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# INFLUENCE OF INDUSTRIAL WATERS OF PLANT SILCAPOR AND RIVER NERODIME IN PHYSIC-CHEMICALS CHARACTERISTICS OF RIVER LEPENCI IN KOSOVO

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**Abstract**
Rivers, seas and oceans have become the storage for waste, sewage and industrial wastewater. Although the quantity of freshwater that is used for drinking are very small even this amount of water day by day is polluted very much that is seriously compromised drinking water. Pollution of surface water and groundwater has become general problem in the world, Kosovo on this issue have not yet begun to do anything. All waters indiscriminately discharged into rivers without any treatment. One of the rivers in the Republic of Kosovo that have such luck is river Lepenci which descend in the Sharr Mountains and flows through the valley Siriniqi, Shtërpcë, Drajkovc, Firajë, Brod, Doganaj, Soponicë, Rekë, Nikaj, Biqec, Kovaqec, Kaçanik, Ivaj, Kotlinë, Bush, Uji i Thartë, Hani i Elezit and then passes in Macedonia on the Vardar river then flows into the Aegean Sea. In this river waters indiscriminately dumped waste, sewage and industrial wastewater. In this paper is addressed the impact of industrial wastewater processing plant technology blocks siporex technology, Silcapor, in physic – chemical characteristics water in river Lepenci. This plant is one kilometer distance from the river Lepenci. From the results of chemical analysis of the Lepenci River's water, we have seen that water is very polluted and the values are many times higher than normal values. Determining the impact of these waters is the aim of this paper, explanation of opportunities for cleaning of industrial water as well as wastewater and water of river Nerodime which flows into River Lepenci. Analysis of water in the river Lepenci in Kaçanik involves determining the physical and chemical properties on six measuring points: Banovina Bridge, Factory Silcapor, Soponicë, Bob, Nerodime river before joining of river Lepenci and Kaçanik. As the results of the analysis as well as by the physical appearance of water river Lepenci seen that the water is much polluted and it is not usable for various vital needs. The main goal of this paper is to maintain clean environment with the protection of human health and the ecosystem as a whole.

**Keywords**: Pollution, Lepenci, Silcapor, Industrial Water, Nerodime

## 1. INTRODUCTION

Physic-chemical analysis and qualities of water River Lepenci are based on several steps: Audit area, defining the area, preparation of work scheme, nomenclature of the samples taken in to river, sampling, determination of sampling frequency, parameters that define analyzed, parameters and methods of defining, processing and calculation of results, presentation of the results on table, graph results, discussion of results, conclusions and recommendations.

### 1.1 Audit of the area

An audit of the area in this case means the observation and study of the terrain, where the surroundings can influence Silcapor factory with the activity of its water pollution, which will either group: surface water (effluent or recipient) water, atmospheric water and Nerodime River.

### 1.2 Definition of the area

Physical-mechanical analysis of river water Lepenci includes the length of the river from the Bridge Banovina located in the village near the triangle of road Doganaj- Tetove-Brezovice up to Lime Factory in Kaçanik.

#### 1.2.1 Scheme of work

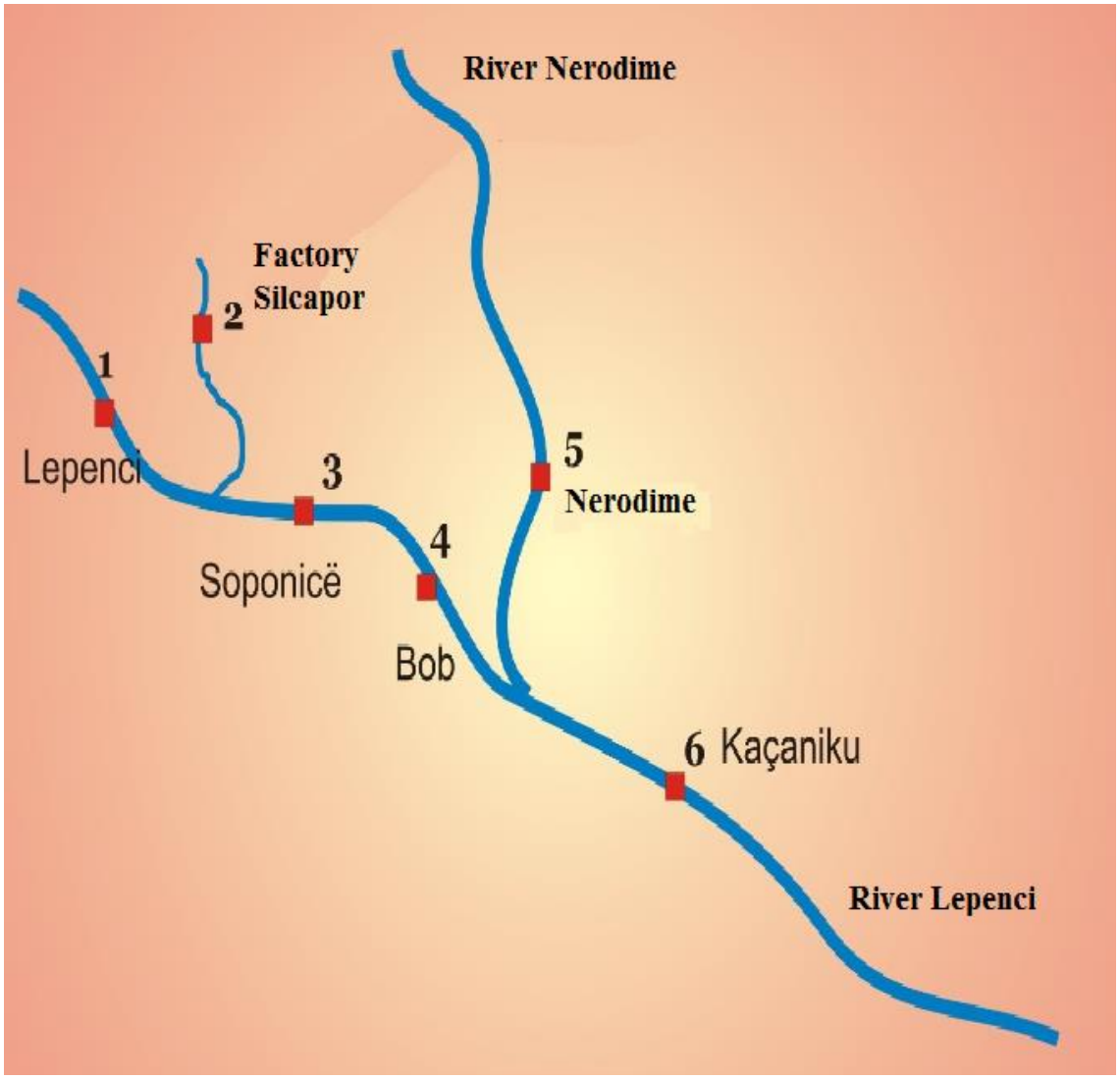


**Figure 1** Scheme work

### 1.2.2 Nomenclature of the samples taken in to river

- M1. Banovina Bridge (before entering in the factory of Silcapor) ,
- M 2. Factory Silcapor,
- M 3. Soponice (after discharge of water from the factory Silcapor),
- M 4. Bob,
- M 5. Nerodime river,
- M 6. Kaçanik before Lime Factory

## 1.3 Sampling

Sampling is one of the basic elements that affect in the accuracy of the test results. Therefore we strictly enforce all regulations, procedures and standards which are described for sampling. The main elements which we are supported during sampling are: sampling techniques, the choice of dishes for sampling, measurement of parameters required at the time of sampling, sampling the main stream of the recipient or pollutant effluents and polluted respectively, respecting the duration of sampling and conducting the analysis, preservation of samples, etc.

## 1.4 Determination of the frequency of sampling

Three sampling were performed in the total, at the end of April 2013, during the month of August 2013, and during November 2013. During these sampling has taken samples in 6 places, samples which covering the study range. **Analyzed parameters:** Turbidity ; Color; Smell; Taste; PH value; Ammoni;

Nitrate; Nitrite; Solvable oxyge; Expenditure of $KMnO_4$; Total Hardness,; Sulphates $SO_4^{2-}$,; Phosphates $PO_4^{3-}$,; Specific conductivit; Manganese; Iro; M-alkalin; Acidit; Chloride.

## 2. Tabular presentation and discussion of results from the Bridge Banovina to the Lime Factory Kaçanik

### 2.1 First cycle of measurements

Table 1 presents the results of measurements of the first cycle of six samples taken in the length of the river Lepenci from the Bridge Banovina up the Lime Factory in Kaçanik.

| Date: April 2013 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Max. range allowed | Result | Result | Result | Result | Result | Result |
| Samples | Unit | M1 | M2 | M3 | M4 | M5 | M6 |
| Turbidity | 1.2-2.4 NTU | 1.41 | 46.6 | 4.01 | 4.6 | 6.3 | 5.09 |
| Color | 0-10 Co-Pt | 11 | 466 | 36 | 52 | 92 | 55 |
| Smell | without | smell | smell | smell | smell | smell | smell |
| Taste | without | bitter | bitter | bitter | bitter | bitter | bitter |
| pH | 6.8-8.5 | 7.8 | 9.9 | 8.1 | 7.9 | 8 | 7.7 |
| N (ammonia) | 0.1 mg/l | 0.02 | 0.05 | 0 | 0.02 | 0.1 | 0.24 |
| N (nitrites) | 0.005 mg/l | 0.0045 | 0.0107 | 0.0087 | 0.0085 | 0.013 | 0.0115 |
| N (nitrates) | 10 mg/l | 2.1 | 11.7 | 1.4 | 1.9 | 2.1 | 2 |
| Solvable oxygen | 0 mg/l | 1.11 | 2.27 | 2.74 | 2.51 | 5.49 | 2.43 |
| Expenditure of KmnO4 | 8-12* mg/l | 8.7 | 8.99 | 10.85 | 9.92 | 21.7 | 9.61 |
| Total hardness | 30 °dH | 6.15 | 7 | 8.4 | 8.4 | 7.84 | 7.28 |
| Sulphates $SO_4^{2-}$ | 200 mg/l | 14.5 | 26.9 | 13.8 | 14.5 | 28.9 | 16.5 |
| Phosphates $PO_4^{3-}$ | 0.25 mg/l | 0.245 | 0.691 | 0.432 | 0.639 | 0.406 | 0.853 |
| Specific conductivity | 600-1500 $\mu Scm^{-1}$ | 295 | 201 | 208 | 250 | 568 | 305 |
| Mn | 0.05 mg/l | 0.043 | 0.073 | 0.025 | 0.04 | 0.029 | 0.038 |
| Fe | 0.3 mg/l | 0.411 | 1.415 | 0.52 | 0.314 | 0.595 | 0.487 |
| Alkaline | 0.1 mval/l | 0.8 | 2.3 | 2.2 | 2.6 | 4.5 | 2.6 |
| Acidity | 0.05 mval/l | 0.019 | 0.05 | 0.02 | 0.01 | 0.05 | 0.015 |
| Chlorides | 1 mg/l | 0.99 | 4 | 4 | 4 | 25 | 10 |

The first sample (M1) was taken near the Banovina Bridge and by the results of analyses this water is listed within the waters in the first and second classes of quality of water. This is because most of the Siriniq Valley, including Shterpce, Firaje, Brod, Doganaj Sllatine, in most cases throw sewage into the river. It should be noted that flora and fauna of the River Lepenci in this area is highly developed.

The second sample (M2) was taken in the waters that flow casting from the factory Silcapor. As the results of the analysis as well as by the physical appearance of Water River Lepenci in this measurement point water is listed within the waters in the fifth classes of quality water. In Figures 2 we see blur created from the water junked from the Factory Silcapor.

The third sample (M3) was taken in the village Soponice after water spill from factory Silcapor, from the chemical analyses have seen that compared with the first sample (M1), no big difference in the pollution of water. By the physic-chemical analysis of $19^{th}$ parameters we can see influence of thrown water (factory sewage) in water of River Lepenci and impact is quite large. During continuous casting of these waters in water of River Lepenci due to the large turbidity and because of the chemical composition of water, almost is impossible to be developing flora and fauna. Often fishermen association is notified of the inspection bodies for massive fish kills due to sewage and dumped water from the factory Silcapor.

The fourth sample (M4) was taken in the village Bob. Due to the short road to the river and due to continuous dumping of sewage from villagers Rek, Nikaj, Biçec, Kovaqec, water quality does not improve, but make it worse. If you look at the criteria for classifying water will see that according to this analysis, this water belongs to the second class of water.

The fifth sample (M5) was taken in the river Nerodime two hundred meters before to conflux with river Lepenci. In this river all sewages from the inhabitants on Ferizaj, Varosh, Gerlice, Old Kaçanik Vjeter, Stagova and Kaçanik are dumping.

The six samples (M6) is taken after 500 meters after being conflux the River Lepenci and Nerodime. We can see that the values of the results of physic-chemical analyzes shown in the table after blending of these two rivers value of the components, decreases compared with polluting of river Nerodime while increased compared with the previous point on the river Lepenci.

## 2.2 Second cycle of measurements

Table 2 presents the results of measurements of the second cycle of six samples taken in the length of the river Lepenci from the bridge Banovina up the Lime Factory in Kaçanik.

| Date: August 2013 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Max. range allowed | Result | Result | Result | Result | Result | Result |
| Samples | Unit | M1 | M2 | M3 | M4 | M5 | M6 |
| Turbidity | 1.2-2.4 NTU | 1.49 | 46.8 | 4.21 | 4.69 | 5.22 | 5.13 |
| Color | 0-10 Co-Pt | 13 | 469 | 43 | 53 | 99 | 59 |
| Smell | without | smell | smell | smell | smell | smell | smell |
| Taste | without | bitter | bitter | bitter | bitter | bitter | bitter |
| pH | 6.8-8.5 | 7.5 | 9.6 | 8.3 | 7.8 | 8.7 | 7.9 |
| N (ammonia) | 0.1 mg/l | 0.03 | 0.07 | 0.01 | 0.02 | 0.39 | 0.28 |
| N (nitrites) | 0.005 mg/l | 0.0043 | 0.0121 | 0.0088 | 0.0088 | 0.0197 | 0.0121 |
| N (nitrates) | 10 mg/l | 2.3 | 11.9 | 1.51 | 1.99 | 3.2 | 2.21 |
| Solvable oxygen | 0 mg/l | 1.1 | 2.33 | 2.89 | 2.67 | 5.73 | 2.54 |
| Expenditure of KmnO4 | 8-12* mg/l | 8.79 | 9.11 | 10.92 | 9.98 | 31.6 | 9.59 |
| Total hardness | 30 °dH | 8.5 | 7.7 | 8.43 | 8.7 | 7.91 | 7.54 |
| Sulphates $SO_4^{2-}$ | 200 mg/l | 14.9 | 28.8 | 14.6 | 14.58 | 31.6 | 17.7 |
| Phosphates $PO_4^{3-}$ | 0.25 mg/l | 0.316 | 0.723 | 0.451 | 0.666 | 0.563 | 0.891 |
| Specific conductivity | 600-1500 $\mu Scm^{-1}$ | 313 | 278 | 223 | 279 | 589 | 371 |
| Mn | 0.05 mg/l | 0.052 | 0.081 | 0.037 | 0.048 | 0.035 | 0.044 |
| Fe | 0.3 mg/l | 0.587 | 1.521 | 0.52 | 0.369 | 0.623 | 0.528 |
| Alkaline | 0.1 mval/l | 0.75 | 2.7 | 2.4 | 2.9 | 4.9 | 2.8 |
| Acidity | 0.05 mval/l | 0.031 | 0.061 | 0.017 | 0.009 | 0.04 | 0.016 |
| Chlorides | 1 mg/l | 1.5 | 6 | 5 | 4 | 27 | 11 |

## 2.3 Third cycle of measurements

| Date: November 2013 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Parameter | Max. range allowed | Result | Result | Result | Result | Result | Result |
| Samples | Unit | M1 | M2 | M3 | M4 | M5 | M6 |
| Turbidity | 1.2-2.4 NTU | 1.53 | 45.1 | 3.51 | 4.11 | 4.1 | 4.9 |
| Color | 0-10 Co-Pt | 14 | 460 | 32 | 43 | 81 | 55 |
| Smell | without | smell | smell | smell | smell | smell | smell |
| Taste | without | bitter | bitter | bitter | bitter | bitter | bitter |
| pH | 6.8-8.5 | 7.5 | 9.7 | 7.89 | 7.2 | 7.5 | 7.3 |
| N (ammonia) | 0.1 mg/l | 0.015 | 0.06 | 0.01 | 0.013 | 0.15 | 0.19 |
| N (nitrites) | 0.005 mg/l | 0.0033 | 0.0111 | 0.0067 | 0.0067 | 0.015 | 0.01 |
| N (nitrates) | 10 mg/l | 1.9 | 11.5 | 1.3 | 1.48 | 2.2 | 1.76 |
| Solvable oxygen | 0 mg/l | 115 | 2.15 | 2.65 | 2.42 | 5.49 | 2.34 |
| Expenditure of KmnO4 | 8-12* mg/l | 8.88 | 8.76 | 10.33 | 9.78 | 19.8 | 9.11 |
| Total hardness | 30 °dH | 8.23 | 6.85 | 8.3 | 8.6 | 7.67 | 6.58 |
| Sulphates $SO_4^{2-}$ | 200 mg/l | 13.4 | 25.7 | 13.7 | 13.3 | 21.7 | 14.6 |
| Phosphates $PO_4^{3-}$ | 0.25 mg/l | 0.211 | 0.682 | 0.41 | 0.641 | 0.367 | 0.765 |
| Specific conductivity | 600-1500 $\mu Scm^{-1}$ | 304 | 187 | 201 | 241 | 468 | 289 |
| Mn | 0.05 mg/l | 0.031 | 0.07 | 0.023 | 0.038 | 0.021 | 0.031 |
| Fe | 0.3 mg/l | 0.386 | 1.4 | 0.54 | 0.31 | 0.481 | 0.41 |
| Alkaline | 0.1 mval/l | 0.71 | 2.4 | 2.1 | 2.7 | 3.1 | 2.4 |
| Acidity | 0.05 mval/l | 0.021 | 0.04 | 0.022 | 0.009 | 0.023 | 0.013 |
| Chlorides | 1 mg/l | 0.76 | 3.8 | 3.3 | 3.8 | 18 | 9.1 |

## 3.CONCLUSIONS

By physic chemical analysis of water of river Lepenci we can see that water of river Lepenci is ranked in second class of water. Major impact on quality of water of the river Lepnci have water junked from the factory Silcapor and sewage which are discarded by the citizens of villages gravitating around of the river. Turbidity which is observed in junked waters of factory Silcapor depends on the quality of raw materials. Turbidity in the waters of this plant is so high that it can not be compared with any amount of water pollution. Turbidity which is caused by water junked from factory Silcapor often observed in the whole of length of the river Lepenci. Many times after inflowing of the water in river Lepenci with high concentration of different substances were found dead fishes. Also in pollution of water of river Lepenci and in reducing of the quality of water, influence water from river Nerodime, which can freely call sewage collector in length from Ferizaj until Kçanik.

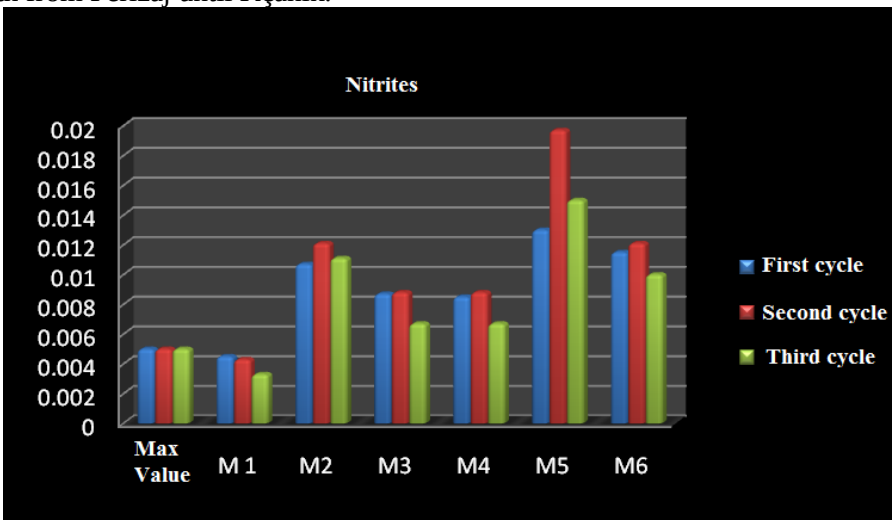


**Figure 3.** Nitrites

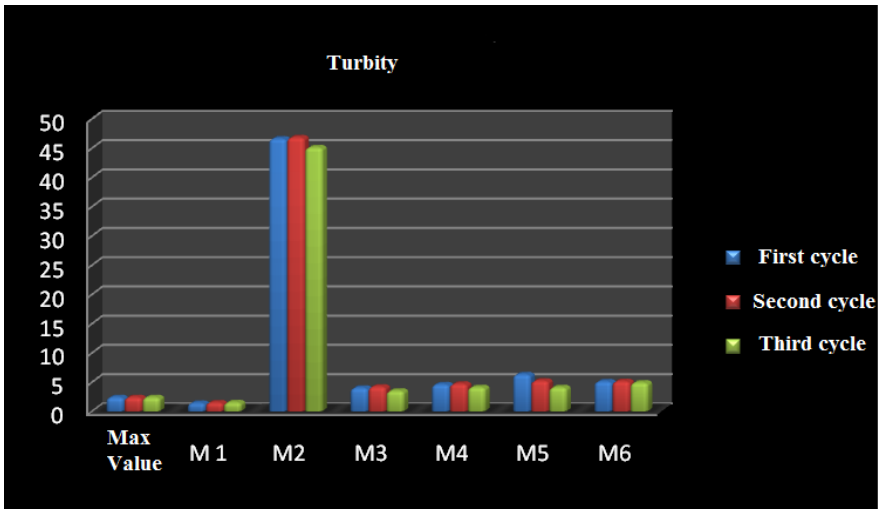


**Figure 4.** Turbidity

## 4.RECOMMENDATIONS

- Processing of waters junked from the factory Silcapor
- Processing Wastewater
- Continuous improvement of technological process
- Implementation of standards on maximum allowable values of pollutants

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