



WASTE WATER TREATMENT PLANT

- VRANJE -

(SERBIA)

CHALLENGES AND OPPORTUNITIES IN BUILDING RESILIENT WASTEWATER INFRASTRUCTURE

2026 DANUBE WATER FORUM

From Vision to Action:

Building a Water Resilient Danube Region

20. - 22. May 2026, Sofia (Bulgaria)



Agenda

01

Plant Overview & Key Parameters



02

Plant Operation & Challenges



03

Conclusions



01

Plant Overview & Key Parameters

WWTP Vranje

(05.2018 – 02.2023 incl. DNP)

PE 70,000 PE₆₀
Q 19,621 m³/d
≈ 818 / 1,552 m³/h
COD 8,198 kg/d

Mechanical pre-treatment
C-, N- and P- removal
Anaerobic sludge stabilization
Sludge dewatering & Storage hall

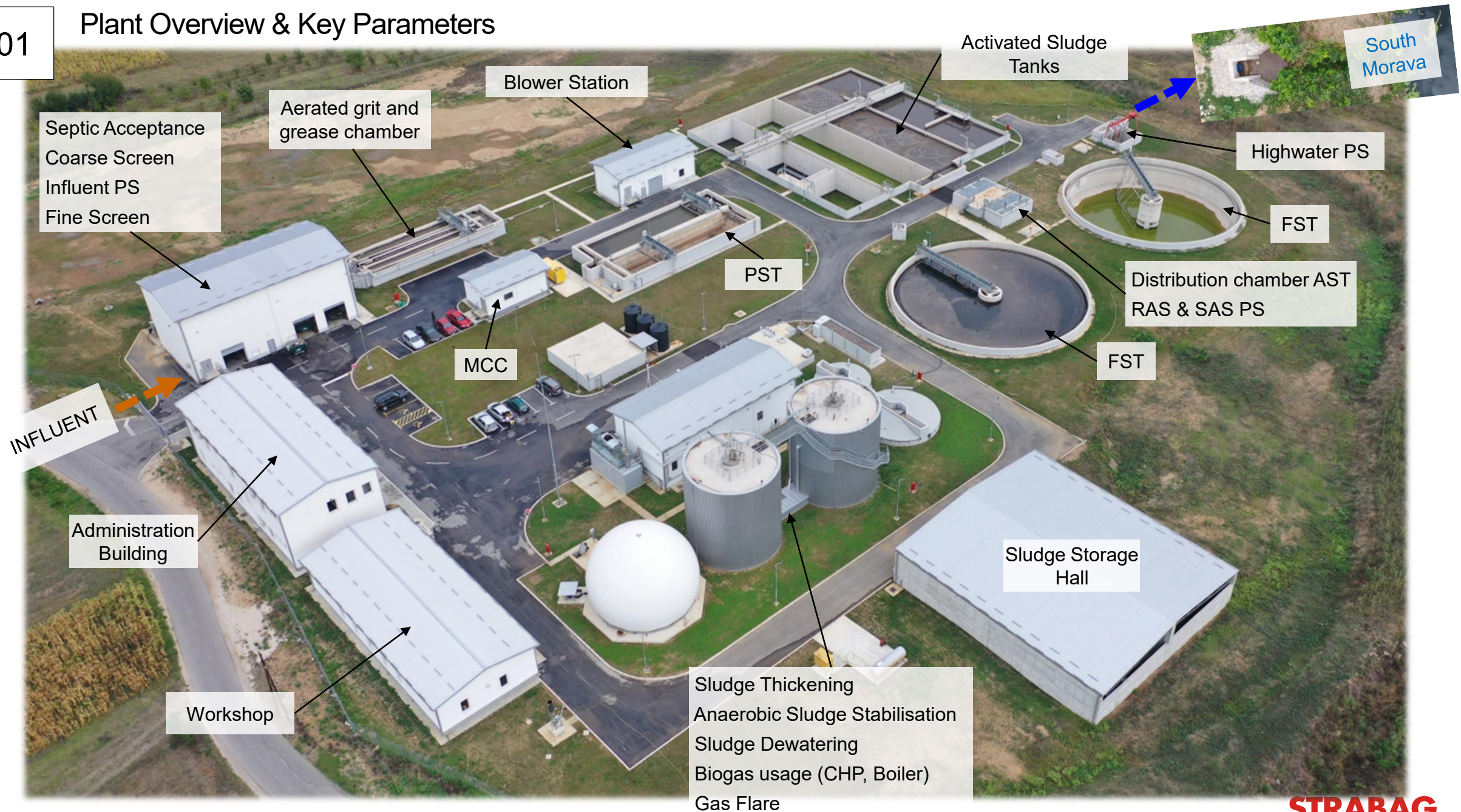
Overview map:



Aerial view WWTP Vranje (08.2022)

01

Plant Overview & Key Parameters



Plant Overview & Key Parameters

Mechanical Pre-Treatment



[090] Primary Sedimentation Tank

Key characteristics:
 $n = 2+0$ lines
 $t_R = 1.06$ h for ADWF



[030] Coarse Screen

Key characteristics:
 $n = 1+1$ screens
 $s = 20$ mm
 $Q = 1,552$ m³/h



[040] Influent PS

Key characteristics:
 $n = 2+1$ pumps
 $Q = 1,552$ m³/h

[050] Fine Screen

Key characteristics:
 $n = 2+1$ screens
 $s = 6$ mm
 $Q = 1,552$ m³/h



[060] aGGC

Key characteristics:
 $n = 2+0$ lines
 $V \approx 87$ m³ per Line

Plant Overview & Key Parameters

Biological Treatment

[230] RAS PS

Key characteristics:

n= 2+1 pumps

Q = 1,552 m³/h



[140] Final Sedimentation Tanks

Key characteristics:

n= 2 lines

DN= 29.0 m



[110] Activated Sludge Tanks

Key characteristics:

n= 2 lines

V≈ 4.002 m³ per line

BioP, DN, DN/N, N – compartment



Plant Overview & Key Parameters

Sludge Treatment & Biogas Usage



[290] Sludge dewatering

Key characteristics:
 n= 1+1 centrifuges
 Q= 15 m³/h / 675 kg SS/h



[270] Digester

Key characteristics:
 n= 2 lines
 V≈ 840 m³ per digester



[340] Biogas Holder

Key characteristics:
 n= 1 biogas holder
 V≈ 810 m³



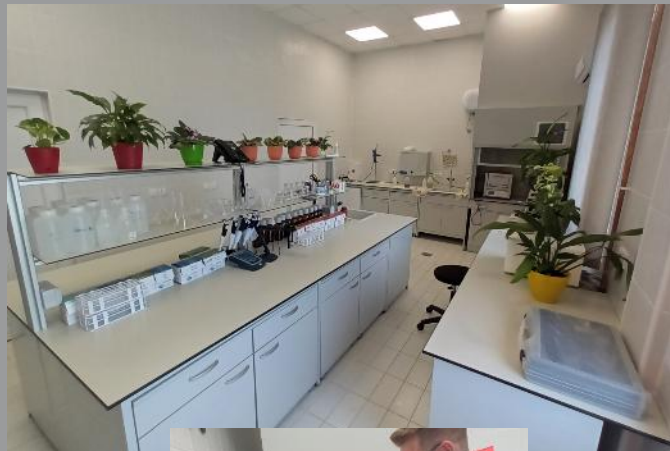
[351] CHP

Key characteristics:
 n= 1 unit
 190 kW_{el}

STRABAG
 WORK ON PROGRESS

WWTP Vranje

70.000 PE



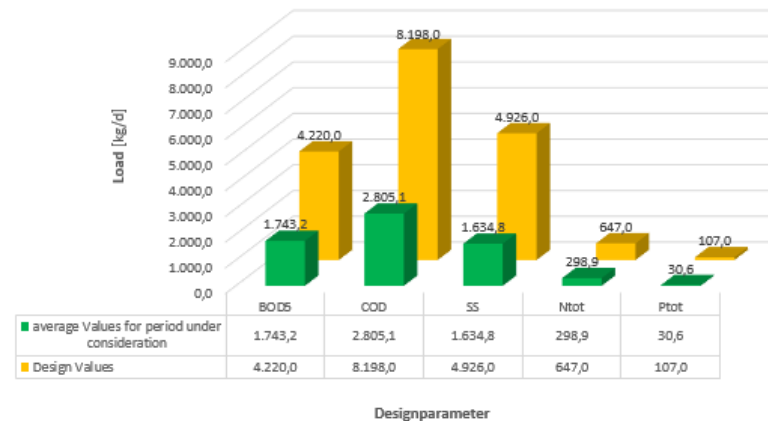
Influent Conditions during Trial Period and DNP

Period under consideration:

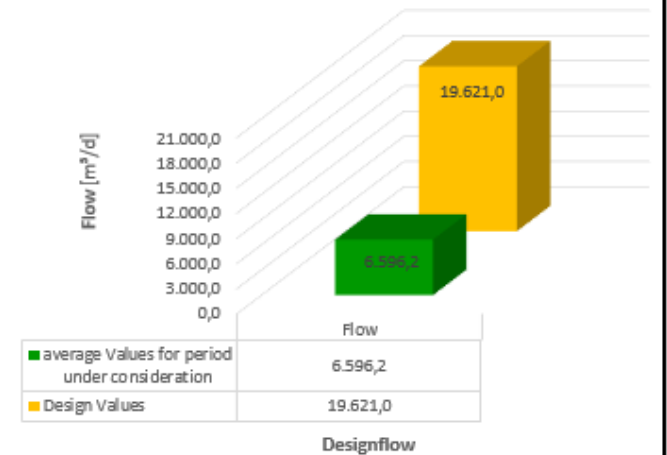
Start: 01.03.2022
End: 28.02.2023

Description	Flow [m³/d]	BOD ₅ [kg/d]	COD [kg/d]	SS [kg/d]	N _{tot} [kg/d]	P _{tot} [kg/d]
Design Values	19.621,0	4.220,0	8.198,0	4.926,0	647,0	107,0
average Values for period under consideration	6.596,2	1.743,2	2.805,1	1.634,8	298,9	30,6
% of Design Values	34%	41%	34%	33%	46%	29%

recorded Influent Loads & Design Loads WWTP



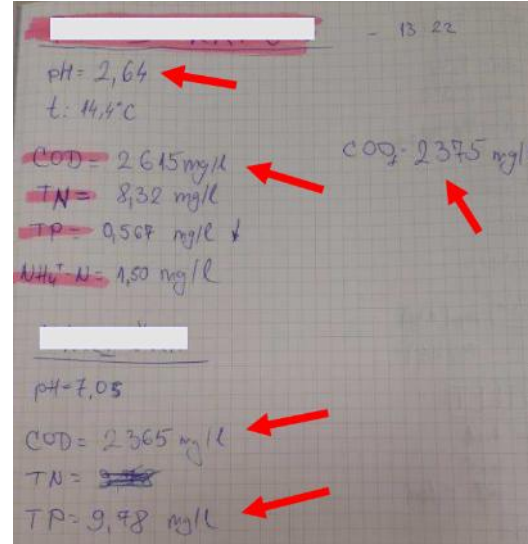
recorded Influent Flow & Design Flow WWTP



❑ Industrial Influent from different factories



Sampling and recording on site



Lab Analyses / Results



Investigations

❑ Adaptation / Modification plant operation

- based on the actual influent conditions
- based on installed equipment, tanks, pipe,...
- to ensure stable plant operation / compliance with effluent limit values
- Optimization electrical power consumption
- ...

WWTP Vranje

70.000 PE



☐ Proper collection and definition of Design loads / Operation Loads WWTP

- **QUANTITY** (hydraulic flow conditions [m^3/d , m^3/h]) and **QUALITY** (COD, BOD_5 , SS, N, P [mg/L , kg/d])
- domestic, commercial and industrial sources
- seasonal influence (tourism)
- ...

☐ Flexibility plant operation

- number of lines
- by-pass operation of treatment steps
- Equipment selection (e.g. CHP)
- ...

☐ Operating personnel

- Skilled personnel
- Training
- ...

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