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CONSIDERATION CONCERNING WATER POLLUTION IN LARGE ELECTRO-POWER PLANTS

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Abstract: *This paper highlights the importance of energy sector, but it also reveals environmental issues that appear in the process of obtaining electricity and thermal energy. This is reason for the main indicators of environmental quality are monitored both locally and regionally.*

Keywords: *LEP, limits, water pollution*

1. INTRODUCTION

Energy is at the same time a positive and negative factor: it contributes to the development of society, in order to facilitate progress, but in the same time is an important source of pollution that harms the environment. Energy demand has grown with the evolution and modernization of society. [1]

The amount of energy required at global level, whether we are using renewable or non renewable energy, increases with the population explosion in the last centuries. [4] Electricity is increasingly replacing other forms of energy due to the facility with which it is transported and the option of turning it into other useful forms of energy such as mechanical energy, chemical energy, light or heat. For this reason, nowadays from all the energy consumption, more than 30% it is electricity. [2]

According to Romania's Energy Strategy overall energy demand in 2030 will be about 50% higher than in 2003, and the oil necessary will be about 46% higher. Known oil reserves can sustain the current level of consumption

only until 2040, and the gas until the year 2070, while world reserves of coal provides a period of over 200 years of utilization. [5]

2. ENERGY AND ENVIROMENT

According to Romania`s National Institute of Statistics most electricity production comes from power plants.

Near Craiova is located an energetical complex with two large electro-power plants (LEP) Isalnita and Craiova 2. LEP consists in complex installations that transform chemical energy of natural fuels in electricity and heat. All the plants facilities are crossed by the following mass flow: the coal necessary for combustion goes to boilers burning and the gas supply is achieved by using an adjusting gas station. The air necessary for combustion is taken from the outside of the building in which the steam boilers are installed using air fans.

The appropriate water supply is obtained from Jiu River which is used after demineralized water treatment process.

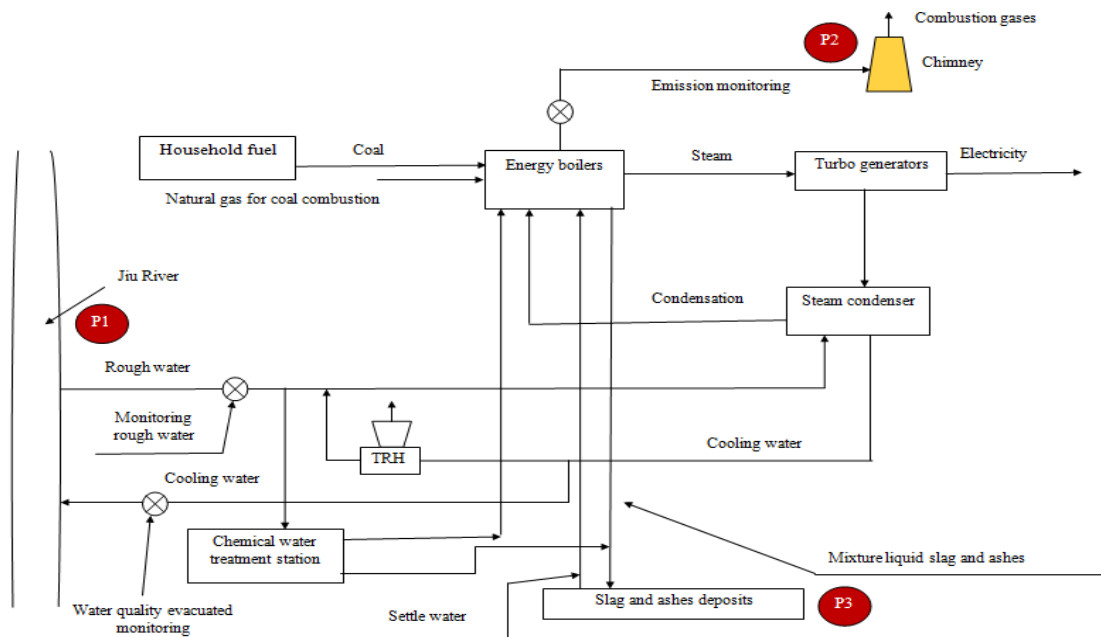


Figure 1. Material flow in LEP

According to material flow diagram (figure 1), the fuel is converted into energy as a result of combustion processes in steam boilers and then it passes through turbo generators to become electricity. All the remaining steam that was not turned into electricity is condensed and reintroduced in the energy circuit or can be used as cooling water for other installations.

After the process of obtaining electricity and heat all the environmental factors are polluted in some measure.[6]

In figure 1 with P1 is noted all the problem of water pollution created by the LEP for Jiu River. Some of the water quality indicators are influenced by the released of technological water directly in the running water; combustion gases, noted with P2, represents the second environment factors influenced by LEP. These harmful gases depending on the atmospheric dispersion phenomena can have a direct influence over the area nearby the source of pollution or they can cause problems in remote areas. Slag and ashes, noted with P3, represent a great problem because the soils were is located all the waste combustion cannot be used for agriculture or other purposes.

Water is the only natural and renewable source on the planet that is vulnerable and limited as well. It can be used both as raw material in productive activities as well as an

energy source, means of transportation, in the same time it plays an important role in maintaining ecological balance.[3]

All the necessary water comes into the LEP through an adduction channel situated in 44° 39'50.39" N, and 23° 7'16.232" E.

During the process of obtaining electricity water from the river Jiu is used in steam condensers and as cooling water in the chemical treatment station of the plant or can be used in the heating circuit of the city.

The disposal of the used water are realized through an evacuation channel situated near the power plant in the location 44° 39'24.14" N, and 23° 7'14.237" E.

The water that is reinserted into the natural flow of the river Jiu must comply with the main quality indicators indicated in the legislation.

According to NTPA 001/2002 the charge level of pollutants from urban and industrial waste water in natural receivers must be within allowable limits.

The main water quality indicators monitored by a specialist worker of the energy complex are pH, chloride, ammonium, suspensions, residue, sulfates and temperature.

All the indicators are monitored every day upstream and downstream the energy complex by plants employees and occasionally by the Environmental Protection Agency.[7]



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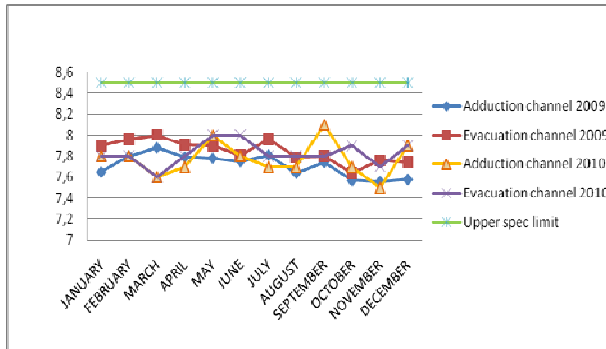


Figure 2. pH evolution in Jiu River

According to figure 2 the value for pH before and after the energy complex do not exceed upper specification limit.

These values are possible because all the residual waters are neutralized before it reach evacuation channel.

In the production steps a major quantity of water is used to cooling down energy generators and turbo generators.

Because of that temperature values are closely monitored to lower the thermal pollution possibility.

This type of pollution can influence in a fast and directly manner fish and all the aquatic vegetation. In the last years the measurement shown a decrease of water temperature from the power plant discarded in emissary.

As can be seen in figure 3 the limit of 35°C are exceed only in summer time, because the temperature in the adduction channel is very close of the maxim specification limit. [7]

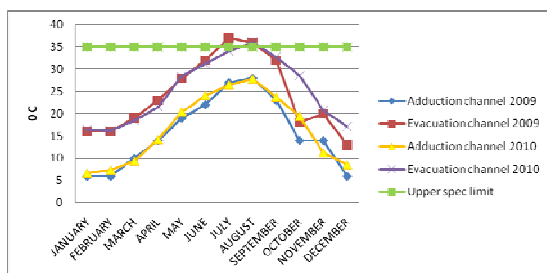


Figure 3. Temperature evolution in Jiu River

Another problem in terms of water pollution can be the quantity of metal in residual water.

3. EXPERIMENTAL RESULTS

In the experimental results it has been used water sample from the adduction and evacuation channel. All the samples were analyzed with a VARIAN Atomic Absorption Spectrometer 280 FS and dedicated software SpectrAA. The software can display the concentration or absorbance for each sample.

According to the experimental result (figure 4) the level of lead in the evacuation channel is exceeded only when the concentration in the adduction channel exceed the legal limits.

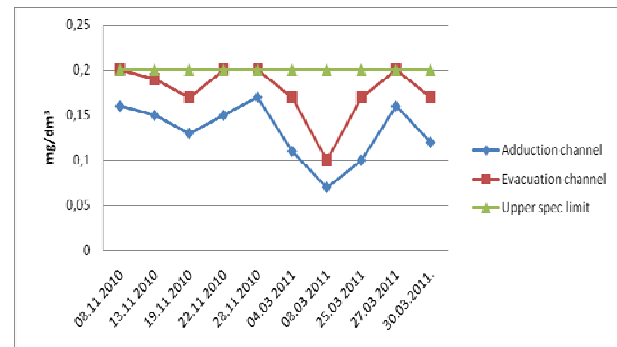


Figure 4. Pb level in Jiu River

From sample taken from the adduction and evacuation channel analysis have been performed in order to determine the level of copper and iron as shown in the figure below.

The concentrations of copper in the residual water from the power plant are very low, as seen in figure 5. The difference between the measured value and standard limit is very high therefore copper pollution is not relevant to this energy sector.

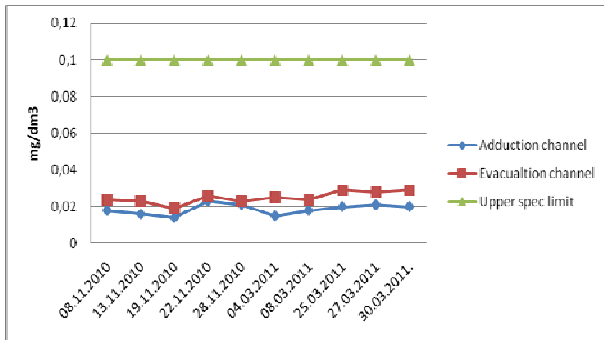


Figure 5. Cu level in Jiu River

The measurements conducted in distinct months, when energy requirements are different, show that Fe pollution is not a common situation near a LEP (figure 6). [7]

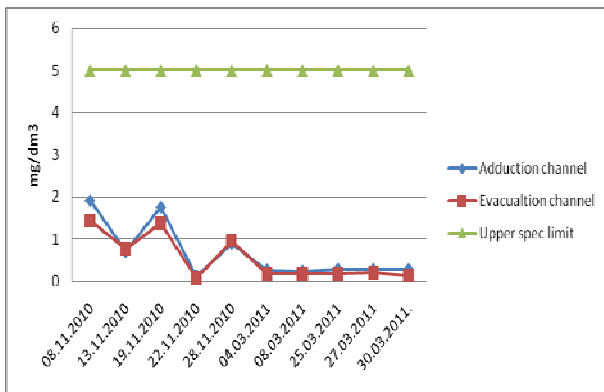


Figure 6. Fe level in Jiu River

According to previous figures, LEP is not a significant source of metal pollution in water terms. This situation has some exception in the periods when preliminary charging of the receptor resulted in exceeding the limits for quality indicators.

4. CONCLUSION

Air and soil pollution are important but water quality is significantly more important because life in all its forms cannot exist without water.

According to the annual report regarding the status of environmental factors in Romania in 2010 the ecological status of water within the catchment area is mainly good in Jiu River.

The charts were traced based on experimental determinations taken near Craiova's LEP. [8]

The analysis performed to the sample in the adduction and evacuation channel for power plant have shown that the LEP is not the main source of Jiu pollution. Amaradia River significant may disrupt water quality in Jiu, especially suspension materials.

Jiu River water quality is influenced by other power plant activity from Oltenia such as Turceni and Rovinari. In comparison with other energy plants, Craiova's LEP has made major investments in the new technologies leading to reduce the pollution degree.

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