aid of biological processes. The aeration of the activated sludge is performed by fine-bubble disc membranes, which are divided into three fields. A process-controlled change of the aeration guarantees a safe plant-operation.

Sludge digester for anaerobic treatment of biological excess sludge and primary sludge for production of methane gas

Primary sludge as well as biological excess sludge (thickened by a dewatering centrifuge) are collected and anaerobically fermented within a digester. During this process methane gas is released. Afterwards, the remaining solids the so called "digested sludge" are dewatered (by a centrifuge) and can be utilized for agricultural purposes.

Combined heat and power plant for power generation out of biogas

The methane gas, which is produced during the sludge digesting is intermediately stored within a gasholder and is continuously burned within the in-house block heat and power plant. The capacity of the generator is 124 kW. The produced electric current is directly consumed at the wastewater treatment plant and the recycled waste heat is used for the fermentation of the sludge.

