Thermo power plant "Kosovo B"– a pollution source for Sitnica River

Besime Sh. KAJTAZI

Boulevard Bill Clinton Nr 29, 10000 Prishtine, Kosovo

Tania FLOQI

Department of Engineering and Architecture, Faculty of Engineering, Informatics and Architecture, UE Tirana, Albania

ABSTRACT

Kosovo's waters are unevenly distributed in time and space. Kosovo is water scarce, and it also has the low level of water resources development and storage. In particular Iber basin is water stressed, but in the next 20 years it is expected that all Kosovo's basins will be water stressed [1]. This is due to population and general economic growth, and resource variability. The anticipated revitalization of the irrigation and mining sector and additional demands from the energy sector will increase pressure on new water demands. For these reasons, the water quality of existing resources will become an ever-growing problem if not addressed now.

Keywords

Clean rivers; industrial pollution; protection and sustainable use of water resources

INTRODUCTION

Sitnica is the main river stretching in Kosovo valley that confluence with Ibar, one of main river basins in Kosovo which further flows towards north of country joining Danub later. The watershed covers a total area of 2,873km^2, or about 25% of the total area of Kosovo. Sitnica is lowland river with very variable flow, being very low during summer 0,5m^3/s while during winter reaches up to 328m^3/s [2]. It originates in the northeast foothills of the Sharr mountains in the municipality of Ferizaj, where it is called Sazlija. It then heads to the north and the plains of Kosovo where it is joined, by several tributaries. In the suburbs of the capital Pristina, it enters the mining basin of Kosovo and is joined by two much polluted tributaries: Graçanka and Prishtevka. It is in this section that the quality of its water deteriorates sharply with wastewater discharges from Pristina, wastewater from industries located along its course (coal mines and thermoelectric power stations), and landfills and storage of solid wastes along the river banks etc.

Kosovo is at very early stages of building the facilities for treatment of wastewater. Only 0.7% of produced wastewater is treated before its return to the nature [3]. All other wastewater is discharged without any prior treatment to nearby streams and rivers.

The main energy production industry (thermopower plant "Kosovo B") is

located nearby Sitnica and their operation is not compliant with environmental protection standards and regulations.

The wastewater generated from the operation of lignite-fired power plant with minimal treatment such as sedimentation, is discharged into Sitnica river.

The wastewaters discharged from power plant are as follows:

- Bottom ash removal water
- Heavy Fuel Oil polluted water
- Run-off water, potentially polluted by oils and hydrocarbons (including coal yard)
- Water Chemical Treatment plant effluents, including:
    - Sludge produced by softening (decarbonization - DECA) treatment
    - Water from regeneration of ion-exchange resins
    - Overflow of decarbonization (DECA) and demineralization (DEMI) water basins
- Sanitary wastewater

METODS AND MATERIALS

Through wastewater sampling in six discharging points from operations of thermal power plant "Kosovo B" and their laboratory analyses, we have analysed the pollution that this industry being the main source of energy production for the country, is causing to another important natural resource Sitnica river.

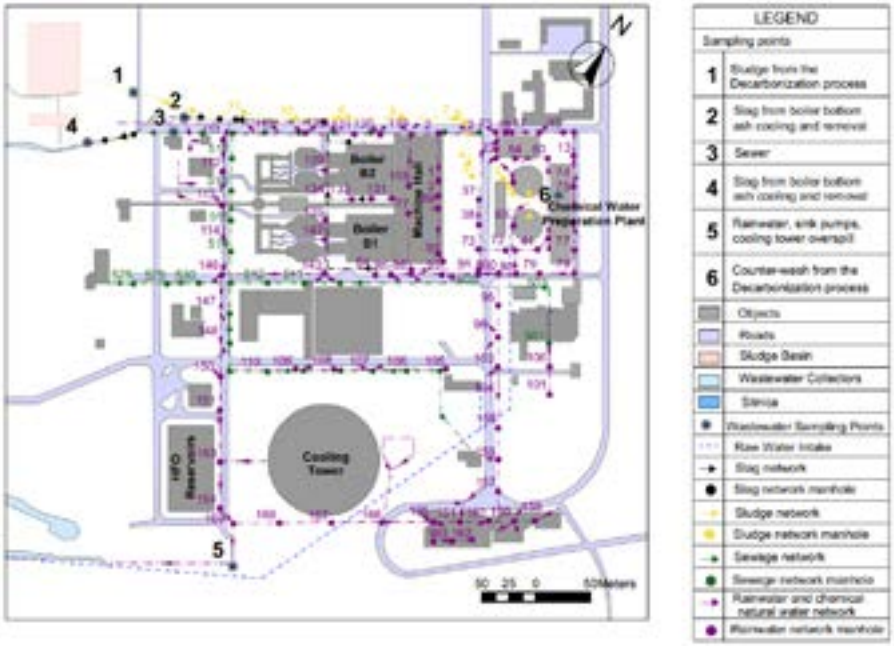

Figure 1: Layout of the thermo powerplant Kosovo B and the locations of the six sampling points

In Figure 1 we have presented the layout of the thermopower plant "Kosovo B" and the locations of the six points where the wastewater samples have been taken for analyses as follows:

1. Sludge from the Decarbonization process. This wastewater is the sludge that is produced from raw water treatment plant that treats water for the energy production;
2. Slag from boiler bottom ash cooling and removal. It is the water that is used to cool the ash created from coal burning before it undergoes sedimentation;

3. Sewer is the sanitary wastewater collected from administrative buildings and kitchen;
4. Slag from boiler bottom ash cooling and removal. The water that is used to cool the ash created from coal burning after sedimentation and before discharge into river;
5. Rainwater, sink pumps, cooling tower overspill. This is mainly drainage water, and spill from cooling tower;
6. Counter-wash from the Decarbonization process. Water that is used to wash the filters in the decarbonization process.

The testing methods and standards applied for analyses are mainly ISO, DIN and EPA standards based on parameters each specifically and they are shown below in Table 1.

In one of the columns of Figure 1, we have presented the Industrial emission limits according to national Administrative Instruction nr. 30/2014 that are applicable for discharges from industry into the river.

Table 1: Wastewater analyses from six samples

Parameter	Unit	Method	Industrial emission limits acc. AI nr. 30/201	Results					
				1	**2**	**3**	**4**	**5**	**6**

			4						
Flow	l/m			17.0	5510	18.9	90.0	45.0	6.0
Temperature	°C	DIN 38404 C4		14.6	25.2	20.1	29.3	31.2	16.5
Electrical conductivity	µS/cm	DIN 38404 C8		170	340	620	390	440	120
pH		ISO 10523		10.57	8.72	7.81	9.74	9.92	9.99
Colour	Pt/Co	ISO 7887:1994		None	None	None	Light black	Light black	None
TSS	g/l	ISO 11923:1997	35-60	6.0	40.0	172	128.0	16.0	20.0
TDS	mg/l	US EPA 8163		80.0	200	340	240	220.0	200
TPH	mg/l	EPA 1664			<20	<20			

Total F	mg/l	EPA 365.3			0.55		0.63	0.59	
Total CL	mg/l	ISO 7393:1985			<0.03		0.03	0.06	
Al	mg/l	EPA 3015A, EPA 6010C: 2007	3		0.470		0.320	0.726	
As	mg/l		0.1		<2 ppb		<2 ppb	<2 ppb	
Cr	mg/l		1		0.039		0.038	0.036	
Hg	mg/l		0.01		< 1 ppb		< 1 ppb	< 1 ppb	
Mn	mg/l				0.012		0.016	0.060	
Ni	mg/l		0.5		0.101		0.132	0.130	
Pb	mg/l		0.5		< 1ppb		< 1ppb	< 1ppb	
S	mg/l		400		4.066		9.210	9.240	

Zn	mg/l		1		0.124		0.111	0.132	
Ca	mg/l	ISO 7980:1986, EPA 6010 C:207		8.47					
Mg	mg/l	ISO 7980:1986, EPA 6010 C:207		1.80					
BOD	mg/L	ISO 5815:2003	25			83			
COD	mg/L	ISO 6060:1989	125			236			
N (Total)	mg/L	ISO 5663	20			17.68			
P (Total)	mg/L	EPA 8048				1.16			

Faecal Coliform	Cfu /ml	ISO 9308-1				>300			
Escherichia Coli	Cfu /ml	ISO 9308-1	1000/100ml			>300			
Anionic surfactants	mg/L	ISO 7875-1: 1996				0.39			
Non-ionic surfactants	g/L	ISO 7875-2: 1984				0.07			

RESULTS

The results from analyses of the six samples of wastewater generated by energy production can be summarised as follows:

- The temperature of these wastewater discharges is between 14-29°C, that can be considered high for some aquatic life species
- Electrical conductivity varies between 120-620 μS/cm
- pH value is going from 7.81 up to 10.5 which makes these wastewaters basic
- TSS are above limit in two samples (3 and 4)

- **BOD and COD analysed in sample 3(sewerage) are above the limits and they show the organic load and total load of the wastewater**
- **It was noted that some of metals(As, Hg, Pb) are exceeding the limits.**

DISCUSSIONS

Pollution coming from thermopower plants represents important pollution pressure in Sitnica river, and its better management represents an important area for improving the ecological status of the river.

In order that the power plant operations are compliant with national legislation requirements and European Directives, based on studies, analyses and the results of the laboratory tests of the taken samples, the appropriate treatment facilities are proposed as follows:

- An appropriate wastewater treatment plant, consisting of a physical-chemical and biological stage should be designed and built in order to treat the wastewater streams: sanitary, bottom ash removal, Deca process sludge and atmospheric water in order to fully comply with environmental standards;
- For runoff and heavy fuel oils (HFO) contaminated water a basin should be dimensioned and built combined with appropriate treatment stages (sedimentation and skimming) in order to remove the pollutants;
- Check the possibility to re-use the treated wastewater in the plant (i.e. for ash transport) in order to reduce the water consumption;

CONCLUSIONS

Sitnica river is important water resource for central part of Kosovo and it must be protected. The achieve this goal there are a series of actions and investments to be undertaken.

On regards to the pollution from thermopower plant we recommend the:

- Construction wastewater treatment plant for industrial wastewater
- Construction and development of monitoring stations of water discharges from thermo power plant in Sitnica river and regular reporting to the competent authorities.

Kosovo as the rest of the Western Balkan region, enjoys an enlargement perspective. The policy development should be aligned with EU "acquis", and infrastructure should be implemented according to European codes and standards.

Country is struggling with the compliance with EU directives, especially with the Urban Wastewater Treatment Directive (UWWTD) and Industrial Emissions Directive (IED). The lack of appropriate facilities for wastewater treatment before their discharge into recipient represents an important gap in water sector that need to be addressed in order to comply with EU standards and regulation.

While water is a central issue in water security, it is increasingly clear that this goes beyond single sector issue topics and it percolates into all parts of society and economy.

REFERENCES

1. *State Water Strategy for Kosovo 2017-2036.*
2. **Report**: *State of waters in Kosovo,* Kosovo Environmental Protection Agency, 2015.
3. **Report:** *Annual report of water service providers 2019, Water Regulatory Authority of Kosovo.*
4. **Report**: TA3-KOS-ENV-01*: Project Preparation Feasibility Study for Prishtina Wastewater Treatment Plant,* December 2012 Kosovo.
5. **Report**: *Kosovo Water Security Report,* The World Bank 2017.
6. **Edited book:** E. Roberts Alley, P.E. 2007 *Water Quality Control*. Mc Graw Hill, WEF PRESS Water Environment Federation Alexandria, Virginia, pp.2.3 -2.7
7. **Administrative Instruction nr. 16/2017** *on classification of surface water bodies*, Ministry of Environment and Economy of Kosovo.
8. **Administrative Instruction nr. 30/2014** *on industrial emission limits*, Ministry of Environment and Economy of Kosovo.
9. *https://ec.europa.eu/environment/water/water-framework/index_en.html*